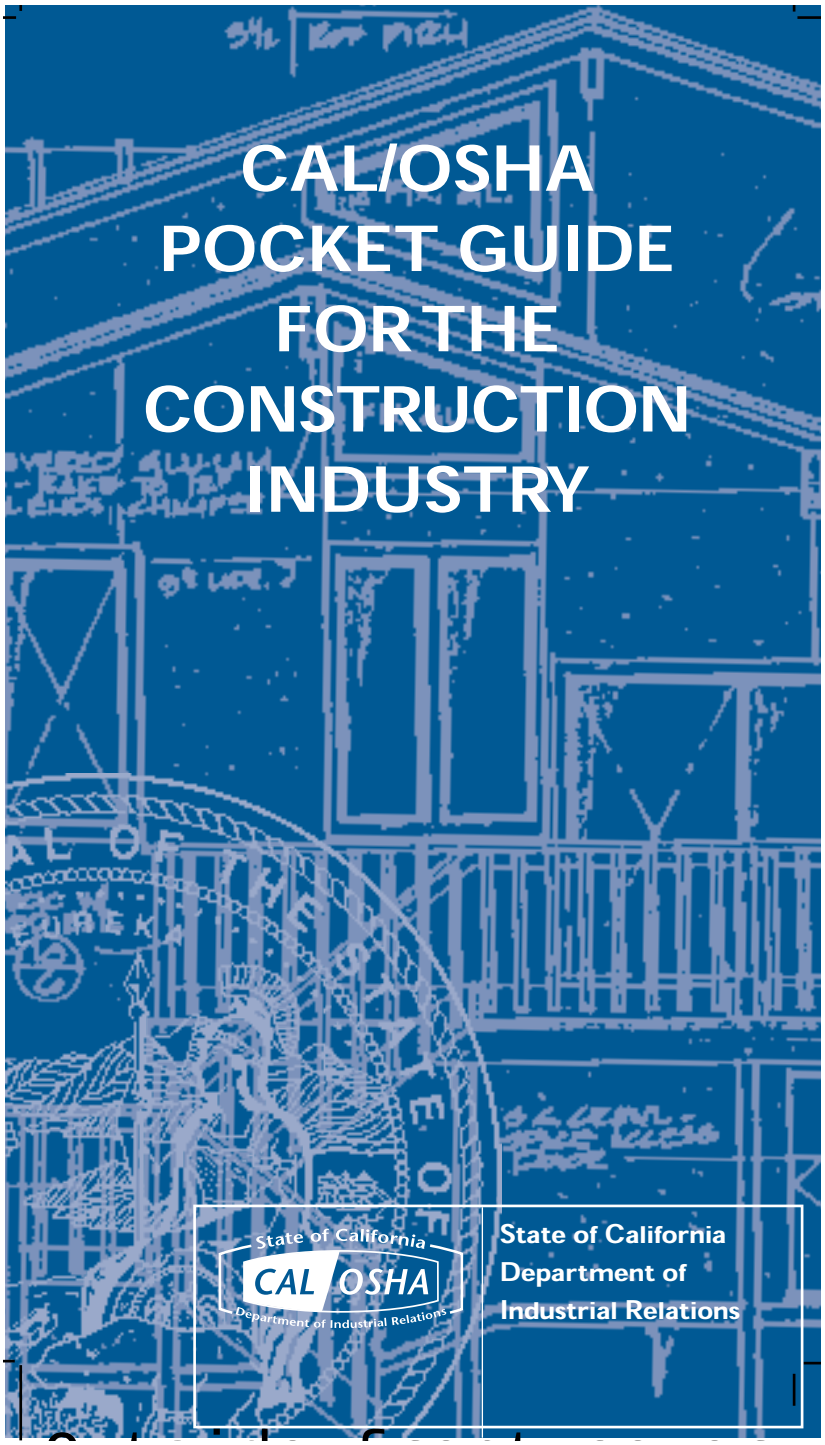

CAL/OSHA POCKET GUIDE FOR THE CONSTRUCTION INDUSTRY

State of California
CAL OSHA
Department of Industrial Relations

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Department of
Industrial Relations

This guide is not meant to be either a substitute for or a legal interpretation of the occupational safety and health regulations.

Readers are cautioned to refer directly to *Title 8* of the *California Code of Regulations* and the *Labor Code* for detailed information regarding the regulation's scope, specifications, and exceptions and for other requirements that may be applicable to their operations.

Current through Register 2000, No. 30 (7/28/2000) of the *California Code of Regulations, Title 8,* and the California *Labor Code* (1999 edition).

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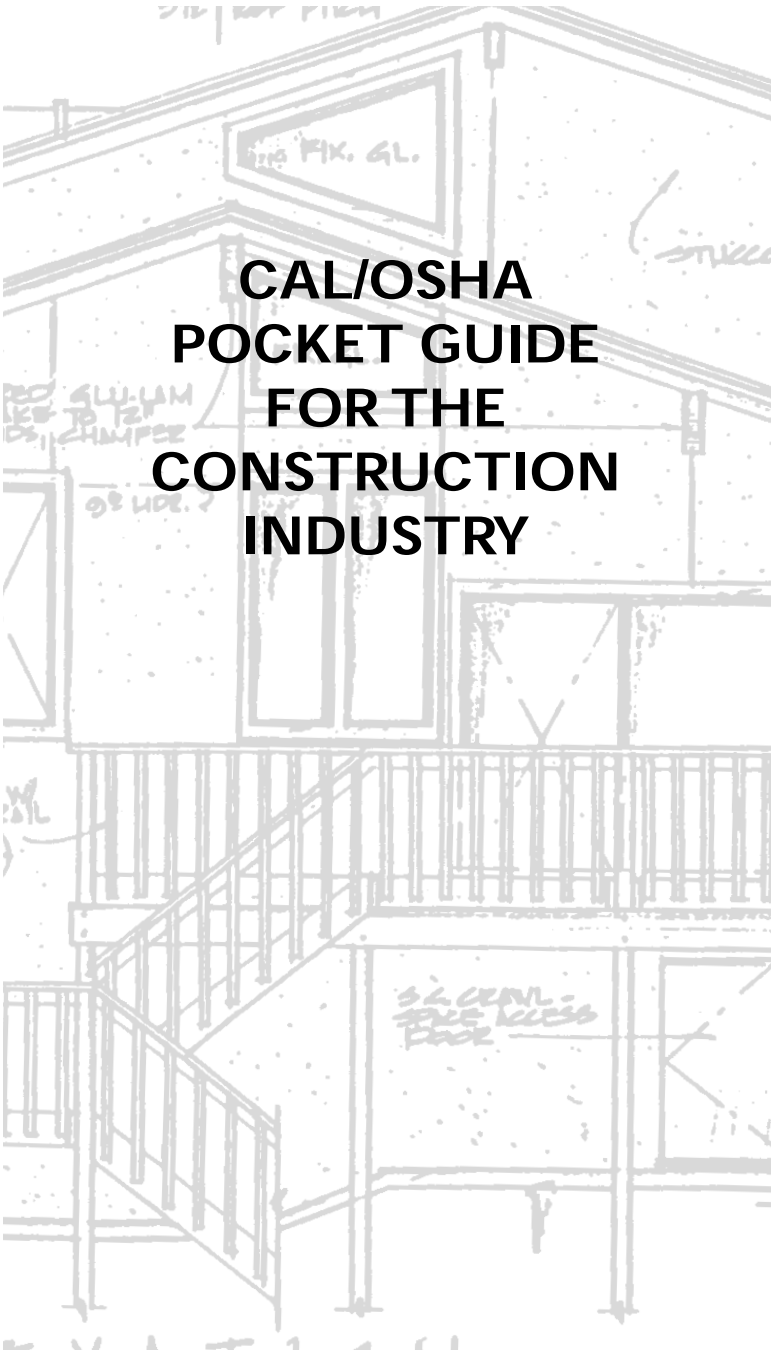
Information on obtaining copies of Cal/OSHA safety orders and other publications is available from the Cal/OSHA Consultation Service located at offices listed in the back of this booklet and on the Internet at <http://www.dir.ca.gov>.



CAL/OSHA POCKET GUIDE FOR THE CONSTRUCTION INDUSTRY

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Introduction

This publication was prepared by Cal/OSHA for use by workers, employers, supervisors, job stewards, and safety personnel. It is meant to serve as a quick field reference. It summarizes selected safety standards from the *California Code of Regulations, Title 8* (*T8 CCR*), that pertain to the construction industry. The major subject headings are alphabetized and cross-referenced with highlights when they appear in the text. Applicable *Title 8* regulatory references are provided on the right-hand side of the subject statements.

Title 8 of the *California Code of Regulations* was developed to ensure a safe and healthful work environment for the California workforce by setting **minimum standards** for workplace safety and health. All California employers and employees, including private contractors and their employees working on federal facilities in California, are subject to these regulations.

For employers in the construction industry, specific standards are found in the Construction Safety Orders (CSOs), Electrical Safety Orders (ESOs), Tunnel Safety Orders (TSOs), and Compressed Air Safety Orders (CASOs) of *T8 CCR.* At work sites or during activities for which no specific safety orders exist, the General Industry Safety Orders (GISOs) apply.

Work Site Safety

In addition to the general requirement to provide a safe and healthful work site, the California employer is required to do the following:

- Comply with all applicable Cal/OSHA safety orders.
- Meet the reporting and recordkeeping requirements for injuries, illnesses, exposures, and deaths.
- Inform employees of their rights and obligations under the Cal/OSHA Program.
- Display the Cal/OSHA poster "Safety and Health Protection on the Job."
- Implement a workplace Injury and Illness Prevention Program (IIP Program).

The most effective way to prevent job-related injuries and illnesses is to implement and maintain a proactive safety program. A proactive safety program is one in which safety is a part of every decision made and activity performed during the course of the workday, the skill level of employees matches the job assignment, appropriate training is provided, and both the employers and the employees help to keep the workplace safe. The benefits of a proactive safety program are numerous and include the following:

- Fewer worker injuries
- Lower compensation insurance
- Lower absenteeism
- Lower employee turnover
- Higher job efficiency
- Higher employee morale
- Higher quality of work

A written Injury and Illness Prevention (IIP) Program should be the foundation of every safety plan in California and is required for every workplace

regulated under *Title 8.* A summary of the basic elements of an IIP Program has been included in this publication starting on page 92. Employers are also encouraged to use Cal/OSHA Consultation Service's model IIP programs, which were developed to help employers design specific IIP programs for their own workplaces.

About Cal/OSHA

Cal/OSHA, also known as the Division of Occupational Safety and Health (DOSH), is best known for its enforcement inspections and its issuance of citations for noncompliance with the safety orders (SOs). However, within Cal/OSHA a separate consultation program is carried out by the Cal/OSHA Consultation Service.

The main purpose of the Consultation Service is to reduce worker exposure to job-site hazards by providing free consultation to California's employers. Because the Cal/OSHA Consultation Service is separate from the Cal/OSHA Enforcement Unit, the consultant does not issue citations. Instead, the consultant presents the employer with a list of violative conditions found, a corrective action plan, and recommendations to better control the hazards at the employer's workplace.

In addition to consultation and technical support, Cal/OSHA Consultation Service staff gives presentations to industry groups and provides publications, such as this pocket guide, free of charge. Employers may arrange for this free and voluntary service by calling the nearest Cal/OSHA Consultation Office listed in the back of this guide.

Cal/OSHA News

Cal/OSHA is implementing several new laws and regulations that affect the construction industry. The following is a summary:

I. Assembly Bill 1127 (AB 1127): This legislation became effective on January 1, 2000, and made many changes to the Cal/OSHA program. These changes include the following:

A. Discrimination complaints: The time period to file a Cal/OSHA discrimination complaint with the Division of Labor Standards Enforcement has been increased to six months.

B. Multi-employer work site regulations: AB 1127 added multi-employer work site regulations affecting any work site where more than one employer and his or her employees work. The categories of citable employers are identified in *T8 CCR* Section **336.10** (see page 104).

C. Fines or prison terms: AB 1127 increased fines and prison sentences that a court may impose for certain *Title 8* violations charged:

   1. Fines for each serious violation can be as high as $25,000, with an initial base penalty of $18,000.
   2. Fines for failure to abate a violation can be as high as $15,000 for each day that the violative condition is not corrected.

D. Exemption for governmental entities: AB 1127 deleted the exemption from Cal/OSHA civil penalties for governmental entities.

E. Enforcement of ergonomics: AB 1127 reaffirms the need to enforce the ergonomics standard.

II. Respirator standard (*T8 CCR* Section 5155): This standard has been amended (see pages 106–7).

III. Forklift regulations (*T8 CCR* sections 3660–3668): Specific training requirements have been identified (see pages 78–80).

IV. Cal/OSHA Construction Safety and Health Inspection Project (CSHIP): Construction ranks first among private-sector industries in the number of nonfatal injuries, and it ranks second in the number of fatal injuries. Falls from heights of at least one story (usually from roofs and scaffolds) are one of the most common causes of death.

A. Cal/OSHA will increase enforcement investigations and consultations in the construction industry, and it will emphasize but not be limited to the following:
   1. Fall protection hazards
   2. Employee training
   3. Electrical hazards
   4. Machinery, equipment, and tool-related hazards (see also "Lock-out/Block-out Procedures")
   5. Excavation and trenching hazards
   6. Heat stress
   7. Musculoskeletal hazards (see "Ergonomics")
   8. Hazards causing chronic illnesses, such as exposure to lead, asbestos, and other cancer-causing products (see "Carcinogens")

B. CSHIP began in June 2000 and is a part of Cal/OSHA's Five-Year Strategic Plan to reduce the

number of fatal and nonfatal serious construction injuries and illnesses.

IMPORTANT

A boom in construction increases the demand for new workers along with the importance of communication about safety standards and work practices.

Employers must ensure that new workers understand what constitutes hazards and unsafe work practices. Employers must encourage workers to express safety concerns and to make suggestions during safety meetings and training. To ensure effective communication, provisions must be made for workers who do not speak English, who have limited comprehension of English, or who speak English as a second language.

See also the “Training” section of this publication.

Access

The employer must provide safe access *to* and *from* all work levels or surfaces. Regulated means of access are as follows:

A. **Stairways**, **ramps,** or **ladders** must be provided at all points where a break in elevation of 18 in. or more occurs in a frequently traveled passageway, entry, or exit. ..... **1629(a)(3)**

B. **Aerial devices,** such as cherry pickers and boom trucks, may be vehicle-mounted or self-propelled and used to position employees, tools, and materials. **3637, 3648**

C. **Elevating work platforms,** such as vertical towers and scissor lifts, are designed to raise and to hold a work platform in a substantially vertical axis. **3637, 3642**

D. **Elevators (construction)** are required as follows:

1. For structures or buildings 60 ft. or more above ground level or 48 ft. below ground level ..... **1630(a)**
2. At demolition sites of seven or more stories or 72 ft. or more in height ..... **1735(r)**

Note: Elevators must be inspected and tested in the presence of a DOSH representative before use. A permit from DOSH to operate is required. ..... **1604.29(a)**

E. **Personnel hoists** may be used at special construction sites, such as bridges and dams, if approved by a registered engineer. ..... **1604.1(c)**

F. **Ladders** can be used to gain access to working surfaces above and below ground level under certain conditions. ..... **1629, 1675(a)**

G. **Ramps and runways** provide means of access for foot or vehicle traffic. **1623–1625**

H. **Stairways** must be installed in buildings that have two or more stories or are 24 ft. or more in height. ..... **1629(a)(1)**

   1. For buildings of two and three stories, at least one stairway is required. ..... **1629(a)(4)**
   2. For buildings of more than three stories, two or more stairways are required. ... **1629(a)(4)**

I. **The following routes of access are prohibited:**

   1. Endless-belt-type manlifts ..... **1604.1(a)(3)**
   2. Single- or double-cleat ladders more than 30 ft. long ..... **1629(c)**
   3. Cleats nailed to studs ..... **1629(b)**
   4. Rides on loads, hooks, slings, or concrete buckets of derricks, hoists, or cranes ..... **1718(a), 1720(c)(3)**

Administrative Requirements

Employers must meet certain administrative requirements that may include Cal/OSHA notification, specific registration, permitting, certification, recordkeeping, and the posting of information in the workplace. Some of these requirements depend on the construction trade or type of activity in which employers are involved. The more common requirements are listed below:

A. **Documents required at the job site** include the following:

1. IIP Program: program document may be kept in the office ..... **1509(a), 3203(a)**
2. Code of Safe Practices ..... **1509(b)**
3. All Cal/OSHA-required permits **341**
4. All Cal/OSHA-required certifications ..... **Various**
5. Respiratory Protection Program, for all work sites where respirators are mandatory ..... **5144(c)**
6. Fall protection plan, if required **1671.1**

B. **Postings required at the job site** include the following:

1. Cal/OSHA poster "Safety and Health Protection on the Job" **340**
2. Code of Safe Practices ..... **1509(b), (c)**
3. Emergency phone numbers ..... **1512(e)**
4. Employee access to records notification, to show that employees have the right to gain access to medical and exposure records ..... **3204(g)**
5. Operating rules for industrial trucks, where employees operate forklifts **3664**
6. Authorized access, at controlled access zones (CAZs) ..... **1671(a)**
7. Variances **407.2, 411.03**
8. Cal/OSHA registration **341.4, 341.10**
9. Citations **332.4**
10. Hazard warning signs at the following job sites:
    a) Where asbestos work is being done ..... **341.10, 1529(k)**

b) Where lead work is being done ..... **1532.1(m)**

c) At confined work spaces **5156–5158**

d) At controlled access zones **1671.2**

e) On cranes, concrete pumps, high-lift trucks, etc., (high-voltage warning signs) ..... **2947, Group 13**

f) On powder-actuated tools ..... **1691(n)**

g) On lasers (laser levels, etc.) ..... **1801(d)**

h) On air compressors with an automatic-start function **3320**

C. **Recordkeeping** requirements are included in *T8 CCR* for the purpose of establishing a historical record of compliance. These requirements include the following:

1. OSHA 200 and 300 logs

> *Note:* These logs record injuries or illnesses. See the Cal/OSHA booklet *A Brief Guide to Recordkeeping Requirements for Occupational Injuries and Illnesses* for additional information.

2. Lock-out/block-out activity records
3. Operation and maintenance activity records
4. Medical surveillance program and records
5. Training records
6. Inspection records

D. **Reports and notifications** to Cal/OSHA must be made of the following incidents and activities:

1. Serious injury or death. A report must be made immediately by telephone (within 8 hours) to a district office. Employers are allowed 24 hours if they can show that circumstances prevented the report from being made in 8 hours. ..... **342(a)**

Note: A *serious injury or illness* is defined as one that requires inpatient hospitalization for more than 24 hours of care other than medical observation or as one in which an employee suffers a loss of a member of the body or a serious degree of permanent disfigurement. ..... **330(h)**

2. Blasting accidents or unusual occurrences. A report must be forwarded to the district office within 24 hours or within 8 hours if the accident involves a serious injury. ..... **1555(a)**
3. Construction activities annual permit. Employers governed by an annual permit must notify DOSH before starting the work. ..... **341.1(f)**
4. Asbestos-related work. The DOSH district office must be notified 24 hours before starting work that is subject to registration. ..... **341.9(a)**
5. Use of regulated carcinogens. The employer must report operations involving the use of a regulated carcinogen within 15 days. **5203**

E. **Permits** issued by Cal/OSHA are required for the following construction activities: ..... **341(a)**

1. Trenching or excavating operations that are 5 ft. or more in depth into which a person is required to descend
2. Constructing and demolishing buildings, structures, scaffolding (except suspended scaffolding), or falsework more than three stories high or of equivalent height (36 ft.)
3. Erecting, climbing (jumping), and dismantling tower cranes
4. Operating diesel engines in tunnels
5. Operating specified air compressors
6. Operating tower cranes if the employer is subject to **341** **341.1, 344.70**

Note: Most permits can be obtained from any DOSH district office. A safety conference and a review of the employer's safety program will be scheduled before permit issuance. **341.1(c)**

F. **Certification requirements** are necessary in the following circumstances:

1. Power-operated cranes and derricks exceeding 3 tons rated capacity shall not be used in lifting service until the equipment has been certified by a DOSH-licensed certifier. **5021**
2. Asbestos consultants and site surveillance technicians must be certified by DOSH. **341.15**

3. Training certification is required for many activities and trades (see specific SOs).

G. **Registration and licensing** are required in the following circumstances:

1. Asbestos registration. An employer must register with DOSH when engaged in asbestos-related work on 100 sq. ft. or more of surface area. **341.6**
2. Blaster's License. A person engaged in a blasting operation must be a licensed blaster or directed by a licensed blaster. ..... **1550(a)**

Aerial Devices

Aerial devices, such as cherry pickers and boom trucks, may be vehicle-mounted or self-propelled and used to position employees. **3637**

A. **General safety requirements** are as follows: **3648**

1. Only authorized persons may operate aerial devices. ..... **3648(c)**
2. Aerial devices must not rest on any structure. ..... **3648(a)**
3. Controls must be tested before use. .. **3648(b)**
4. Workers must stand only on the floor of the basket. No planks, ladders, or other means are allowed to gain greater heights. ..... **3648(e)**
5. A fall protection system must be worn and attached to the boom or basket. ..... **3648(o)**
6. Brakes must be set when employees are elevated. ..... **3648(g)**

7. An aerial lift truck must *not* be moved when an employee is on the elevated boom platform *except under conditions listed in **3648(l).***

B. **The following information must be displayed on the device:** ..... **3638(c)**

1. Manufacturer's name, model, and serial number
2. Rated capacity
3. Operating instructions
4. Cautions and restrictions
5. Load chart, if applicable

C. **Devices must be designed** to applicable American National Standards Institute (ANSI) standards. ..... **3638(b)**

Note: See clearances for operations near high-voltage conductors on page 48.

Airborne Contaminants and Dust

The employer must control employees' exposure to airborne contaminants and employees' skin contact with those substances identified in Table AC-1 of **5155** and **1528.**

Some of the substances listed in Table AC-1 also have specific performance standards, noted in the CSOs and the GISOs, for controlling employee exposure. These substances include asbestos **(1529)**; cadmium **(1532)**; lead **(1532.1)**; benzene **(5218)**; methylenedianiline **(1535)**; and welding fumes **(1536, 1537)**.

Airborne contaminants must be controlled by: **5141**

- Applying engineering controls
- Removing employees from exposure to the hazard and by limiting the daily exposure of employees to the hazard
- Providing respiratory protective equipment whenever such engineering controls are not practicable or fail to achieve full compliance

Air Compressors

Employers must obtain a DOSH permit for the air tanks of air compressors operated at a work site. ..... **461(a)**

> *Exception:* No permit is required for tanks with a diameter of less than 6 in., tanks equipped with a safety valve set to open at no more than 15 psi pressure, or tanks having a volume of 1½ cu. ft. or less with a safety valve set to open at no more than 150 psi. ..... **461(f)**

- Warning signs are required for air compressors equipped with an automatic-start function. **3320**
- Portable air compressors on wheels must be prevented from rolling. ..... **1696(a)**
- Safety valves must be popped weekly. .... **1696(d)**
- Air tanks must be drained daily. ..... **1696(c)**

Asbestos

The word *asbestos* refers to six naturally occurring, fibrous, hydrated mineral silicates that differ in chemical composition. They are actinolite, ammonite, anthophyllite, chrysotile, crocidolite, and tremolite. (Non-fibrous forms of the last three minerals listed here are regulated by GISO **5208.1.**) You may encounter asbestos at a construction site in the following applications and areas:

- Excavations where asbestos-bearing rock outcroppings are at or near the surface
- Fireproofing for steel-frame high-rise buildings
- Pipe and boiler insulation
- Insulators of electrical conductors
- Plaster, cement, drywall, and taping compounds
- Floor tile and tile adhesives
- Acoustical ceilings (tiles and sprayed on)
- Asbestos cement piping, shingles, and panels
- Roofing felt and sealing compounds

Because asbestos exposure has been linked to serious illnesses, Fed/OSHA and Cal/OSHA have implemented strict regulations to minimize exposures to work site and "take-home" asbestos. Below find a summary of regulatory requirements:

A. **Construction projects are subject to regulation under 1529** if they involve one or more of the following activities, regardless of the percentage of asbestos present:

   1. Demolition or salvage of structures where asbestos is present
   2. Removal or encapsulation (including painting) of materials that contain asbestos

3. Construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof that contain asbestos
4. Installation of products that contain asbestos
5. Erection of new and the improvement, alteration, and conversion of existing electric transmission and distribution lines and equipment
6. Excavation that may involve exposure to naturally occurring asbestos, excluding asbestos mining and milling activities
7. Routine facility maintenance
8. Transportation, disposal, storage, and containment of and site housekeeping activities involving asbestos or materials containing asbestos
9. Asbestos spills and emergency cleanups

Regulatory requirements for work activities subject to **1529** vary depending on the *percent*, the *amount*, or the *type* of asbestos-containing materials involved. Listed below are selected requirements and the activities to which they apply:

B. **Cal/OSHA administrative requirements** are as follows:

1. Registration and district notification, if disturbing 100 sq. ft. or more of manufactured construction materials containing more than $^{1}/_{10}$ of 1% of asbestos-containing construction material (ACCM) ..... **341.6(a)**
2. Carcinogen notification, with exposures in excess of permissible exposure limits (PELs)

Exception: Carcinogen notification is not required of employers registered with DOSH per **341.6.** ..... **5203, 1529(e)**

3. DOSH certification, if the person performs duties of an asbestos consultant or technician that involve 100 sq. ft. or more of ACCM ..... **341.15(a)**

C. **Training** is required for all employees engaged in Class I through IV work and all work in which they are likely to be exposed in excess of the PELs. The training must be provided:

1. At the employer's expense
2. Before or at the time of initial assignment
3. Annually after initial training
4. In accordance with **1529(k)(9)**

D. **Permissible exposure limits**: The employer must ensure that employee exposures do not exceed the following PELs:

1. Eight-hour time-weighted average of 0.1 fibers/cc
2. Thirty-minute excursion limit of 1 f/cc ..... **1529(c)**

E. **Multi-employer work sites are regulated under 1529:**

1. The general contractor on the project must exercise general supervisory authority. ..... **1529(d)**
2. An employer doing work involving asbestos must notify other employers at the site. ..... **1529(d)**

3. All employers on site must ensure that their own employees are not exposed to asbestos fibers because of a breach in containment or control methods used by the creating employer. ..... **1529(d)**

F. **Exposure assessments and monitoring** are required as follows:

1. Initial exposure assessment must be made by all employers subject to **1529** before or at the onset of the project. ..... **1529(f)(2)**
2. Daily exposure monitoring of employees must be conducted by all employers disturbing materials that contain more than 1% asbestos in Class I and II work. ... **1529(f)(3)**
3. Periodic exposure monitoring of employees must be conducted when disturbing asbestos-containing materials (ACMs) in operations involving other than Class I and II work during which the PELs might be exceeded. ..... **1529(f)(3)**

Exception: Periodic exposure monitoring is not required if a negative exposure assessment has been made within the past 12 months. ..... **1529(f)**

G. **Respirator protection** requirements are specific to asbestos-related activities and exposures as outlined in **1529(h):**

1. The employer must provide respirators.
2. The appropriate respirator must be selected from Table 1 of **1529.** ..... **1529(h)**

3. A written respiratory protection program must be implemented in accordance with **5144(c).**

H. **Methods of compliance and work practices** are noted below:

1. The wet method must be used unless the employer can demonstrate that it is not feasible. ..... **1529(g)(1)**
2. Vacuum cleaners with high-efficiency particulate air (HEPA) filters must be used to clean up ACM and presumed asbestos-containing material (PACM). ..... **1529(g)(1)**
3. Prompt cleanup and disposal in leak-tight containers are required except as specified in **1529(g)(8)(B).** ..... **1529(g)(1)**
4. Specific work practices for different activities are also outlined in **1529.** ..... **1529(g)(4–11)**

I. **Prohibited work practices and controls** are as follows:

1. Spraying of any substance containing any amount of asbestos (see exception) **1528**
2. High-speed abrasive disc saw cutting of ACM or PACM without appropriate local exhaust or point-of-cut ventilation ..... **1529(g)(3)**
3. Using compressed air to remove asbestos or materials containing asbestos ..... **1529(g)(3)**
4. Dry sweeping, shoveling, or other dry cleaning of dust or ACM or PACM debris ..... **1529(g)(3)**
5. Rotating employees as a means of reducing exposure to asbestos ..... **1529(g)(3)**

Blasting (Abrasives/Sand)

Regulations for blasting with abrasives and sand include the following:

A. Employees must wear supplied-air respirators (covering the head, neck, and shoulders):

   1. During abrasive blasting when dust may exceed limits specified in **5155** ..... **5151(b)(1)(B)**
   2. During abrasive blasting with silica sand or where toxic material evolves ..... **5151(b)(1)(C)**

> *Note:* A dust filter respirator may be used for 2 hours during abrasive blasting if the concentration of silica dust is less than ten times the limit specified in **5155.**

B. Hearing protection must be worn as required by **1521.**

C. Body protection must be worn as required by **1522.**

Blasting (Explosives)

A person must hold a valid California Blaster's License and must be physically present when performing, directing, and supervising blasting operations. ..... **1550(a)**

A. **Blaster's License** requirements are discussed in **344.20.**

B. **All blasting accidents** affecting worker safety must be reported to DOSH within 24 hours. ..... **1555(a)**

Note: Accidents involving a serious injury or illness must be reported to DOSH within 8 hours. ..... **342(a)**

C. **Explosives must be stored** in the proper type of magazine (see **1561** Appendix B). ..... **1561(a)**

D. **Caps and detonators** must be stored in separate magazines away from other explosives. ..... **1561(b), (f)**

E. **Storage requirements** are discussed in **1561–1563.**

F. **Transportation requirements** are discussed in **1564.**

G. **Safety rules for blasting operations** are as follows:

1. No smoking or open flames are permitted within 50 ft. of explosives handling. ..... **1565(a)**
2. No source of ignition, except during firing, is permitted in areas containing loaded holes. ..... **1565(a)**
3. Only nonsparking tools are to be used for opening containers of explosives. ... **1565(b)**
4. Explosives must be kept clear of electrical circuits by 25 ft. ..... **1565(d)**
5. Unused explosives must be returned promptly to the magazine. ..... **1565(e)**
6. Blasting mats must be used when flying material could damage property. ..... **5276(h)**
7. A tally sheet that records all movement of explosives must be kept at each magazine. ..... **1565(f)**

8. Holes may be loaded only after all drilling is complete (see exception in **1565[h]**). ..... **1565(h)**
9. No vehicle traffic should pass over loaded holes. ..... **1565(h)**
10. Loaded holes must be attended. ..... **1565(j)**
11. Blasting must be done during daylight. ..... **1565(m)**
12. Workers must not try to quench an explosive's fire. ..... **1565(l)**
13. Explosives at a blast site must be attended. ..... **1565(o)**

Note: See also **GISOs 5276–5358.**

Carcinogens

Whenever carcinogenic (cancer-causing) chemicals, as specified in SOs **5200–5220,** are present in construction materials, the employer must comply with the reporting requirements and safety rules. The material safety data sheet (MSDS) and labels on the container must be reviewed to determine the presence of carcinogens.

Code of Safe Practices

The Code of Safe Practices is a set of work site rules that stipulate how to perform job duties safely and to keep the work site safe. The following are selected requirements:

A. The employer must develop and adopt a written Code of Safe Practices. ..... **1509(b)**

B. It must be specific to the employer's operations. ..... **1509(b)**

C. It must be posted at each job site office or be readily available at the job site. ..... **1509(c)**

D. Workers, when first hired, must be directed to read the Code of Safe Practices. ..... **1510(a)**

Note: Plate A-3 in Appendix A of **1938** is a suggested code. The code is general and should be used as a starting point for developing a code that fits the contractor's operations more exactly.

Competent Person

A competent person is defined in **1504(a)** as one who is capable of identifying existing and predictable hazards that are unsanitary or dangerous to employees. The competent person has authority to impose prompt corrective measures to eliminate these hazards.

Some SOs identify specific requirements for the competent person's training, knowledge, abilities, and duties. Following is a list of SOs that require the use of a competent person: (1) asbestos **1529(o);** (2) excavation **1541–1541.1;** (3) cadmium **1532(b);** (4) fall protection **1670–1671.2;** (5) bolting and riveting **1716;** and (6) lift-slab construction operations **1722.1(i)**

Compressed-Air Work Sites

Compressed-air work sites are sites where employees perform duties in a pressurized environment, such as a caisson. Hazards associated with compressed-air work are similar to hazards found in diving operations, such as decompression sickness, and in confined spaces. In addition, structural failures or blowouts may occur, causing the work area to become inundated with mud and water. Regulatory requirements for this type of work are found in **1200** through **1280** and include the following:

A. Cal/OSHA must receive written notification at least seven days before the work is started. ..... **1205(a)**

B. Compression rates are prescribed in **1210(a).**

C. Air lock requirements are discussed in **1220.**

D. Decompression chamber requirements are noted in **1225.**

E. Temperature, lighting, sanitation, and ventilation requirements are discussed in **1230.**

F. Compression plant, air supply, and communication requirements are prescribed in **1240.**

G. Medical attendance and examination requirements are noted in **1280.**

Concrete Construction

Injuries and illnesses common to the concrete construction industry are as follows:

- Concrete burns from exposure to wet concrete
- Silicosis from exposure to concrete dust during such operations as concrete cutting, drilling, grinding, or sandblasting
- Broken bones, lacerations, and crushing injuries caused by falls from elevated work surfaces; impalement by rebar or other objects; and impact from falling objects, form and shoring failure, and structural failure of components of the project

Because the hazards associated with concrete construction are great, employees must use appropriate personal protective equipment and conform to safe work practices at all times (see below).

A. **Forms/falsework** and **vertical shoring** (see page 81) **1717**

B. **Masonry construction** **1722**

1. All masonry walls more than 8 ft. high must be braced to prevent overturning and collapse unless the wall is adequately supported through its design or construction method.
2. A limited access zone (LAZ) shall be established whenever a masonry wall is being constructed and must conform to the following:
   a) The LAZ shall be established before the start of construction.
   b) The LAZ shall be established on the unscaffolded side.

c) The width of the LAZ shall be equal to the height of the wall to be constructed plus 4 ft. and shall run the entire length of the wall.

d) The LAZ shall be entered only by employees actively engaged in constructing the wall. No other employee shall be permitted entry.

e) The LAZ shall remain in place until the wall is adequately supported to prevent collapse unless the height of the wall is more than 8 ft., in which case the LAZ shall remain in place until the requirements of **1722(b)** have been met.

C. **Precast, prefabricated panels, tilt-up** **1714**

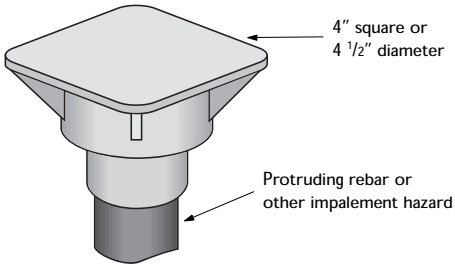
1. An erection plan, addenda, and procedure shall be prepared by an engineer (Ca PE).
2. The erection plan, addenda, and procedure shall be available at the job site.
3. Job site inspections shall be made by the responsible engineer (or representative) during the course of erection.
4. Proposed field modifications shall be approved by the responsible engineer.

D. **Rebar and other impalement hazards** **1712**

1. Employees working at grade or at the same surface level as exposed protruding rebar or similar projections shall be protected against impalement by guarding exposed ends with approved protective covers, caps, or troughs (see illustrations 1 and 2). ..... **1712(c)**

Illustration 1

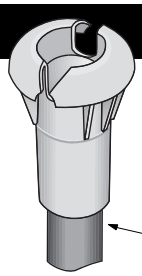
Protective Covers



Manufactured protective covers used for impalement protection must meet the following requirements:

- The protective covers must be Cal/OSHA approved.
- The cover surface must be at least 4 in. square. If the cover is round, its surface must have a minimum diameter of 4 1/2 in. For a trough, the protective cover must be at least 4 in. wide.
- The protective covers used "above grade" must be designed to withstand the impact of a 250 lbs. weight dropped from 10 ft.
- The protective covers used "at grade" must be designed to withstand the impact of a 250 lbs. weight dropped from 7 1/2 ft.

Mushroomed Cap Alert

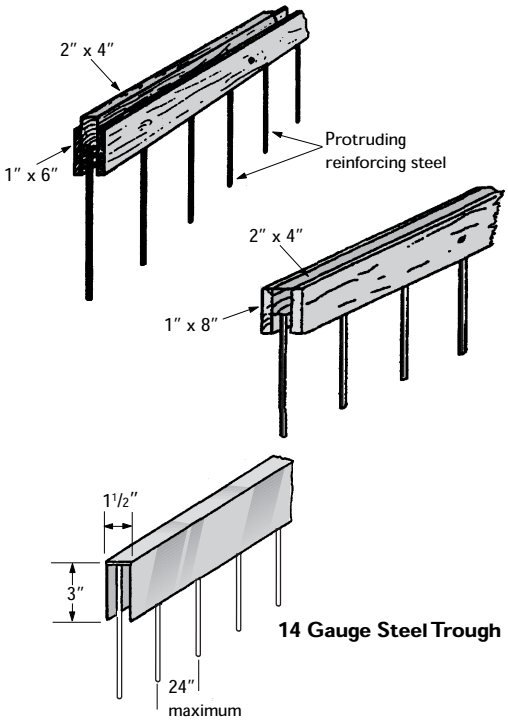


Mushroomed caps cannot be used as impalement protection unless they are approved by Cal/OSHA (see **344.90**).

Mushroomed Cap

Illustration 2

Troughs



14 Gauge Steel Trough

Troughs can be used for impalement protection providing the following applies:

- The trough designs shown above can be used when employees are working at heights of 6 ft. or less "above grade."
- If employees are working at heights above 6 ft., the design must be specified by an engineer (Ca PE).
- Job-built wood troughs must be constructed of at least "standard grade" Douglas fir.

2. Employees who work above grade or above any surface and who are exposed to protruding rebar or similar projections shall be protected from impalement by:
   a) The use of guardrails, or
   b) Approved fall protection systems, or
   c) Approved troughs and covers per ..... **344.90, 1712(c)**
3. Job-built wood protective covers and troughs shall be built of at least "standard-grade" Douglas fir.
4. Manufactured covers and caps shall be approved by Cal/OSHA, per **344.90.**
5. Personal fall protection must be used while employees place or tie rebar in walls, columns, piers, and other structures more than 6 ft. high. ..... **1712(e)**

Exception: Personal fall protection is not required during point-to-point horizontal or vertical travel on rebar.

6. Guying and supporting of all rebar for walls, piers, columns, and similar vertical structures are required.
7. Wire mesh rolls shall be secured to prevent dangerous recoiling action. **1712**

E. **Concrete finishing**

1. Powered finishing tools must be equipped with a dead-man-type control.
2. Bull float handles must be constructed of a nonconductive material if they could come into contact with energized electrical conductors.

Confined Spaces

Every year several confined space entrants and would-be rescuers die from hazards, such as oxygen deficiency, toxic and explosive atmospheres, and uncontrolled energized equipment. To prevent such accidents employers must be able to:

- Recognize a confined space and the specific hazards associated with that space.
- Know and understand *T8 CCR* **5156–5158** and related requirements concerning respiratory protection, fall protection, lock-out/block-out procedures, fire prevention, and rescue.
- Implement the safety orders effectively.

> *Note:* For most construction work **5158** applies; however, work in confined spaces during refurbishing operations may be subject to the permit-required confined space regulations in **5157** (see **5156**).

A. **Confined space** (CSp) is defined in **5158(b)(1)** as space that exhibits *both* of the following conditions:

   1. The existing ventilation does not remove dangerous air contaminants or oxygen-deficient air that exists or may exist or develop.
   2. Ready access or egress for the removal of a suddenly disabled employee is difficult because of the location or size of the opening(s).

B. **The following locations** may exhibit confined-space conditions:

1. Trenches and excavations
2. Sewers and drains
3. Tanks
4. Vaults
5. Wells and shafts
6. Crawl spaces
7. Ducts
8. Compartments
9. Pits, tubs, and bins
10. Pipelines

C. Employers must check initially—and if conditions can change, employers must check on an ongoing basis—to discern whether work locations exhibit confined-space conditions.

   If confined-space conditions have been identified, the following must be completed before employees may begin work:

   1. Written operating procedures must be prepared, and employees must be trained. ..... **5158(c)(1), (2)**
   2. Lines containing hazardous substances must be disconnected, blinded, or blocked. ..... **5158(d)(1)**
   3. The space must be emptied, flushed, or purged. ..... **5158(d)(2)**
   4. The air must be tested for dangerous contamination or oxygen deficiency. ..... **5158(d)(5)(A)**
   5. Ventilation must be provided if testing reveals any atmospheric hazard. ..... **5158(d)(6)**

D. **Working in a confined space where dangerous air contamination exists requires:**

1. Appropriate respiratory protection ..... **5158(d)(11), 5158(e)(1)**
2. Provisions for ready entry and exit where feasible ..... **5158(d)(10)**
3. The wearing of a safety harness attached to a retrieval line and retrieval equipment (see Illustration 3) ..... **5158(e)(1)(C), (E)**

Exception: See **5158(e)(1)(C).**

Illustration 3
Retrieval Equipment in Use

4. One standby employee (with entry gear) trained in first aid and cardiopulmonary resuscitation plus one additional employee within sight or call ..... **5158(e)(1), (2)**
5. Effective means of communication between the employee in the confined space and the standby employee ..... **5158(e)(2)**
6. Ongoing atmospheric testing for dangerous air contamination and oxygen deficiency ..... **5158(d)**
7. Ongoing surveillance of the surrounding area to avoid hazards, such as vapors drifting from nearby tanks, piping, sewers, and operations ..... **5158(c)(1)(B)**

Corrosive Liquids

Employers must provide the following when employees handle corrosives:

- Personal protective equipment ..... **1514(a)**
- Properly labeled containers with appropriate hazard warnings ..... **5194(f)(4)**
- An eyewash and a deluge shower that meet ANSI standards ..... **3400(d), 5162**
- A hazard communication (haz-com) program **5194**

Cranes

Hazards associated with crane operations are electrocution from overhead power lines and equipment failures because of operator error; faulty or damaged equipment; overloading; support

failure—such as ground or outrigger collapse; and miscommunication.

A. **General requirements**

1. Each crane and accessory gear that exceeds 3-ton capacity must be certified annually by a DOSH-licensed certifier. ..... **5021(a)(1)**
2. All required certificates must be kept with the certified equipment or at the project site. **5025**
3. All cranes must be equipped with audible warning devices controllable by the operator. ..... **4889(a), 4936**
4. A crane shall not be operated when its wheels or tracks are off the ground unless it is properly bearing on outriggers. ..... **4994(a)**
5. A signal person shall be provided when the point of operation is not in full and direct view of the crane operator. ..... **5001(a)**

Note: See the recommended hand signals in Illustration 4 on page 36.

B. **Crane inspections** **5031**

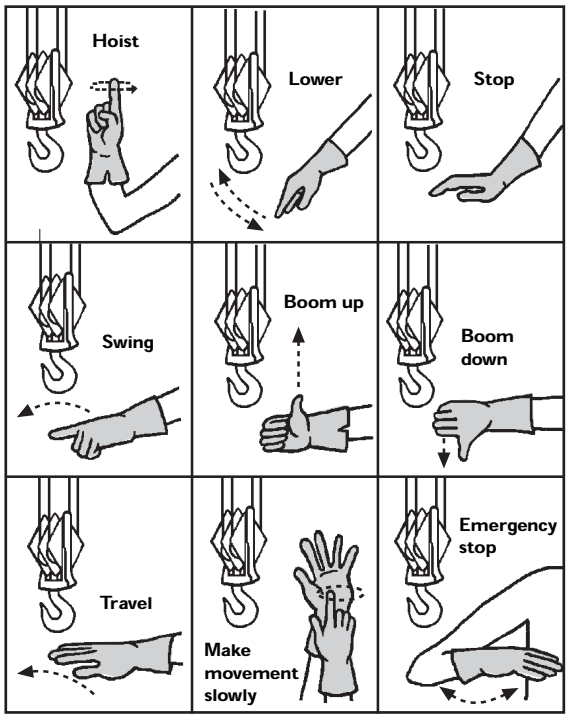
1. Cranes must be inspected before each shift and daily. ..... **5031(b)**
2. Periodic inspections must occur at least four times a year. ..... **5031(c)**

Note: The annual certification per **5021(a)** can serve as one of the periodic inspections. ..... **5031(c)**

3. Proof load testing must occur every four years. ..... **5031(d)**

Illustration 4

Recommended Hand Signals



C. **Specific crane requirements**

1. Mobile hydraulic cranes ..... **Article 94 in the GISOs**

   a) A load-rating chart must be posted at a location that is readily visible to the operator. ..... **4954(e)**

   b) Outriggers must be used according to certifying agent requirements. .... **4954(a)**

c) Boom angle indicators must be clearly visible from the operator's station. ..... **4924(c)**

d) Boom length indicators (telescopic booms) must be clearly visible. .. **4954(b)**

e) A boom hoist disconnect must be installed. ..... **4954(c)**

f) A boom stop is required. ..... **4954(d)**

2. Boom-type mobile cranes

a) These cranes are locomotive, crawler, and motor truck cranes and boom-type excavators. **4920**

b) The following requirements apply to boom-type mobile cranes:

(1) A load-rating chart must be posted at a location that is readily visible to the operator. ..... **4923(a)**

(2) All mobile cranes with booms more than 200 ft. long or with capacity exceeding 50 tons must be equipped with a DOSH-approved load-indicating device (or its equivalent). ..... **4924(b)**

(3) Either a readily visible boom angle or a boom radius indicator is required for cranes with a boom longer than 60 ft. or a maximum rated capacity above 15 tons. ..... **4924(d)**

c) A fire extinguisher of 10:BC rating shall be accessible to the operator's station. **4997**

d) An operable boomstop is required on any crane whose boom could fall over backwards. ..... **4922(a)**

e) The operating station must be protected by a canopy-type guard or cab roof. ..... **4925(a)**

f) Safe access (by steps and handholds) must be provided. ..... **4926(a)**

3. Tower cranes (climbing cranes)

a) Tower cranes are composed of a vertical mast supporting a boom that rotates on the mast in the horizontal plane only. ..... **4965(a)**

b) The following standards apply to tower cranes:

(1) The manufacturer's specifications regarding design, erection, operation, and safety must be available at the job site. ..... **4965(b)**

(2) A DOSH permit is required before a tower crane is erected, climbed, or dismantled. **344.70**

(3) A new certification by a DOSH-licensed certifier is required for a fixed crane relocated to a new position on the same project or erected at a new site. **344.81**

(4) A DOSH permit to operate is required before operating a fixed or mobile tower crane. ..... **344.70(b)**

(5) DOSH may require a capacity test at any time.

(6) A test load of 110%-capacity rating must be available at the job site. ..... **4966(f)(2)**

(7) Booms are normally allowed to freely weathervane; however, if the boom is lashed, the lashing must be in accordance with the certifying agent's recommendations. **4967**

(8) Damaged boom sections or components must be repaired to not less than the capacity of the original section or components. **5035**

(9) A new or repaired boom must be tested in accordance with **5022** before it is used unless the boom or component has been designed or repaired and inspected by a certified agent. ... **5035**

D. **Slings and attachments**

1. Slings and attachments must be inspected daily for damage or defects. **5043**
2. A manufacturer's label with capacity listed must be attached to the sling. ..... **5042, 5048(a)**
3. Damaged or defective slings must be removed from service immediately. ..... **5042(a)(1)**
4. Chain or wire rope slings must *not* be shortened by knots, bolts, or other means. ..... **5042(a)(1)**
5. Sling legs must not be kinked. .... **5042(a)(3)**
6. Slings must not be overloaded. ... **5042(a)(4)**
7. Slings must be padded to protect against damage from sharp loads. ..... **5042(a)(7)**

8. Suspended loads must be kept clear of all obstructions. ..... **5042(a)(8)**
9. Alloy chains must not be annealed. ..... **5042(a)(14)**
10. Employers must avoid operations that expose employees to overhead loads. .. **5002**
11. Safety-type hooks (or their equivalent) must be used when loads must pass over workers or occupied passageways. "Christmas-treeing" is prohibited. **5002**
12. Deformed or defective sling hooks and rings must not be used. ..... **5049(a)**
13. Chains with deformed links must not be used. ..... **5044(h)**

Note: For safety rules regarding alloy steel chain, wire rope, metal mesh, and fiber and synthetic web slings, see **GISOs 5044–5048**.

14. The use of a man basket is prohibited unless no other choice is available and the conditions of **5004(d)** and **5004(e)** are met. ..... **5004(c)**

Note: Heavy equipment that is used as a crane or a hoist must meet the applicable crane standards.

Demolition

The primary hazards associated with demolition are (1) falls from elevated work surfaces; (2) exposure to hazardous air contaminants; (3) being struck by falling or collapsing structures; and

(4) electrical hazards. Regulations to address these hazards include the following:

A. **A DOSH permit** is required for demolition of structures (buildings) more than 36 ft. high. ..... **341(a)(3)**

B. **A predemolition survey** must be made to determine whether the planned work will cause:

   1. Any structure to collapse ..... **1734(b)(1)**
   2. Worker exposure to asbestos ..... **1529(k)(1), 1735(b)**
   3. Worker exposure to lead ..... **1532.1(d)(1)**

C. **Utilities to the structure** being demolished must be turned off or protected from damage. ..... **1735(a)**

D. **Demolition techniques** include the following:

   1. Entrances to multi-story buildings must be protected by a sidewalk shed or a canopy. ..... **1735(j)**
   2. The demolition work on floors and exterior walls must progress from top to bottom. ..... **1735(f)(1)**

> *Exception:* Demolition with explosives and for cutting chute holes is not required to progress from top to bottom. ..... **1735(f)(1)**

   3. The employer must check continually for hazards created by weakening of the structure's members. If a hazard occurs, it must be removed before workers may continue. ..... **1735(d)(4)**

4. Floor openings must have curbs and stop logs to prevent equipment from running over the edge. ..... **1735(v)**
5. Wall openings must be guarded except on the ground floor and the floor being demolished. ..... **1735(k)**
6. Walkways 20 in. wide must be provided as a means of access across joists, beams, or girders. ..... **1735(h)**
7. Demolition debris must be kept wet to prevent dust from rising. ..... **1735(t)**
8. Whenever waste material is dropped to any point lying outside the exterior walls of the building, enclosed chutes shall be used unless the area is effectively protected by barricades, fences, or equivalent means. Signs shall be posted to warn employees of the hazards of falling debris. ..... **1736(a)**
9. Chutes or chute sections that are at an angle of more than 45˚ from the horizontal must be entirely enclosed except for openings equipped with closures at or about floor level for the insertion of materials. ..... **1736(f)**
10. When chutes are used to load trucks, they must be fully enclosed. Gates must be installed in each chute at or near the discharge end. A qualified person must be assigned to control the operation of the gate and the backing and loading of trucks. ..... **1736(b)**
11. Any chute opening into which employees dump debris by hand must be protected by a guardrail. ..... **1736(d)**

12. When debris is dropped through holes in a floor without the use of chutes, the area onto which the material is dropped shall be completely enclosed with barricades not less than 42 in. high and not less than 6 ft. back from the projected edge of the opening above. Signs that warn of the hazard of falling materials shall be posted at each level. Removal of debris shall not be permitted in the lower drop area until handling of debris ceases above. ..... **1736(f)**

E. **Crane demolition work** is guided by these regulations: **4941**

1. The wrecking ball's weight must not exceed 50% of the clamshell rating or 25% of the rope-breaking strength. ..... **4941(a)**
2. The swing of the boom should be limited to 30˚ left or right. ..... **4941(b)**
3. The wrecking ball must be attached with a swivel-type connection. ..... **4941(b)**
4. The load line and ball must be inspected at least twice each shift. ..... **4941(c)**
5. Outriggers are required when using a wrecking ball (truck cranes). ..... **4941(d)**

Note: See crane standards on pages 34–40. ..... **Group 13 in the GISOs**

Dust, Fumes, Mists, Vapors, and Gases

Oxygen-deficient atmospheres or harmful dusts, fumes, mists, vapors, or gases in concentrations sufficient to present a hazard to employees must be controlled when possible by removing the employee from the exposure, limiting daily exposure, or applying engineering controls. **1528**

A. Whenever the above controls are not practical or fail to achieve full compliance, **respirator protection** must be used, according to **5144.** ..... **1528(a)**

B. **Ventilation** must comply with Article 4 in the GISOs if it is used as an engineering control method. ..... **1528(c)**

C. **Common sources of the above hazards** include the following:

1. Engine exhaust emission (carbon monoxide)
2. Blasting (CO_2, asbestos, silica, dust)
3. Concrete and rock cutting (asbestos, silica, dust)
4. Fuel storage tanks (harmful vapors)
5. Lead abatement (lead particles)
6. Asbestos abatement (asbestos fibers, vapors)
7. Demolition (asbestos, silica, lead, dust, etc.)
8. Welding (fumes)
9. Painting and spraying (vapors, lead)
10. Sand blasting (asbestos, silica, lead, dust)

Electrical

Each year a large number of employees are injured or killed because they come into contact with energized electrical wiring or equipment. The Electrical Safety Orders (ESOs) are designed to control or to eliminate these often deadly exposures and include:

A. **General requirements for low-voltage systems (≤ 600 V)**

1. Only qualified persons may work on electrical equipment or systems. ... **2320.1(a)**
2. Maintenance of electrical installations is required to ensure their safe condition. **2340.1**
3. Electrical equipment and wiring must be protected from mechanical damage and environmental deterioration. ..... **2340.26, 2340.11(a)(2), 2340.23**
4. Covers or barriers must be installed on boxes, fittings, and enclosures to prevent accidental contact with live parts. ..... **2340.17(a)**

B. **Main service equipment**

Whenever the electric utility provides service via overhead lines, the installation must:

1. Consist of an acceptable service pole **2405.3**
2. Be suitably grounded ..... **2395.5(b)**
3. Provide suitable overcurrent protection **2390.1**

C. **Wiring methods and devices**

1. Flexible cords may be used in place of permanent wiring methods for temporary work if the cords are equipped with an attachment plug and energized from an approved receptacle. ..... **2500.7(a), (b)**
2. Flexible cords must be Type S and cannot be spliced unless they are size No. 12 (or larger). ..... **2500.9(a)**
3. Skirted attachment plugs must be used on all equipment operating at more than 300 V. ..... **2510.7(b)**

D. **Grounding**

1. Each receptacle must have a grounding contact that is connected to an equipment grounding conductor. ..... **2510.7(a)**
2. Temporary wiring must be grounded. ..... **2405.2(g)**
3. Powered tools and electrical equipment with exposed, noncurrent-carrying metal parts must be grounded. ..... **2395.45(b)**

Exception: Double-insulated powered tools need not be grounded. ..... **2395.45(b)**

4. Generators rated greater than 5,000 V or multi-phase must be grounded. ..... **2395.6(a)(4)**

Exception: A portable or vehicle-mounted generator need not be grounded if it is rated less than 5,000 V and single phase, provided

that the grounding terminals of its receptacle are bonded to the vehicle frame, the generator frame, and to the plugged-in equipment. ..... **2395.6(a)**

E. **Ground-fault circuit interrupters (GFCIs)**

The GFCI device senses ground faults (accidental electrical paths to ground) in circuits and immediately cuts off all electrical power in that circuit.

1. GFCIs are required on receptacles that are not connected to the site's permanent wiring and that have a rating of 15 or 20 amps., 120 V, AC, single phase. ..... **2405.4(c)**
2. The assured equipment grounding conductor program (AEGC program) is an approved alternative to the GFCI requirement if the following program elements are included: ..... **2405.4(d)**
   a) A description of the program must be written.
   b) The employer shall designate one or more qualified persons to implement the program.
   c) Daily visual inspection of included equipment must be conducted.
   d) The following tests shall be performed:
      (1) All equipment grounding conductors shall be tested for continuity and shall be electrically continuous.
      (2) All plugs and receptacles must be tested for proper attachment to the equipment grounding conductor.

e) The tests shall be performed as follows:

(1) Before the first use of newly acquired equipment

(2) Before equipment is returned to service

(3) Before equipment is used after an incident that may have caused damage

(4) At intervals not to exceed three months

f) The employer shall not make available or permit the use of equipment that has not met the requirements of **2405.4(d).**

g) A means of identifying tested equipment shall be provided.

F. **High-voltage power lines (> 600 V)**

1. Great care must be taken when working or operating equipment near overhead high-voltage power lines.
2. The required minimum safe distances (clearance) from overhead lines energized by 600 V to 50,000 V are: **2946**

a) For boom-type equipment in transit, 6 ft.

b) For boom-type equipment in operation, 10 ft.

c) For people working near overhead lines, 6 ft.

Note: See **2946** for minimum required clearances from voltages greater than 50,000 V.

3. The following activities are prohibited unless overhead power lines have been de-energized and visibly grounded:

a) Work over high-voltage lines ..... **2946(b)(1)**

b) Work within required clearances ..... **2946(b)(2)**

Note: When work is to be performed within minimum required clearances, the power line operator must be notified. **2948**

G. **High-voltage warning signs** **2947**

High-voltage warning signs must be posted in plain view of equipment operators.

H. **Lock-out procedures**

Lock-out procedures must be followed during the cleaning, servicing, or adjusting of machinery. ..... **GISO 3314, ESO 2320.4**

Elevating Work Platforms

Elevating work platforms, such as vertical towers and scissor lifts, are designed to raise and to hold a work platform in a substantially vertical axis. **3637**

Selected requirements are as follows:

A. An operations and instruction manual must be available where the platform is in use. .. **3638(a)**

B. The following must be displayed on each unit:

1. Safe operation restrictions ..... **3638(c)(5)**
2. Manufacturer's name, model, and serial number ..... **3638(c)(1)**
3. Rated capacity ..... **3638(c)(2)**
4. Maximum travel height ..... **3638(c)(3)(A)**

5. Operating instructions ..... **3638(c)(6)**
6. A statement that the unit is in compliance with listed ANSI standards ..... **3638(b)**

C. Employees must be instructed in proper (safe) use of the platform. ..... **3638(d)**

D. The platforms must have guardrails 42 in. ± 3 in. high. When guardrails are lower than 39 in. high, fall protection—per **3210(b)**—is required. ..... **3642(a)**

E. The minimum platform width is 16 in. ..... **3642(f)(3)**

F. Powered units must be equipped with an emergency lowering means. ..... **3642(c)**

G. Powered units must have guarded and plainly marked upper and lower controls. ..... **3642(d)**

H. All units must guard rotating and moving parts and pinch and shear points. **3643**

I. Devices must be designed to applicable ANSI standards. ..... **3638(b)**

Note: Refer to GISO **3646** for additional operation guidelines and requirements.

Elevators, Lifts, and Hoists

Construction elevator and personnel hoist requirements are as follows:

A. An elevator is required for structures or buildings 60 ft. or more above ground level or 48 ft. below ground level. ..... **1630(a)(1)**

B. An elevator is required at demolition sites of seven or more stories or 72 ft. or more in height. ..... **1735(r)**

C. Use of endless-belt-type manlifts is prohibited. ..... **1604.1(a)**

D. Before use, construction elevators must be inspected and tested in the presence of a DOSH representative. A permit to operate is required. ..... **1604.29(a)**

E. Ropes must be inspected at least once every 30 days, and records must be kept. ..... **1604.25(j)**

F. A capacity plate must be posted inside the car. ..... **1604.21 (b)**

G. Elevators must be operated only by competent, authorized persons. ..... **1604.26(c)**

H. Installation must comply with **1604**.

I. Landings must be provided at the top floor and at least at every third floor. ..... **1630(d)**

J. Landing doors must be mechanically locked so that they cannot be opened from the landing side. A hook-and-eye lock is prohibited. ..... **1604.6(b)**

K. For hoists located outside of a structure, the hoistway enclosures must be 8 ft. high on the building side or the scaffold side at each floor landing and 8 ft. high on all sides of the pit. ..... **1604.5(c)**

L. Hoistway doors shall be at least 6 ½ ft. high. Solid doors must contain a vision panel. (See **1604.6[a]** for specific requirements.) ..... **1604.6(a)**

Emergency Medical Services

Emergency Medical Services (EMS) must be readily available. ..... **1512(a), (e)**

A. A **first aid kit** must be provided on all job sites and must contain the minimum of supplies as determined by an authorized licensed physician or as listed in **1512(c).**

B. **Trained personnel** in possession of a current Red Cross First Aid certificate or its equivalent must be immediately available at the job site to provide first aid treatment. ..... **1504(a), 1512(b)**

C. **Employees must be informed** of the procedures to follow in case of an injury or illness. ..... **1512(d)**

D. **Proper equipment for prompt transport** of the injured or ill person to an EMS facility or an effective communication system for calling an emergency medical facility, ambulance, or fire service must be provided. Telephone numbers for listed emergency services must be posted (see OSHA poster S-500). ..... **1512(e)**

E. **Exposure to bloodborne pathogens** is considered a job-related hazard for construction workers who are assigned first-aid duties in addition to construction work. Although construction employers are specifically exempted from GISO **5193** requirements, they are required to provide appropriate protection for employees who may be exposed to bloodborne pathogens when providing first aid. **3203**

Engine Exhaust Emission

Extreme care must be taken when engine exhaust can build up in work spaces, such as confined spaces, excavations, and trenches.

A. **Exhaust purifier devices** must be used to maintain concentrations of dangerous gases or fumes below maximum acceptable concentrations if natural or forced dilution ventilation and exhaust collection systems are inadequate. **5146**

B. **Use of internal combustion engines** in tunnels is prohibited.

> *Exception:* **Diesel engines** may be used in underground tunnels if the engines are permitted by DOSH. **7069, 7070, 8470**

Erection and Construction

Every year many workers lose their lives or are seriously injured when they fall or are crushed or struck because the structure they are erecting shifts or collapses. The following SOs address these hazards:

A. **Truss and beam requirements**

1. Trusses and beams must be braced laterally and progressively during construction to prevent buckling or overturning. The first member shall be plumbed, connected, braced, or guyed against shifting before succeeding members are erected and secured to it. ..... **1710(a)**

2. An erection plan and procedure must be provided for trusses and beams more than 25 ft. long. The plan must be prepared by an engineer (Ca PE), and it must be followed and kept available on the job site for inspection by Cal/OSHA staff. ..... **1710(b)**

B. **Structural steel building requirements**

1. A load shall not be released from its hoisting line until the solid web structural members are secured with no fewer than two bolts at each end. ..... **1710(c)(1)**
2. Open web steel joists shall not be placed on any structural steel framework unless the framework is safely bolted or welded. ..... **1710(c)(2)**
3. Where longspan joists or trusses—40 ft. or longer—are used, rows of bridging shall be installed to provide lateral stability during construction before slacking of the hoisting line. ..... **1710(c)(4)**
4. Floors must be planked at every other story. ..... **1635(b)(3), 1710(e)(4)**
5. A floor must be installed within two floors below any tier of beams on which erection, riveting, bolting, welding, or painting is being done; otherwise, fall protection is required. ..... **1635(b)(2)**
6. Fall protection is required when workers are connecting beams where the fall distance is greater than 30 ft. ..... **1710(g)(1)**
7. During work other than connecting operations, fall protection is required where the fall distance is greater than 15 ft. ..... **1710(g)(2)**

C. **Wood frame construction requirements**

1. Every floor must be solidly planked, subfloored, formed, or concrete-filled before work may start on the next level. ..... **1635(a)(2)**
2. For single wood floors or other flooring systems, the floor immediately below the story where the floor joists are being installed shall be kept planked or decked over. ..... **1710(f)**
3. Before manually raising wood-framed walls that are 10 ft. or more in height, temporary restraints, such as cleats on the foundation or floor system, must be installed to prevent inadvertent horizontal sliding or uplift of the wood-framed wall bottom plate. Anchor bolts shall not be used for blocking or bracing the wood-framed wall being raised. ..... **1710(i)**

Ergonomics in Construction

The construction industry is plagued by debilitating and costly occupational injuries to workers' backs, necks, shoulders, and extremities. Many of these injuries could be prevented by simple changes in the workplace and in work activities.

Ergonomics is the study of improving the fit between the worker and the physical demands of the workplace. Knowledge of ergonomics is used to design the workplace and work activities to help the worker avoid injury and to improve productivity.

The primary type of injuries or traumas that ergonomics deals with are the repetitive motion injuries (RMIs). As the name implies, RMIs are caused by

activities that are repeated on a regular basis. RMIs primarily affect the neck, back, shoulders, and extremities. The symptoms of RMIs may not be noticeable until after months or even years of exposure. Symptoms may appear to be acute after a sudden and severe onset. They can include chronic pain, numbness, tingling, and limited range of motion.

A. **Factors that can contribute to RMIs:**

1. Awkward posture
2. Forceful exertion, including heavy lifting
3. Repetitive work
4. Vibration from tools and equipment
5. Pinching (contact stress) during tool use and material handling
6. Temperature extremes
7. Lack of recovery time to affected body parts

Note: Repeated localized fatigue or soreness after completion of the same task or day's work often indicates that the worker is being exposed to conditions that can lead to RMIs.

B. **Requirements that employers must follow:**

1. Employers must establish and implement a program designed to minimize RMIs if more than one person is diagnosed with RMIs as follows:
   a) The RMIs are work related.
   b) The employees incurred the RMIs while performing a job process or operation of identical work activity.

c) The RMIs were reported in the past 12 months.

d) A licensed physician objectively identified and diagnosed the RMIs. ..... **5110(a)**

2. The program must include the following:

a) A work site evaluation

b) Control of exposures that caused the RMIs

c) Training of employees ..... **5110(b)**

C. **Techniques for reducing RMIs:**

1. Proper lifting and material handling
2. Use of equipment to reduce load and strain
3. Employee rotation for repetitive tasks
4. Use of ergonomically designed tools
5. Use of personal protective equipment
6. Appropriately timed rest periods

Excavation, Trenches, and Earthwork

Hazards associated with excavation are cave-ins; the striking of underground utilities; falling tools, materials, and equipment; and hazardous air contaminants or oxygen-deficient environments.

A. The **minimum safety requirements** are as follows:

1. Before opening an excavation these actions should be taken:

a) Notify all regional notification centers and all underground utility owners who are not members of the notification

centers two working days before starting the work.

b) Estimate the location of the underground utilities. ..... **1541(b)(1), (2)**

c) Obtain a permit from DOSH if workers are required to enter an excavation that is 5 ft. or deeper. ..... **341(a)(1)**

2. While excavating, the exact locations of the underground utilities must be determined by safe and acceptable means. .... **1541(b)(3)**
3. While the excavation is open, the underground utilities must be protected, supported, or removed as necessary. ..... **1541(b)(4)**

B. **When employees are in an excavation, the following requirements apply:**

1. Employees shall be protected from cave-ins by an appropriate protective system. ..... **1541.1(a)(1)**

Exception: If excavations are made entirely in stable rock, or are less than 5 ft. deep, and a competent person has determined that there is no potential for a cave-in, no protective system is needed.

2. A competent person must be on site to do the following:

a) Conduct inspections of the excavations, adjacent areas, and protective systems before the start of work; as needed throughout the shift; and daily for potential cave-ins, failures, hazardous atmospheres, or other hazards. ..... **1541(k)(1)**

b) Take prompt corrective action or remove employees from the hazard.

3. The competent person must be able to demonstrate the following:
   a) The ability to recognize all possible hazards associated with excavation work and to test for hazardous atmospheres.
   b) Knowledge of the current safety orders pertaining to excavation and trenching.
   c) The ability to analyze and classify soils.
   d) Knowledge of the design and use of protective systems.
   e) The authority and ability to take prompt corrective action when conditions change.

C. **Requirements for protective systems** include the following:

1. Protective system design must be based on soil classification: Type A, B, or C soils. ..... **1541.1(b), (c)**
2. Soil classification is required as follows unless the protective system design is based on Type C soil:
   a) Classification must take into account both site and environmental conditions. ..... **1541.1 Appendix A (a)(1)**
   b) Soil must be classified by a competent person as Type A, B, or C soil. ..... **1541.1 Appendix A (c)(1)**
   c) Classification must be based on the results of at least one visual and one manual analysis (see Table 1 on page 60 and Illustration 5 on page 61). ..... **1541.1 Appendix A (c)(2)**

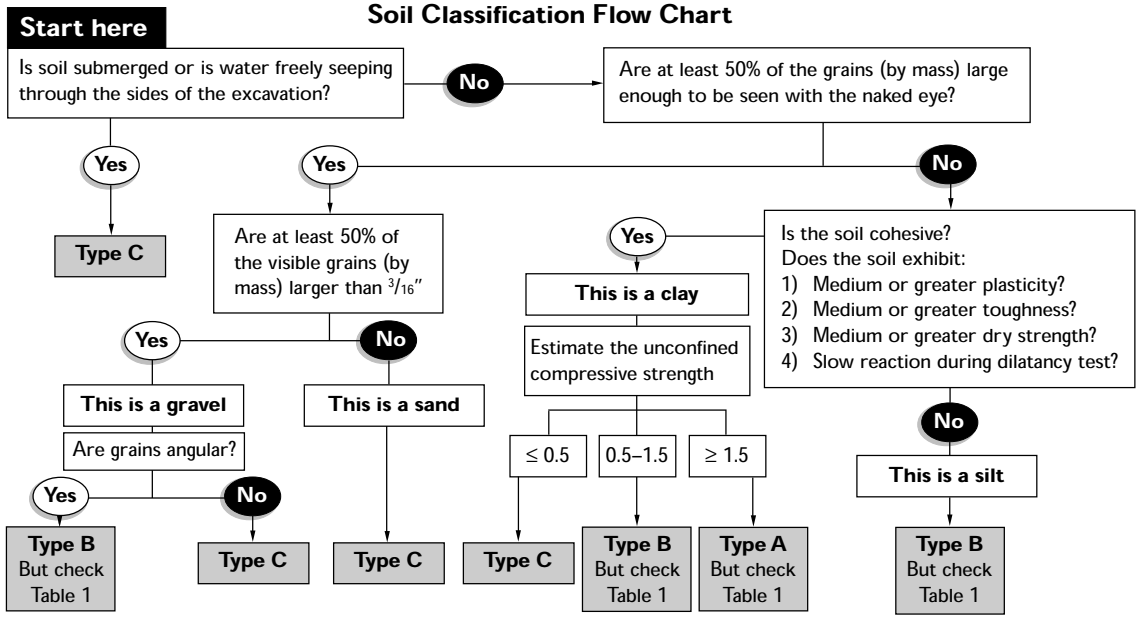
Table 1

Site Conditions That Affect Rock/Soil Slope Stability

Condition	*Requirement*
Soil is fractured/unstable dry rock.	Downgrade to Type B.
Soil is fractured/unstable submerged rock.	Downgrade to Type C.
Soil is cemented (caliche, hardpan, etc.).	Classify as Type A.
Soil is fissured.	Downgrade from Type A to Type B.
Soil is subject to vibration.	Downgrade from Type A to Type B.
Soil has been previously disturbed.	Downgrade from Type A to Type B.
Soil is submerged or water is freely seeping through the sides of the excavation.	Downgrade from Type A to Type C. Downgrade from Type B to Type C.
Soil profile is layered with the layers dipping into the excavation on a slope of four horizontal to one vertical or steeper.	Downgrade from Type A to Type C. Downgrade from Type B to Type C.

Illustration 5

Soil Classification Flow Chart



3. Standard shoring, sloping, and benching must be used as specified in **1540** and **1541.1(b)** or according to tabulated data prepared by a registered engineer (see illustrations 6–8 on pages 63–65).
4. Protective systems for excavations deeper than 20 ft. shall be designed by a registered engineer. ..... **1541.1, Appendix F**
5. Additional bracing must be used when vibration or surcharge loads are a hazard. ..... **1541.1, Appendix A**
6. Excavations must be inspected as needed after every rainstorm, earthquake, or other hazard-increasing occurrence. (Water in the excavation may require a reclassification of soil type.) ..... **1541(k)(1)**
7. Employees must be protected from falling materials by scaling, installation of protective barriers, or other methods. ... **1541(j)(1)**
8. Employees must be protected from excavated or other material by keeping such material 2 ft. from the excavation edge or by using barrier devices. ..... **1541(j)(2)**
9. Ladders or other safe access must be provided within 25 ft. of a work area in trenches 4 ft. or deeper. ..... **1541(c)(2)**
10. Excavation beneath the level of adjacent foundations, retaining walls, or other structures is prohibited unless requirements of **1541(i)** have been met. ..... **1541(i)(1)**
11. Shored, braced, or underpinned structures must be inspected daily when stability is in danger. ..... **1541(i)(2)**

Illustration 6

Benching and Sloping for Excavations Made in Type "A" Soil

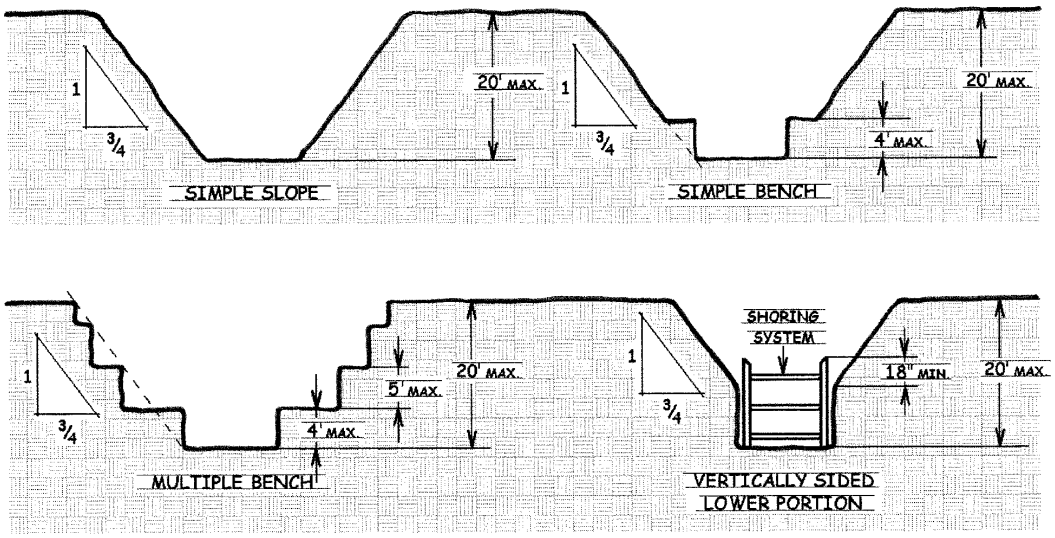


Illustration 7

Benching and Sloping for Excavations Made in Type "B" Soil

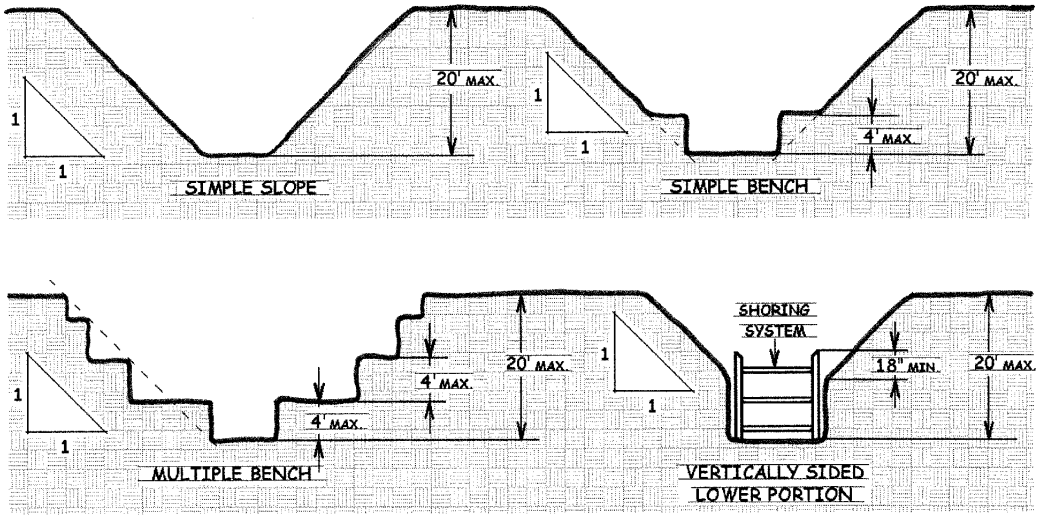
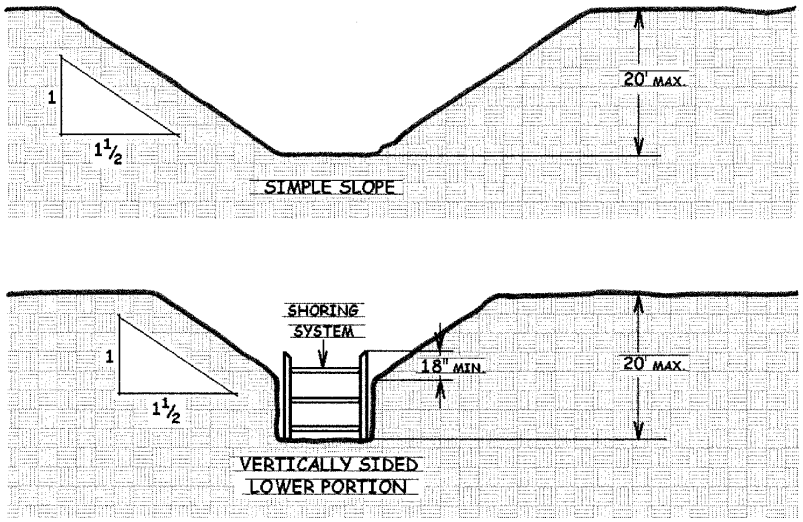


Illustration 8

Benching and Sloping for Excavations Made in Type "C" Soil



12. Walkways or bridges with standard guardrails must be installed when employees or equipment are required or permitted to cross over excavations that are at least 6 ft. deep and wider than 30 in. ..... **1541(l)(1)**
13. Barriers must be erected around excavations in remote locations. All wells, pits, shafts, and caissons must be covered or barricaded, or if temporary, backfilled when work is completed. ..... **1541(l)(2)**

D. Safety orders pertaining to **shafts and wells** include the following:

1. All shafts and wells more than 5 ft. deep into which workers are required to enter must be retained with lagging, spiling, or casing. ..... **1542(a)(1)**
2. Tests or procedures shall be performed before entry into exploration shafts to ensure the absence of dangerous air contamination or oxygen deficiency. ..... **1542(c)(3), 5158**
3. An employee entering a bell-bottom pier hole or other deep or confined-footing excavation shall wear a harness that has a lifeline attended by another employee. ..... **1541(g)(2)(B)**
4. Shafts in other than hard, compact soil shall be completely lagged and braced. ..... **1542(c)(1)**
5. Head protection is required for workers who enter a well or shaft. **3381**
6. Shafts more than 20 ft. deep are subject to the TSOs. ..... **8403(a)**

Explosion Hazards

Employees are often exposed to explosion hazards without their knowledge. In addition to substances (such as dynamite) that are designed specifically for the purpose of creating explosions, there are substances that will cause an explosion when present in certain concentrations and exposed to an ignition source. SOs to control these hazards include:

A. **Combustible dust:** Combustible dust concentrations must be controlled at or below 25% of the lower explosive limit (LEL) unless all ignition sources are eliminated or identified and specifically controlled. ..... **5174(a)**

   1. Accumulated and settled combustible dusts must be cleaned up to prevent a fire or explosion. ..... **5174(b)**
   2. Cleaning with compressed air and blowing combustible dust may be done only when other methods cannot be used, when possible sources of ignition have been eliminated, and when hoses and nozzles are grounded. ..... **5174(f)**

B. **Flammable vapors**: Ventilation in enclosed places must be sufficient to prevent flammable vapor or gas concentrations from exceeding 25% of the LEL. ..... **5416(a)**

   No source of ignition is permitted indoors or outdoors where vapor or gas concentrations may reasonably be expected to exceed 25% of the LEL. ..... **5416(c)**

Note: Check also for confined space conditions **(5158)** and hazardous locations ..... **(2540.1).**

Fall Protection

T8 CCR includes fall protection standards in various sections of the GISOs, CSOs, TSOs, and ESOs. These standards reflect the levels of the fall hazards associated with each activity.

A. The factors affecting the level of hazard include the following:
   1. Fall height
   2. Level of hazard awareness and skill of the employee
   3. Physical work environment (e.g., conditions affecting the stability of the employee on the work surface)
   4. Duration of exposure to the fall hazard.

Note: Because factors 2, 3, and 4 listed above vary with different trades and activities, the regulatory requirements for fall protection reflect those differences.

Below find definitions and selected fall protection requirements:

B. A **personal fall protection (PFP) system** prevents a worker from falling or—if the worker is falling—stops the fall. PFP systems include guardrails, safety nets, personal fall restraint

systems, personal fall arrest systems, and positioning device systems.

1. Guardrails are required to guard the open sides of all work surfaces that are 7 ½ ft. or higher or workers who must be otherwise protected. The railing must be made from select lumber (or equivalent) and must consist of a top rail 42 in. to 45 in. high, 2" x 4" (min.); a 1" x 6" midrail halfway between the top rail and the floor; and support posts at least 2" x 4" at 8 ft. o.c.
2. A personal fall restraint (PFR) system is used to prevent an employee from falling. It consists of anchorages, connectors, and a body belt or harness. It may include lanyards, lifelines, and rope grabs designed for that purpose.
3. A personal fall arrest (PFA) system is used to stop an employee during a fall from a working level and to keep him or her from hitting a lower level or structure. The system consists of an anchorage, connectors, and a body harness. It may include a lanyard, a lifeline, a deceleration device, or suitable combinations of these. A PFA system must meet the following requirements:
   a) It must limit the maximum arresting force on an employee to 1,800 lbs.
   b) It must not allow an employee to free-fall for more than 4 ft. or to come into contact with a lower level.
   c) Anchorage points must be able to support 5,000 lbs. per employee attached or:

(1) Must be designed, installed, and used as part of a complete PFA system with a safety factor of two; and

(2) Under the supervision of a qualified person.

d) The PFA system lifeline must meet the following requirements:

(1) It must be able to support 5,000 lbs.

(2) Each employee must be attached to a separate lifeline.

Exception: During the construction of elevator shafts, two employees may be attached to a lifeline that is able to support 10,000 lbs.

(3) The lower end of the vertical lifeline must extend to within 4 ft. from the ground.

(4) A horizontal lifeline system must be designed, installed, and used under the supervision of a qualified person and maintained with a safety factor of at least two. ..... **1670(b)**

Note: The use of a body belt or safety belt as a part of a PFA system is prohibited. ... **1670(b)**

4. Safety belts and body belts are to be used only as positioning devices or in PFR systems. A PFP system may be required while an employee uses a safety belt, as specified in certain safety orders. Safety belts must limit the maximum arresting force on an

employee to 900 lbs. and the free-fall distance to 2 ft. ..... **1670(c)**

5. Safety nets may be used in place of all other fall protection systems if the nets are installed properly. **1671**

C. A PFP system must be used if guardrailing or safety nets are not installed for the following fall distances and work activities:

1. A fall distance of more than 6 ft., when placing or tying rebar in walls, columns, piers, etc. ..... **1712(e)**

Exception: A PFP system is not required during point-to-point horizontal or vertical travel on rebar.

2. A fall distance of 7 1/2 ft. or greater during the following:
   a) Work from the perimeter of a structure, through shaftways and openings, and on roofs with slopes greater than 7:12. ..... **1670(a)**
   b) Work from thrustouts or similar locations when the worker's footing is less than 3 1/2 in. wide ..... **1669(a)**
   c) Work on suspended staging, floats, catwalks, walkways, or advertising sign platforms ..... **1670(a)**
   d) Work from slopes steeper than 40° ..... **1670(a)**

3. A fall distance of 15 ft. or greater during the following:
   a) Work from buildings, bridges, structures, or construction members, such as trusses, beams, purlins, or plates ..... **1669(a)**
   b) Ironwork other than connecting ..... **1710(g)(2)**
   c) Work on structural wood framing systems ..... **1716.1(c)(1)**
4. An eave height of 20 ft. or greater, during all roofing operations (see exceptions in 2a above and 6a and 6b below) ..... **1730(b)**
5. A fall distance of 30 ft. or greater, when ironworkers are connecting structural beams ..... **1710(g)(1)**
6. Any height during work:
   a) On roofs having a pitch of 4:12 or greater, while workers use pneumatic nailers ..... **1704(d)**
   b) On roofs, while an operator uses a felt-laying machine or other equipment that requires the operator to walk backwards (see prohibitions noted in **1730[d]**) ..... **1730(d)**
   c) From boatswain's chairs ..... **1662(c)**
   d) From float scaffolds ..... **1663(a)(5)**
   e) From needle-beam scaffolds .. **1664(a)(12)**
   f) From suspended scaffolds ..... **1660(g)**

D. A **fall protection plan (FPP)** must be implemented when a fall protection (FP) system is required but not used because the system creates a greater hazard or is impractical. **1671.1**

The fall protection plan must: ..... **1671.1(a)(1)**

1. Be prepared by a qualified person (QP) who is identified in the plan.
2. Be developed for a specific site or developed for essentially identical operations.
3. Be updated by the QP.
4. Document why a conventional FP system is not used.
5. Identify the competent person to implement and supervise the FPP.
6. Identify the controlled access zone for each location where a conventional FP system cannot be used.
7. Identify employees allowed in the CAZ.
8. Be implemented and supervised by the competent person.

Note: An up-to-date copy of the fall protection plan must be at the job site.

E. The **controlled access zone** must be established and maintained as follows: **1671.2**

1. A control line or its equivalent must control access to the CAZ and must:
   a) Consist of ropes, wires, tapes, or equivalent materials and be supported by stanchions.
   b) Be flagged or marked at not more than 6 ft. o.c.
   c) Be rigged not fewer than 39 in. and not more than 45 in. from the working surface.

d) Have a breaking strength of 200 lbs. (min.). See **1671.2** for greater detail.

2. Signs must be posted to keep out unauthorized persons.
3. A safety monitoring system must include a designated safety monitor who is able to:
   a) Monitor the safety of other employees.
   b) Recognize fall hazards.
   c) Warn an employee when it appears that the employee is unaware of a fall hazard or is acting in an unsafe manner.
   d) Stay in sight of and in communication with the employee being monitored.
   e) Have no other responsibilities. **1671.2**

Note:

A. Only an employee covered by a fall protection plan shall be allowed in a CAZ.

B. The booklet *Fall Protection for the Construction Industry* is available free of charge from Cal/OSHA.

Fire Protection and Prevention

The employer is responsible for establishing an effective fire prevention program and ensuring that it is followed throughout all phases of the construction work. ..... **1920(a)**

A. Fire-fighting equipment must be:

1. Freely accessible at all times ..... **1920(b)**
2. Placed in a conspicuous location ..... **1920(c)**

3. Well maintained ..... **1920(d)**

B. A water supply that is adequate to operate fire-fighting equipment must be made available as soon as combustible materials accumulate. **1921(a)**

C. **Fire extinguisher** use must comply with the following:

1. Fire extinguishers must be kept fully charged, inspected monthly, and serviced annually. ..... **1922(a)**
2. At least one fire extinguisher, rated not less than 2A, must be provided at each floor.
3. At least one fire extinguisher, rated not less than 2A, must be provided adjacent to the stairway at each floor level.
4. Fire extinguishers rated not less than 2A must be provided for each 3,000 ft. of floor area or a fraction thereof.
5. Fire extinguishers must be kept within 75 ft. of the protected area ..... **1922(a)**

Exception: Fire extinguishers must be kept within 50 ft. of wherever more than 5 gal. of flammable or combustible liquid or 5 lbs. of flammable 3 gas is being used. ..... **1922(a)**

6. Training in the use of fire extinguishers must be provided annually. ..... **6151(g)**

Note: See specific SOs and manufacturing specifications for appropriate use of fire extinguishers.

First Aid

Regulations concerning first aid include the following:

A. A **first aid kit** must be provided on all job sites and must contain the minimum of supplies as determined by an authorized licensed physician or as listed in **1512(c).**

B. **Trained personnel** in possession of a current Red Cross First Aid certificate or its equivalent must be immediately available at the job site to provide first aid treatment. ..... **1504(a), 1512(b)**

C. **Emergency medical services** must be readily available. ..... **1512(a), (e)**

D. **Exposure to bloodborne pathogens** is considered a job-related hazard for construction workers who are assigned first-aid duties in addition to construction work. Although construction employers are specifically exempted from GISO **5193** requirements, they are required to provide appropriate protection for employees who may be exposed to bloodborne pathogens when providing first aid. **3203**

Flaggers

Flaggers must be used at locations on a construction site as soon as barricades and warning signs cannot effectively control moving traffic. The employer must ensure the following:

A. Flaggers must be placed in locations so as to give effective warning. ..... **1599(b)**

B. Warning signs must be placed according to the *Manual of Traffic Controls for Construction and Maintenance Work Zones,* published in 1996 by Caltrans. ..... **1599(c)**

C. Flaggers must wear orange or strong yellow-green warning garments, such as vests, jackets, shirts, or rainwear. ..... **1599(d)**

D. Flaggers' stations must be illuminated, and flaggers must wear reflectorized garments that are visible at a minimum of 1,000 ft. during hours of darkness. ..... **1599(c)**

E. Flaggers must be trained. ..... **1599(f), (g)**

F. Training must be documented in accordance with the IIP Program requirements. ..... **1599(f)**

Flammable and Combustible Liquids

Flammable and combustible liquids include gasoline, paint thinners, solvents, etc.

A. These liquids must be kept in closed containers when not in use. ..... **1935(a)**

B. Leakage or spillage must be disposed of promptly and safely. ..... **1935(b)**

C. Flammable and combustible liquids may be used only where no open flames or sources of ignition exist (see specifics in **1935[c]**). ..... **1935(c)**

D. All containers of flammable and combustible liquids must be plainly marked with a warning legend. ..... **5417(a)**

E. Flammable liquids must not be used: ..... **5417(c)**

1. To wash floors, structures, or equipment except where there is adequate ventilation
2. To spray for cleaning purposes unless the liquids are used in a spray booth or outdoors where there is no ignition source within 25 ft. of their use

F. Flammable liquids must be stored and transported in closed containers. ..... **5417(e)**

> *Note:* For specific requirements concerning indoor and outdoor storage, see **1931** and **1932.** For on-site dispensing operations see **1934.**

G. A hazard communication program may be required. **5194**

Forklifts

Safety regulations concerning the use of forklifts are as follows.

A. **The rated lifting capacity** of the forklift must be posted in a location readily visible to the operator. ..... **3660(a)**

B. **Elevating employees** requires the following:

1. The forklift must be equipped with a platform not less than 24" x 24" in size.
   a) The platform must be properly secured to the forks or the mast.
   b) The platform must be equipped with guardrails, toe boards, and a back guard.
   c) It must have no spaces or holes larger than 1 in.

d) It must have a slip-resistant platform surface. ..... **3657(a)**

2. The operator must be at the controls while the employees are elevated. ..... **3657(d)**
3. The operator must be instructed in the operating rules for elevating employees. ..... **3657(h)**

Note: When guardrails are not possible, fall protection is required. ..... **3657(b)**

C. All forklifts must have parking brakes. .. **3661(b)**

D. All forklifts must have an operable horn. ..... **3661 (c)**

E. When the operator is exposed to the possibility of falling objects, the forklift must be equipped with overhead protection (canopy). ..... **3657(c)**

F. The employer must post and enforce a set of operating rules that include the following: ..... **3664(a)**

1. Only trained and authorized drivers may operate forklifts.
2. Stunt driving and horseplay are prohibited.
3. Employees must not ride on the forks.
4. Employees must never be permitted under the forks (unless forks are blocked).
5. The driver must inspect the vehicle once during a shift.
6. The operator must look in the direction of travel and must not move the vehicle until all persons are clear of the vehicle.
7. Forks must be carried as low as possible.

8. The operator must lower the forks, shut off the engine, and set the brakes (or block the wheels) before leaving the forklift unattended (that is, when the operator is out of sight of the vehicle or 25 ft. away from it).
9. Trucks must be blocked and brakes must be set before a forklift is driven onto the truck bed.
10. Extreme care must be taken when tilting elevated loads.
11. The forklift must have operable brakes capable of stopping it safely when it is fully loaded.

G. **An employee must be properly trained** (as certified by the employer) before operating a forklift. ..... **3668(a)**

1. An evaluation of the operator's performance must be conducted at least once every three years. ..... **3668(d)**
2. Refresher training in relevant topics must be provided to the operator when: ...**3668(d)(1)**
   a) The operator is observed operating the vehicle in an unsafe manner.
   b) The operator has been involved in an accident or near-miss incident.
   c) The operator's evaluation reveals that he or she is not operating the truck safely.
   d) The operator is assigned to drive a different type of truck.
   e) Changes in workplace conditions could affect safe operation of the truck.

Forms, Falsework, and Vertical Shoring

By definition concrete forms are considered falsework. Falsework, however, also includes support systems for forms, newly completed floors, bridge spans, etc., that provide support until appropriate curing or stressing processes have been completed. See below for selected SOs:

A. **Design of falsework**

1. Concrete formwork and falsework must be designed, supported, and braced to safely withstand the intended load. ..... **1717(a)(1)**
2. Falsework design, detailed calculations, and drawings must be signed and approved by an engineer (Ca PE) if the falsework height (sill to soffit) exceeds 14 ft., if the individual horizontal span length exceeds 16 ft., or if vehicle or railroad traffic goes through the falsework. ..... **1717(b)(1)(A), (B)**

Note: For other falsework, approval may be provided by a manufacturer's representative or a licensed contractor's qualified representative. ..... **1717(b)(2)(B), (C)**

3. Falsework plans must be available at the job site. ..... **1717(b)(3)**
4. Minimum design loads are as follows: ..... **1717(a)(2)**
   a) Total combined live and dead load: 100 psf
   b) Live load and formwork: 20 psf

5. Additional loads must be considered in the design. ..... **1717(a)**

B. **Erection of falsework**

1. Falsework must be erected on a stable, level, compacted base and supported by adequate pads, plates, or sills. ..... **1717(b)(4)**
2. Shore clamps (metal) must be installed in accord with manufacturer's instructions. ..... **1717(d)(2)**

C. **Inspection**

1. Before pouring concrete on falsework requiring design approval, an engineer (Ca PE) or the engineer's representative must inspect for and certify compliance with plans. ..... **1717(c)(1)**

Note: For other falsework, the inspection and certification may be provided by a manufacturer's representative or a licensed contractor's qualified representative. ..... **1717(c)(2)(B), (C)**

2. A copy of the inspection certification must be available at the job site. ..... **1717(c)(3)**

D. **Access to forms and falsework**

1. Joists (5 1/2 in. wide) at not more than 36 in. o.c. may be used as walkways while forms are placed. ..... **1717(d)(3)**
2. A plank (12 in. wide) may be used as a walkway while joists are placed. ..... **1717(d)(5)**

E. **Fall protection**

Periphery rails are required as soon as supporting members are in place. ..... **1717(d)(4)**

Note: The area under formwork is a restricted area and must be posted with perimeter warning signs. ..... **1717(d)(6)(A)**

Guardrails

Guardrails must be installed at the open sides of all work surfaces that are 7 ½ ft. or higher, or workers must be protected by other fall protection or, if justified, by a valid fall protection plan. ..... **1621(a)**

A. **Guardrailing specifications**

1. Railing must be made from select lumber (or equivalent material) and must consist of:
   a) A wooden top rail that is 42 in. to 45 in. high and that measures 2" x 4" or larger
   b) A midrail that is placed halfway between the top rail and the floor and that measures at least 1" x 6"
   c) A supporting post that measures at least 2" x 4" and is placed every 8 ft. ..... **1620(a), (b), and (c)**
2. All railings should be capable of withstanding a load of 200 lbs.
3. Railing constructed of substitute materials must meet the following requirements:
   a) The top rail must be smooth surfaced and 42 in. to 45 in. high above the floor, platform, etc.

b) Protection between the top rail and the floor, platform, etc., must be equivalent to that provided by the standard midrail.

4. The top rail or midrail on scaffolding platforms may be substituted by the X-braces as specified in the scaffolding regulations (see page 118). ..... **1644(a)(6)**

B. **Guardrailing applications**

1. Floor and roof openings: Floor and roof openings in any work surface must be railed or covered. The cover must be substantial, securely fastened, and able to withstand the load of workers or material. Covers must bear a sign stating—OPENING—DO NOT REMOVE. ..... **1632(b), (e)**

Note: Roof openings include finished skylights unless they meet the requirements of **3212(e).**

2. Wall openings: Wall openings must be guarded if there is a drop of more than 4 ft. and the bottom of the opening is less than 3 ft. above the working surface. ..... **1632(j)**
3. Elevators: Guardrails are required for elevator shaft openings that are not enclosed or do not have cages. **1633**
4. Falsework: Guardrails are required as soon as falsework-supporting members are in place. ..... **1717(d)(4)**
5. Demolition: Wall openings must be guardrailed during demolition except on the floor being demolished and on the ground floor. ..... **1735(k)**

6. Roofing operations: Provisions must be made during roofing operations to prevent workers from falling off roofs 20 ft. or higher. ..... **1730(b)(1)**
7. Skeleton steel building: A single 3/8-in. wire rope, in lieu of standard railing, may be used to guard openings and exposed edges of temporary floors or planking in skeleton steel buildings. The 3/8-in. wire rope must have a breaking strength of 13,500 lbs. (min.) and be placed at 42 in. to 45 in. above the finished floor. ..... **1710(e)(3)**

Hazard Communication Program (Haz-Com)

Employers whose employees may be exposed to hazardous substances are required to have a haz-com program. **5194**

A. The program must include the following:

1. A list of the hazardous substances that are used or stored in the workplace
2. Labels and other forms of warning on containers of hazardous substances
3. Readily accessible MSDSs
4. Training on the hazardous substances that employees are or could be exposed to in the workplace
5. A plan for managing multi-employer worksite issues
6. A plan for periodically (e.g., annually) evaluating the effectiveness of the program and for updating the program

B. The haz-com program must be in writing and must be available on request to employees, their representatives, and Cal/OSHA.

Note: The *Guide to the California Hazard Communication Regulation* is available free of charge from Cal/OSHA.

Hazardous Substances

Hazardous substances are generally defined as substances likely to cause injury or illness because they are explosive, flammable, toxic, poisonous, corrosive, oxidizing, irritant, or otherwise harmful. These substances may include solvents, paints, thinners, cleaning agents, fresh concrete, and fuels. The use of or possible exposure to these substances at the workplace requires some sort of employee protection and, if applicable, the development and implementation of a haz-com program.

The hazardous substances that require a haz-com program include the following:

A. Any substance that is a physical or a health hazard

B. Any hazardous substance listed in the following:

   1. The Hazardous Substances List (*T8 CCR* **339**)
   2. The *Code of Federal Regulations* (*CFR*, Part 1910, Subpart Z)
   3. *Threshold Limit Values for Chemical Substances in the Work Environment* (ACGIH) 1991-1992.

4. *Sixth Annual Report on Carcinogens*, National Toxicology Program, 1991
5. Monographs, International Agency for Research on Cancer, Volumes 1–53, and Supplements 1–8, World Health Organization
6. MSDSs on reproductive toxicants or cancer-producing substances
7. *T22 CCR* **12,000** (Proposition 65)

Heat Stress

Heat stress can be a serious health hazard for employees required to work while exposed to the sun or other heat sources. Supervisors and foremen should look continuously for symptoms and signs of heat stress-related disorders in employees.

A. Two heat stress-related disorders are noted in Table 2:

Table 2
Symptoms and Signs of Heat Stress

Disorder	*Symptoms*	*Signs*
Heat Exhaustion	Weakness Fatigue Blurred vision Dizziness Headache	High pulse rate Extreme sweating Pale face Insecure gait Normal to slightly elevated temperature
Heatstroke	Chills Restlessness Irritability	Red face Hot dry skin (usual) Disorientation High temperature (≥104F) Erratic behavior Shivering Collapse Convulsions Unconsciousness

B. The employer must provide a suitable number of trained persons to render first aid as follows:

   1. To give first aid for heat exhaustion, lay the person down flat in a cool environment, loosen his or her clothing, and give him or her plenty of water to drink.
   2. To give first aid for heat stroke, immediately start aggressive cooling of the person and get him or her to a hospital.

C. The employer must protect employees from heat stress by:

   1. Providing cool, potable water ..... **1524(a)**
   2. Providing frequent cool-down breaks
   3. Timing the heaviest work load for during the coolest part of the workday
   4. Encouraging workers to drink water and to cool down
   5. Looking for signs and symptoms of heat stress
   6. Providing training on heat stress—including prevention, recognition, and first aid—as a part of the company's IIP Program. **3203, 3400, 3439**

Heavy Construction Equipment

Safety requirements for heavy construction equipment are as follows:

A. General repairs must not be made to powered equipment until workers are protected from movement of the equipment or its parts. ..... **1595(a)**

B. Before repairs are made workers must comply with lock-out/block-out requirements if applicable. **3314**

C. Wherever mobile equipment operation encroaches on a public thoroughfare, a system of traffic controls must be used. ..... **1598(a)**

D. Flaggers are required at all locations where barricades and warning signs cannot control the moving traffic (see pages 76–77). ... **1599(a), (d)**

E. Job-site vehicles must be equipped with the following:

1. Operable service, emergency, and parking brakes ..... **1591(c), 1597(a)**
2. Two operable headlights and taillights for night operation ..... **1597(b)**
3. Windshield wipers and defogging equipment as required ..... **1597(d)**
4. Seat belts if the vehicle has rollover protection structures ..... **1597(g)**
5. Fenders or mud flaps ..... **1591(f), 1597(I)**
6. Adequate seating if the vehicles are used to transport employees ..... **1597(f)**

F. Vehicles and systems must be checked for proper operation at the start of each shift. ..... **1597(j)**

G. **Rollover protection structures and seat belts** must be installed and used for the following equipment with a brake horsepower rating above 20:

1. Crawler tractor
2. Bulldozer
3. Front-end loader

4. Motor grader
5. Scraper
6. Tractor (except side boom pipe laying)
7. Water wagon prime mover
8. Sheepsfoot-type rollers and compactors
9. Rollers and compactors (weighing more than 5,950 lbs.) ..... **1596(a)**

H. **Haulage and earthmoving equipment** safety requirements are as follows:

1. Every vehicle having a body capacity of 2.5 cu. yds. or more must be equipped with an automatic back-up alarm that sounds immediately on backing. ..... **1592(a)**
2. All other vehicles operating when rear vision is blocked must be equipped with an automatic back-up alarm or its equivalent. ..... **1592(b)**
3. All vehicles must be equipped with a manually operated warning device. ..... **1592(c)**
4. Haulage vehicles in operation must be under operator control and must be kept in gear when descending grades. ..... **1593(b)**
5. The brakes on a haulage vehicle must meet the criteria specified by the CSOs. ... **1591(c)**
6. The control devices on a haulage vehicle must be inspected at the beginning of each shift. ..... **1593(d)**
7. Exposed scissor points on front-end loaders must be guarded. ..... **1593(i)**
8. Engines must be stopped during refueling. ..... **1594(a)**

9. Lights are required for night operation. ..... **1591(g)**
10. Vehicles loaded by cranes, shovels, loaders, and similar devices must have an adequate cab or canopy for operator protection. ..... **1591(e)**
11. Dust control is required when dust seriously limits visibility. ..... **1590(b)**
12. Respirators are required for drivers when air contamination becomes hazardous. ..... **1590(b)**
13. Industrial tractor operator's instructions must be posted in a conspicuous place, and operators must be able to understand them. ..... **3664(b)**

Housekeeping/Site Cleaning

Housekeeping is a term used to describe the cleaning of the work site and surrounding areas of construction project-related debris. The term also refers to the managing and storing of materials that are used on the project. Listed below are the general requirements for housekeeping to which all work sites are subject. It is important to remember that work sites subject to specific SOs may have additional housekeeping requirements with which to comply.

A. Work surfaces, passageways, and stairs must be kept reasonably clear of scrap lumber and debris. ..... **1513(a)**

B. Ground areas within 6 ft. of buildings under construction must be kept reasonably free of irregularities. ..... **1513(b)**

C. Storage areas and walkways on construction sites must be kept reasonably free of dangerous depressions, obstructions, and debris. .... **1513(c**)

D. Piled or stacked material must be placed in stable stacks to prevent it from falling, slipping, or collapsing. ..... **1549(a)**

Injury and Illness Prevention Program

An Injury and Illness Prevention Program is required at all work sites. The program is considered effective if it satisfies the regulatory requirements of **3203** and helps the employer and the employee to identify the hazards specific to their work site and then to control these hazards. Following is a summary of the regulatory requirements.

A. **The IIP Program must be in writing and must include the following elements:** ..... **1509(a), 3203(a)**

1. The employer's assignment of responsibilities ..... **3203(a)(1)**
2. A system for ensuring employee compliance with safe work practices ..... **3203(a)(2)**
3. A job and equipment training and retraining program ..... **3203(a)(7)**
4. A system for two-way communication between employers and employees about safety issues ..... **3203(a)(3)**
5. Scheduled inspections and an evaluation system to identify hazards ..... **3203(a)(4)**
6. An accident investigation process ..... **3203(a)(5)**

7. Procedures for correcting unsafe and unhealthy conditions ..... **3203(a)(6)**
8. Safety and health training ..... **3203(a)(7)**
9. Recordkeeping ..... **3203(b)**

B. **Special IIP Program requirements** are as follows:

1. Employers must adopt and post a Code of Safe Practices at each job site. Plate A-3 in Appendix A of the CSOs illustrates a general format. ..... **1509(b), (c)**
2. Periodic meetings of supervisors must be held to discuss the safety program and accidents that have occurred. ..... **1509(d), 3203**
3. Supervisors must conduct tailgate or toolbox safety meetings at least every ten working days; however, weekly meetings are recommended. ..... **1509(e)**

C. **Safety training for employees** is regulated as follows:

1. New workers must be instructed in safe work practices, job hazards, and safety precautions and must be required to read the Code of Safe Practices. ..... **1510(a)**
2. The employer shall permit only qualified or experienced employees to operate equipment or machinery. ..... **1510(b)**
3. Workers must be instructed in the following:
   a) The recognition of job site-specific hazards
   b) Procedures for protecting themselves
   c) First aid procedures in the event of injury ..... **1510(c)**

D. **General safety requirements** are as follows:

1. No worker shall be required or permitted to work in an unsafe workplace. ..... **1511(a)**
2. Before starting work the employer must survey the job site for hazards and use necessary safeguards to ensure that work is performed safely. ..... **1511(b)**

E. **Specific requirements** are as follows:

If an employer is subject to specific safety orders, the requirements of these SOs must be considered when developing the employer's IIP Program. These SOs may include specific procedures or processes as well as requirements for reporting, training, exposure limits, personal protection, and registration and certification.

F. **Employees have numerous rights** under the IIP Program, including the following: ..... **3203(a)**

1. The right to work in a safe and healthy workplace
2. The right to inform the employer of workplace hazards without fear of reprisal
3. The right to receive training that is readily understandable

G. **Safety program recommendations** are as follows:

1. Supervisors should be qualified in safety procedures and held accountable.
2. The effectiveness of the safety program should be monitored.

Note: The *Guide to Developing Your Workplace Injury and Illness Prevention Program* is available free of charge from Cal/OSHA.

Ladders

Ladders may be used to provide access when no other means of access is required in the SOs. Falls are the most common cause of worker injury associated with ladder use and are primarily caused by (1) use of faulty ladders; (2) improper set-up of a ladder; or (3) the incorrect use of ladders. SOs to control these hazards are listed below.

A. **Ladder specifications** are as follows:

1. Extension ladders shall not exceed 44 ft. in length. ..... **1678(a)**
2. Single-cleat ladders shall not exceed 30 ft. in length. ..... **1629(c)**
3. Double-cleat ladders shall not exceed 24 ft. in length. ..... **1676(d)**
4. Double-cleat ladders are required for two-way traffic or when 25 or more employees are using a ladder. ..... **1629(c)**
5. An overlapping section should not be less than 10% of the working length of the ladder. ..... **1678(b)**

B. **Job-built ladders** must meet the following requirements:

1. Job-built ladders must safely support the intended load. ..... **1676(a)**
2. Cleats must be made from clear, straight-grained lumber and must be uniformly spaced 12 in. apart vertically. ..... **1676(c)**
3. Cleats must be nailed at each end with three 10d nails or the equivalent. ..... **1676(j)**
4. Cleats must be blocked or notched into the side rails. ..... **1676(j)**

5. The width of single-cleat ladders shall be 15 in. to 20 in. ..... **1676(f)**
6. Rails must be made from select Douglas fir without knots (or the equivalent). ..... **1676(b)**
7. Rail splicing is permitted only when there is no loss of strength to the rail. ..... **1676(b)**
8. Single-cleat ladders must not exceed 30 ft. in length. ..... **1676(d)**
9. Double-cleat ladders must not exceed 24 ft. in length. ..... **1676(d)**

C. Two **types of stepladders** are allowed as follows: **1675, 3278, 3287**

1. Type I, Industrial, 3 ft. to 20 ft., for heavy duty, such as work on utilities, use by contractors, and industrial use.
2. Type II, Commercial, 3 ft. to 12 ft., for medium duty, such as use by painters, office use, and light industrial use... **3278(d)**

D. To **safely use ladders,** employees must follow the instructions noted below:

1. Face the ladder while climbing and descending. ..... **3276(a)(2)**
2. Do not stand on the top three rungs of ladders. ..... **1675(k)**
3. Remove damaged or defective ladders from use. ..... **1675(b)**
4. Do not place ladders where they can be accidentally struck or displaced. ..... **1675(h)**
5. Tie, block, or otherwise secure portable ladders in use. ..... **1675(j)**

6. Extend ladder side rails to at least 3 ft. above the landing unless handholds are provided. ..... **1629(c)(3), 1675(i)**
7. Do not splice ladders together. .. **3278(e)(13)**
8. Do not use metal ladders for electrical work or near live electrical parts. ..... **3279(d)(11), 1675(l)**
9. Mark portable metal ladders with the words—CAUTION—DO NOT USE AROUND ELECTRICAL EQUIPMENT. ..... **3279(d)(11)**

E. To **safely use stepladders,** employees must follow the instructions noted below:

1. Do not step on the topcap or the step below the topcap. ..... **3287(a)(12)(B)**
2. Do not place planks on the topcap. .. **1675(f)**
3. Do not use the X-bracing on the rear section of a stepladder for climbing unless the ladder is so designed and provided with steps for climbing on both front and rear sections. ..... **3278(e)(20)**
4. Make sure that the stepladder is properly set up and that the spreader is in locked position before use. ..... **3278(d)(1)(D)**
5. Do not use the stepladder as a lean-to ladder. ..... **3278(d)(1)(D)**

Laser Equipment

The primary hazard of using laser equipment is injury to the eyes. Following are selected regulatory requirements.

A. Only qualified persons may operate laser equipment. ..... **1801(a)**

B. Employees who may be exposed to laser light greater than 5 milliwatts must wear eye protection devices. ..... **1801(c)**

C. Warning signs must be posted in areas where lasers are used. ..... **1801(d)**

D. Equipment must be turned off or shielded when unattended and not in use. ..... **1801(e)**

E. Laser beams must never be pointed or directed at persons. ..... **1801(g)**

F. Lasers must have a label indicating their maximum output. ..... **1801(i)**

Lead

Occupational exposures to lead can occur in construction activities, such as plumbing system retrofits; the spraying, removal, or heating of paint that contains lead; and the welding, cutting, and grinding of lead-containing construction materials.

Occupational lead exposures can affect workers as well as family members and friends who come into contact with the "take-home" lead on the worker's clothing, hair, hands, etc. The toxic effects of lead on the human body have been well documented and include damage to the kidneys, brain, and reproductive organs that in turn causes the loss of kidney function, sterility, decreased fertility, and birth defects and mental retardation in offspring.

Because of these serious and, in many cases, life-threatening health effects, laws and regulations have been enacted to protect people from lead exposure.

A. Cal/OSHA enforces the "Lead in Construction Safety Orders" that make employers responsible for the following:

1. Before engaging in any work during which an employee may be exposed to lead, the employer must be thoroughly knowledgeable about the requirements of CSO **1532.1.**
2. For each job site the lead hazard must be assessed. ..... **1532.1(d)(1)**
3. Where lead is present the following is required:
   a) Lead dust must be controlled by HEPA vacuuming, wet cleanup, or other effective methods. ..... **1532.1(h)**
   b) Workers must be provided with washing facilities that are supplied with soap and clean water. ..... **1532.1(i)**
   c) Workers must receive appropriate training. ..... **1532.1(l)**
   d) The employer must implement a written compliance program to ensure control of hazardous lead exposures. .... **1532.1(e)**
   e) The employer must provide the worker with and require the use of appropriate personal protective equipment. ..... **1532.1(e), (g)**

B. The **permissible exposure limits (PELs)** for airborne lead are 0.05 milligrams per cubic meter of air (mg/m^3) and an action level of 0.03 mg/m^3, both as an 8-hour time-weighted average (TWA). ..... **1532.1(b), (c)**

C. **Trigger tasks** are certain highly hazardous tasks that carry the presumption of airborne exposure above the PEL. They require special protective measures until it is determined that worker airborne exposures to lead are below levels

specified in **1532.1.** Following are the three levels of trigger tasks involving lead-containing materials and associated respirator requirements:

1. Level 1 trigger tasks: spray painting, manual demolition, manual scraping or sanding, using a heat gun, and power-tool cleaning with dust collection system
   - Minimum respirator requirement: a half-mask respirator with N-100, R-100, or P-100 filters
2. Level 2 trigger tasks: using lead-containing mortar; burning lead; rivet busting; cleaning power tools without a dust collection system; using dry, expendable abrasives for clean-up procedures; moving or removing an abrasive blasting enclosure
   - Minimum respirator requirement: a full-face mask respirator with N-100, R-100, or P-100 filters; an air-supplied hood or helmet; or a loose-fitting hood or helmet with a powered air purifying respirator with N-100, R-100, or P-100 filters
3. Level 3 trigger tasks: abrasive blasting, welding, cutting, or torch burning on structures
   - Minimum respirator requirement: a half-mask, supplied-air respirator operated in a positive pressure mode

D. **Protective requirements** for *all* trigger tasks and any other task that may cause a lead exposure above the PEL include the following:

1. Respirators, protective equipment, and protective clothing

2. Clothing change areas and a shower
3. Initial blood tests for lead and zinc protoporphyrin
4. Basic lead hazard, respirator, and safety training
5. The establishment of a regulated area and warning signs as shown below:

WARNING

LEAD WORK AREA

—POISON—

NO SMOKING OR EATING

Note: The above protective requirements must be enforced until worker airborne exposures are shown to be below levels specified in **1532.1.**

E. **Blood lead monitoring** is especially important to evaluating work and hygiene practices that may result in lead ingestion. Employees whose blood lead levels exceed specified limits must be removed from the work that caused the lead exposures in excess of the action level. These workers must be provided with normal earnings, seniority, and other employee rights and benefits for 18 months or until the job from which they were removed is discontinued, whichever occurs first. ..... **1532.1(k)(2)**

F. **Feasible engineering and work practice controls** must be implemented to maintain employee exposures to lead below the PELs.

G. **A written compliance program** that details how lead exposures will be controlled is required. ..... **1532.1(e)**

H. On jobs at residential and public-access buildings, workers whose exposures to lead measure above the PELs and their supervisors must receive state-approved training and certification by the California Department of Health Services.

I. **Records** of air monitoring, blood lead testing, and medical removal must be maintained. ..... **1532.1(n)**

Lock-out/Block-out Procedures

Every year many employees are injured or lose their lives when the equipment they are repairing or maintaining is turned on by a co-worker or when potential energy is released while the employee is in harm's way of the equipment. To prevent such injuries SOs require that a lock-out/block-out procedure must be followed. GISO **3314** and ESO **2320.4** require that equipment be de-energized during cleaning, servicing, or adjusting operations as follows:

A. Machinery or equipment capable of movement shall be stopped, and the power source shall be de-energized or disengaged.

B. Moveable parts shall be mechanically blocked or locked out.

C. Employees shall be trained and made familiar with the safe use and maintenance of such tools.

D. Equipment that has lockable controls or that is readily adaptable to lockable controls shall be locked out or positively sealed in the *off* position.

E. Accident prevention signs or tags shall be placed on the controls of equipment, machines, and prime movers during repair work.

F. An energy control procedure shall be developed and used by the employer. **3314**

G. For heavy construction equipment repair, **1595(a)** requires that repairs must not be made until workers are protected from movement of the equipment or its parts.

Note: The *Lock-out/Block-out* booklet is available free of charge from Cal/OSHA.

Machine Guarding

Machine guarding is required on all moving machine parts when the operation of a machine or accidental contact with the parts could injure the operator or other workers. The following moving machine parts must be guarded:

- Gears, sprockets, and chain drives ..... **4075(a)**
- Belt and pulley drives ..... **4070(a)**
- Belt conveyor head and tail pulleys ..... **3999(b)**
- Screw conveyors ..... **3999(a)**
- Exposed shafts and shaft ends ... **4050(a), 4051(a)**
- Collars and couplings ..... **4050(a)**
- Hazardous revolving or reciprocating parts ..... **4002(a)**

Multi-employer Work Sites

Multi-employer work sites are work locations where more than one employer and his or her employees work, usually but not necessarily at the same time. Most construction sites are multi-employer work sites, and therefore more than one employer is responsible for safety at these work sites. Each employer is required to notify the other employers of hazards and to guard against exposing their own employees as well as all other employees on the site.

The four categories of employers who may be cited by Cal/OSHA for employee exposures to violative conditions are identified in **336.10.**

A. An **exposing employer** is an employer whose employees were exposed to the violative condition at the work site regardless of whether that employer created the violative condition.

B. A **creating employer** is an employer who actually created the violative condition.

C. A **controlling employer** is an employer who is responsible, by contract or through actual practice, for safety and health conditions at the work site and who has the authority to correct the violation.

D. A **correcting employer** is an employer who has the responsibility to correct the violative condition.

Personal Protective Equipment

When a hazard cannot be eliminated or controlled as required by *T8 CCR*, workers must be protected by personal protective equipment as follows:

A. **Eye and face protection** is required when there is an inherent risk of eye injury from flying particles, injurious chemicals, or harmful light rays. **3382**

B. **Foot protection** is required for workers who are exposed to foot injury from hot, corrosive, or injurious substances; from falling objects; or from crushing or penetrating actions. Foot protection is also required for employees who work in abnormally wet locations. **3385**

C. **Hand protection** is required for workers who are exposed to cuts, burns, electrical current, or harmful physical or chemical agents. ..... **1520, 2320.2(a)**

D. **Body protection** is required for workers who are exposed to injurious materials. These workers must wear appropriate body protection and clothing appropriate for their work. ..... **1522(a)**

   1. Loose clothing, such as sleeves, ties, and cuffs, may not be worn around machinery in which it could become entangled. ... **1522(b)**
   2. Workers must not wear clothing saturated with flammable liquids or corrosive or oxidizing agents. ..... **1522(c)**

E. **Hearing protection (HP)** is required because the noise levels of many construction operations frequently exceed 90 dBA. When employees are

subjected to sound levels listed in Table 3 **(5096[b]),** feasible administrative or engineering controls must be used. If these controls fail to reduce sound levels to an acceptable range, workers must wear hearing protection and be trained to properly use the HP devices.

Table 3

Allowable Exposure Levels to Sound

Sound level (dBA)	*Time per day (hours)*
90	8
95	4
100	2
105	1
110	1/2

F. **Head protection** is required for employees who are exposed to flying or falling objects or to electric shocks and burns. These employees must wear approved head protection. **Hair must be confined** if there is a risk of injury from entangling it in moving parts, combustibles, or toxic contaminants. ..... **3381(a)**

Note: Everyone at a construction site should wear hard hats with bills in the forward position.

G. **Respiratory protection** is required when engineering or operational controls are not feasible for limiting harmful exposure to airborne contaminants. In these circumstances exposed employees must wear respirators approved by the

Mine Safety and Health Administration (MSHA) or by the National Institute for Occupational Safety and Health (NIOSH). .... **5144(a)**

For all respirator use a written respiratory protection program must be in place, covering employee training, respirator selection, medical evaluation, fit testing, use, cleaning, sanitizing, inspection, and maintenance. ..... **5144(a), (c)**

Note: The health and safety fact sheet "New Respirator Regulation" and the *Cal/OSHA Guide to Respiratory Protection at Work* are available free of charge from Cal/OSHA.

H. Some of the SOs require **specialized personal protective equipment** (PPE) not mentioned here. Workers should refer to the specific SOs applicable to their work to determine additional PPE requirements.

Pile Driving

Regulations concerning pile driving are as follows:

A. The hammer must be safely supported while work is being performed below it. ..... **1600(a)**

B. Pressure hoses of steam or air connected to the hammer must be secured by chain or wire rope. ..... **1600(b)**

C. Guardrailed or roped work platforms must be provided when employees are working aloft. ..... **1600(d)**

D. Fixed leads must be provided with ladders and rings or similar attachment points for use with an appropriate fall protection system. .... **1600(f)**

E. Fall protection must be provided when workers are exposed to unguarded platforms or walkways exceeding 7 ½ ft. in height. ..... **1670(a)**

F. Walkways that are at least 20 in. wide must be provided for access to all work areas. .... **1600(i)**

G. Workers are prohibited from riding the hammer. ..... **1600(h)**

H. A driving head or a bonnet is required except when driving sheet piling. ..... **1600(j)**

I. Adequate and accessible flotation gear (a boat, raft, or pontoon) must be provided to protect workers who are exposed to a drowning hazard. ..... **1600(k)**

J. The crew must use standard hand signals, and only the loftsman may control the lowering of the hammer. ..... **1600(m)**

K. A hammer stop block is required. ..... **1600(q)**

L. Two steam (or air) shutoff valves are required; one must be a quick-acting valve within reach of the hammer operator. ..... **1600(s)**

M. Rigs must be stabilized with guys or outriggers when needed. ..... **1600(t)**

Note: For regulations that govern the unloading of piles, refer to CSO **1601**.

Qualified Person

A qualified person is a person designated by the employer; and who by reason of training, experience, or instruction has demonstrated the ability to perform safely all assigned duties; and, when required, is properly licensed in accordance with federal, state, or local laws and regulations. **1504**

Ramps and Runways

Regulations concerning ramps and runways are as follows:

A. **General requirements**

1. Ramps must be properly designed to provide a safe means of access for foot or vehicle traffic. **1623–1625**
2. Open sides of ramps that are 7 1/2 ft. or more above ground must have standard guardrails. ..... **1621(a)**

B. **Foot ramps**

1. Foot ramps must be at least 20 in. wide and must be secured and supported to avoid deflection or springing action. ..... **1624(a)**
2. If the ramp slope exceeds 2 ft. of rise for every 10 ft. of run, cleats must be 8 in. or more in length and must be placed not more than 16 in. apart. **1624**

C. **Wheelbarrow ramps and runways**

1. Wheelbarrow ramps and runways must be firmly secured against displacement. ..... **1624(c)**

2. Ramps more than 3 ft. high must be 30 in. wide, and planks must be firmly cleated together. **1623**
3. Falsework design loads must be increased by 10 psf for worker-propelled carts. ..... **1717(a)**

Roofing Operations

Work conditions at roofing projects are often difficult and harsh and continuously expose workers to serious hazards. In California one of the most common causes of work-related deaths is falls from roofs. Injuries common to the roofing industry include (1) broken bones because of falls; (2) back injuries because of awkward postures and heavy lifting; and (3) burns from contact with hot roofing asphalt and associated equipment.

Roofing operations are classified as either single-unit or multi-unit. Examples of single-unit (monolithic) roofing are built-up roofing, flat-seam metal roofing, and vinyl roofing. Examples of multi-unit roofing are asphalt shingles, cement, clay and slate tile, standing seam metal panels, shingle metal roofing, and wood shingles.

The following regulations aim to minimize or eliminate the hazards associated with the roofing industry:

A. Work on roofs higher than 20 ft. or work involving equipment that the operator must pull backward, regardless of roof height, requires one or a combination of the following to reduce the fall hazard: ..... **1730(b)(1)**

1. For single-unit roofs with slopes of 0:12 through 4:12
   a) Warning lines and headers
   b) Personal fall protection systems per **1724(f)**
   c) Catch platforms with guardrails
   d) Scaffold platforms
   e) Eave barriers
   f) Parapets that are 24 in. or higher
   g) Standard railings and toeboards ... **1730(b)**
2. For single-unit roofs with slopes exceeding 4:12
   a) Parapets that are 24 in. or higher
   b) Personal fall protection systems per **1724(f)**
   c) Catch platforms
   d) Scaffold platforms
   e) Eave barriers
   f) Standard railings and toeboards ... **1730(c)**

Note: Provisions in **1730(c)** do not apply at job sites where motorized equipment on which the operator rides has been designed for use on roofs having slopes greater than 4:12 and is used where a parapet is at least 36 in. high at roof edges that are perpendicular to the direction in which the equipment is moving. ..... **1730(c)**

3. For multi-unit roofs
   a) Parapets that are at least 24 in. high
   b) Personal fall protection systems per **1724(f)**

c) Catch platforms
d) Scaffold platforms
e) Eave barriers
f) Roof jack systems (Safety lines are required when using roof jack systems on roofs steeper than 7:12.) ..... **1730(e), (f)**

Note: On a roof with a slope exceeding 4:12, do not use equipment that must be pulled backward by an operator. ..... **1730(d)**

B. **Hot operations** are subject to the following regulations:

1. Workers must not carry buckets containing hot material up ladders. ..... **1725(a)**
2. An attendant must be stationed within 100 ft. of any kettle not equipped with a thermostat. ..... **1725(d)**
3. Liquefied petroleum gas cylinders must not be located where the burner will increase the temperature of the cylinder. ..... **1725(g)**
4. A Class BC fire extinguisher shall be kept near each kettle in use as shown below:
   a) For a kettle with a capacity of less than 150 gal. = 8:BC
   b) For a kettle with a capacity of 150 gal. to 350 gal. = 16:BC
   c) For a kettle with a capacity of more than 350 gal. = 20:BC ..... **1726(d)**
5. The fuel tanks of compressed-air-fueled kettles must be equipped with a relief valve set for a pressure not to exceed 60 psi. ..... **1726(c)**

6. Coal tar pitch operations are subject to the following requirements:
   a) Workers must use skin protection. ..... **1728(a)**
   b) Washing or cleansing facilities must be available. ..... **1728(c)**
   c) Workers must use respirators and eye protection in confined spaces that are not adequately ventilated. ..... **1728(b), 5158**
7. Hot pitch and asphalt buckets have the following maximum capacities:
   a) Carry buckets = 6 gal.
   b) Mop buckets = 9 ½ gal. .... **1729(a)(2), (4)**

C. **Personal fall protection** for roofing operations is regulated as follows: ..... **1724(f)**

1. Personal fall arrest systems, personal fall restraint systems, and positioning devices must be installed and used in accordance with Article 24 in the GISO. ..... **1724(f)**
2. Safety lines must be securely attached to substantial anchorages on the roof. ... **1724(f)**
3. Roof openings must be guardrailed or covered. The cover must be substantial, securely fastened, and able to withstand the load of workers and material.
4. Covers must bear a sign stating—OPENING—DO NOT REMOVE. ..... **1632(b), (e)**

Note: Roof openings that include finished skylights must be covered or guarded, or workers must use personal fall protection. ..... **3212(e)**

Scaffolds

Work activities associated with scaffolds are subject to many hazards; however, falls are by far the number-one cause of injury or death among construction workers. The following requirements regulate the design, erection, dismantling, and use of scaffolds:

A. **General requirements**

1. Scaffolds must be provided for work that cannot be done safely by employees standing on ladders or on solid construction that is at least 20 in. wide. ..... **1637(a)**
2. The design of scaffolds must conform to design standards, or scaffolds must be designed by a licensed engineer. Standards are based on stress grade lumber. Metal or aluminum may be substituted if the structural integrity of the scaffold is maintained. ..... **1637(b)**
3. The erecting and dismantling of scaffolds are regulated as follows:
   a) Scaffold erection and dismantlement must be supervised by a qualified person. ..... **1637(k)(1)**
   b) Scaffolds must be erected and dismantled according to design standards, engineered specifications, or manufacturer's instructions. ..... **3328, 1637(k)**
   c) A DOSH permit is required for erecting and dismantling scaffolds that exceed three stories or 36 ft. in height. ..... **341(a)(2)**

4. Scaffold access: Ladders, horizontal members, and stairways must provide safe and unobstructed access to all platforms. The equipment must be located so that its use will not disturb the stability of the scaffold: ..... **1637(n)(1)**

   a) Ladders may be used if the following applies:

      (1) Ladder use must comply with Article 25 in the CSOs.

      (2) Ladders must be securely attached to scaffolds.

      (3) Ladders must extend 3 ft. above the platform, or handholds must be provided. ..... **1675(i)**

   b) Horizontal members built into the end frame of a scaffold may be used to access platforms if the following applies:

      (1) The horizontal members are parallel and level.

      (2) The horizontal members make a continuous ladder, bottom to top, with the ladder sides of the frames in a vertical line.

      (3) The horizontal members provide sufficient clearance for a good handhold and foot space. ..... **1637(n), 1644(a)**

   c) Stairways must conform to the following:

      (1) Permanent stairways must comply with GISO requirements. ... **1637(n)(2)**

(2) Prefabricated scaffold stairs must comply with ANSI 10.8-1988. ..... **1637(n)(2)**

5. Scaffolds must be secured as follows:
   a) Scaffolds must be tied off with a double-looped No. 12 iron wire or a single-looped No. 10 iron wire or the equivalent. A compression member should prevent scaffold movement toward the structure. **1640, 1641, 1644**
   b) Light-trade wooden pole scaffolds must be tied off every 20 ft. horizontally and vertically. ..... **1640(b)**
   c) Heavy-trade wooden pole scaffolds must be tied off every 15 ft. horizontally and vertically. ..... **1641(f)**
   d) Metal scaffolds must be tied off as specified in **1644(a)(5).** ..... **1644(a)(5)**
6. Scaffold platforms must conform to the following:
   a) Platforms must be capable of supporting the intended load. ... **1644(a)(1), 1637(m)**
   b) Platforms must be planked solid (without gaps) and cover the entire space between scaffold uprights. ..... **1640(b), 1641(g), 1644(a), 1646(e)**

Exception:
In solid planking the following gaps are permissible:

A. The opening under the back railing
   1. Wood scaffolds: 8 in. (max.) horizontal ..... **1640(b)(5)**
   2. Metal scaffolds: 10 in. (max.) horizontal ..... **1644(a)(7)**

B. Space between the building (structure) and the platform
   1. Wood scaffolds: 14 in. (max.) ..... **1640(b)(5)**
   2. Metal scaffolds: 16 in. (max.) ..... **1644(a)(7)**
   3. Bricklayers scaffolds: 7 in. (max.) to finished face of building ..... **1641(g)(2)**

c) Platform minimum widths are as follows:
   (1) Light trades: 20 in. ..... **1640(b)(5)**
   (2) Heavy trades: 4 ft. ..... **1641(c)**

d) Platform slope must not exceed 2 ft. vertically to 10 ft. horizontally. .. **1637(o)**

e) Overhead protection is required when people are working overhead. .... **1637(q)**

f) Slippery platform conditions are prohibited. ..... **1637(p)**

7. Planking must conform as follows:
   a) Planking must be made of *scaffold grade* lumber with a nominal dimension of 2" x 10". ..... **1637(f)(1)**
   b) Planking shall not exceed a maximum span as follows:

(1) Light trades @ 25 psf = 10 ft.

(2) Medium trades @ 50 psf = 8 ft.

(3) Heavy trades @ 75 psf = 7 ft.

c) Planking shall overhang the ledger or support as follows:

(1) A minimum of 6 in. .. **1640(b), 1645(b)**

(2) A maximum of 18 in. ..... **1637(g), 1645(b)**

d) A single plank is permitted only on platforms up to 4 ft. high. ..... **1640(b)(5)(A)**

8. Guardrailings must be installed on open sides and ends of platforms that are 7 ½ ft. or higher. ..... **1621(a)**

Exception: ..... **1644(a)(6)(A), (B)**

A. X-braces that substitute for a midrail must intersect 20 in. to 36 in. above the platform.

B. X-braces that substitute for a top rail must intersect 42 in. to 48 in. above the platform, and a midrail must be placed at 19 in. to 25 in. above the platform.

9. Toeboards are required on all railed sides of work surfaces where employees work or pass below. ..... **1621(b)**

10. Height limits for scaffolding are as follows:

a) Wood (frame/post) = 60 ft. **1643**

b) Tube and coupler = 125 ft. ..... **1644(b)(4)**

c) Tubular (welded) = 125 ft. ..... **1644(c)(7)**

d) Horse (single) = l0 ft. ..... **1647(b)(2)**

e) Horse (tiered) = 10 ft. ..... **1647(b)(2)**

Exception: These limits do not apply when the scaffolding is designed by an engineer (Ca PE).

11. Prohibited scaffolds and supports are noted below: ..... **1637(j)**
    a) Shore scaffolds
    b) Jack scaffolds
    c) Lean-to scaffolds
    d) Stilts
    e) Nailed brackets
    f) Brick or blocks
    g) Loose tile
    h) Unstable objects

B. **Scaffold-specific requirements**

The requirements listed below are unique to each type of scaffold listed, and they replace or augment the general requirements.

1. Tubular welded scaffold systems

   These scaffold systems are commercially fabricated and must meet the following requirements:

   a) Frames must nest with coupling or stacking pins to provide proper vertical alignment. ..... **1644(c)(5)**
   b) Frame panels must be vertically pinned if uplift may occur. ..... **1644(c)(6)**

2. Tower and rolling scaffolds

   The specifications for tower and rolling scaffolds are as follows:

   a) The "height-to-base" must not exceed 3:1 unless the scaffold is secured. .... **1646(a)**

b) The following conditions must exist if employees ride on a rolling scaffold:

(1) The minimum dimension of the scaffold base, when the scaffold is ready for rolling, is at least half of the height. If outriggers are used to meet this requirement, they must be installed on both sides of the staging.

(2) The floor or surface is within 3º of level and free from pits, holes, or obstructions.

(3) A rolling scaffold less than 50 ft. high must be equipped with rubber wheels or similarly resilient tires. Metal wheels may be used for towers 50 ft. or higher. ..... **1646(f)**

c) A screw jack must extend 1/3 of its length into the leg tube, and the exposed thread must not exceed 12 in. ..... **1646(b)(2)**

d) Two wheels, or casters, must swivel; all four must lock. ..... **1646(c)**

e) A fully planked platform is required. ..... **1646(e)**

f) All frame and center joints shall be locked together by lock pins, bolts, or equivalent fastenings. ..... **1646(d)**

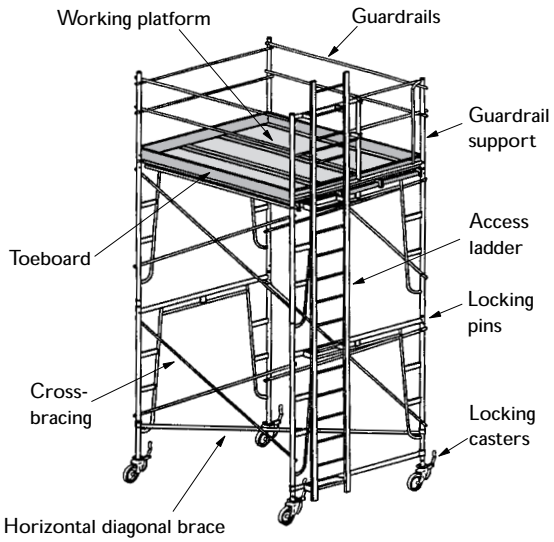
g) The scaffold must have horizontal diagonal bracing (see Illustration 9). ..... **1646(b)**

h) Railings are required if the platform is 7 ½ ft. or more above grade. ..... **1646(b)**

3. General requirements for suspended scaffolds (swing staging) ..... **(1658)**

Illustration 9

Tower and Rolling Scaffold



Most suspended scaffolding has a two-point suspension supported by hangers or stirrups. The following applies:

a) Each wire is suspended from a separate outrigger beam or thrustout. ..... **1658(k)**

b) Multi-stage units or units with overhead protection must be equipped with additional suspension lines to support the scaffolding in case the primary suspension system fails. ..... **1658(u)**

c) The scaffold must be inspected daily and tested frequently. ..... **1658(g)**

d) All hoisting mechanisms and metal platforms must meet nationally recognized standards. ..... **1658(a)**

e) Outrigger beams must be secured in a saddle and anchored at one end to solid structure. The inboard end must be tied back. ..... **1658(j)**

f) The beam must be capable of supporting four times the intended load. .. **1658(j)(1)**

g) Use of a ladder as a platform is prohibited even if a horizontal work surface is added. ..... **1658(d)**

h) The load limit is one person per suspension rope. ..... **1660(a)**

i) An insulated wire suspension rope is required when workers are welding, sandblasting, or using acid or corrosive solutions. ..... **1658(f)**

j) A separate safety harness and lifeline are required for each worker. ..... **1658(i), 1660(g)**

k) Platform dimensions must be as follows:

(1) Width = 14 in. to 36 in. ..... **1660(d)**
= 24 in. to 36 in. if the platform is used by cement masons ..... **1661(b)**

(2) Span = 10 ft. (2" x 10" planks) ..... **1660(e)**
= 12 ft. (2" x 12" planks) ..... **1660(e)**

(3) Bolster (ledger) = 2" x 4" cross section ..... **1660(c)**

4. Specific requirements for suspended scaffolds

   a) Powered suspended scaffolds **1667**

      The general rules for swing scaffolds apply *except* as listed below:

      (1) The minimum platform width must be 20 in. ..... **1667(d)**

      (2) Railings are required on open sides and ends and on all sides if the scaffold is suspended by one rope. ..... **1667(a)**

      (3) The load limit is 425 lbs. for a ladder-type platform. ..... **1667(b)**

      (4) Controls must be of the dead-man type.

      (5) Load release units for fast descent are prohibited. ..... **1667(f)(1)**

   b) Interior hung suspended scaffolds ... **1665**

      These scaffolds are of a wood- or steel-tube-and-coupler type, and they are suspended from a ceiling or roof structure. The general and suspended scaffold rules apply.

Exception:

A. Suspension ropes must be wrapped twice around supporting members and ledgers. ..... **1665(b)**

B. Ends of wire rope must be secured with at least three clips.

c) Float suspended scaffolds **1663**

These scaffolds are intended for such work as welding, riveting, and bolting. ..... **1663(a)**

(1) Platform size: 3 ft. x 6 ft. x ¾ in. plywood ..... **1663(a)(1)**

(2) Rope: 1-in. diameter manila (min.) ..... **1663(a)(4)**

(3) Load limit: three people ..... **1663(a)**

(4) Personal fall protection and a separate lifeline: required for each person ..... **1663(a)(5)**

d) Boatswain's chair **1662**

The use of a boatswain's chair requires training or experience. ..... **1662(a)**

(1) Platform size: 10 in. x 24 in. x 2 in. ..... **1662(i)**

(2) Rope: 5/8-in. diameter manila (min.) and 3/8-in. diameter protected wire for welding ..... **1662(j), (k)**

(3) Personal fall protection and a separate lifeline: required ..... **1662(c)**

(4) Area below: barricaded ..... **1662(b)**

e) Needle beam scaffolds **1664**

The specifications for needle beam scaffolds are as follows:

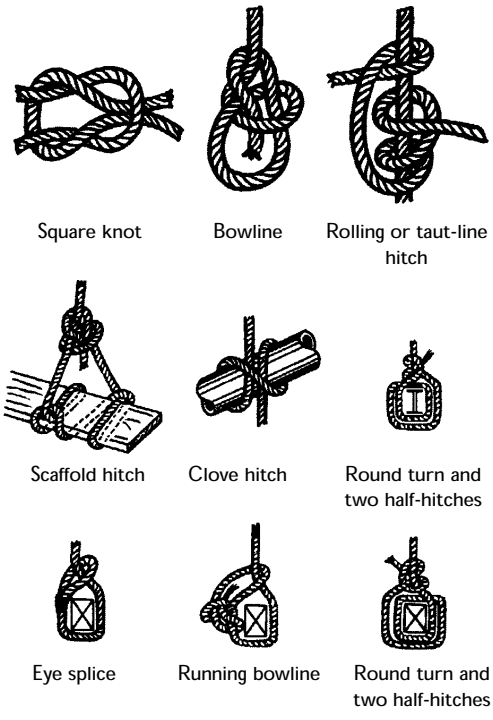
(1) Beam size: 4 in. x 6 in. x 10 ft. ..... **1664(a)(1)**

(2) Rope: 1 1/4-in. diameter manila ..... **1664(a)(4)**

(3) Personal fall protection: required in accordance with Article 24 in the CSOs ..... **1664(a)(12**

Note: See the hitches for holding needle beams in Illustration 10.

Illustration 10
Hitches for Holding Needle Beams



f) Outrigger scaffolds **1645**
Outrigger scaffolds are regulated as follows:

(1) Brackets or beams must be anchored or braced against turning, twisting, or tipping. ..... **1645(a)(1)**

(2) Platform: at least two 2 in. x 10 in. planks. ..... **1645(a)(2), 1645(b)(5)**

(3) Beam size: 3 in. x 12 in. (min.). ..... **1645(a)(2)**

(4) Beam length: Outboard of fulcrum must not exceed 6 ft.; inboard must be 1 ½ times the outboard section. ..... **1645(a)(1)**

Note: For multi-level structures the units must be designed by an engineer (Ca PE). ..... **1645(a)(3)**

g) Bracket scaffolds (light trades)..... **1645**
Brackets must be bolted through walls, welded to tanks, properly secured to metal studs, or hooked over a supporting member. ..... **1645(d)**

(1) Platform: 20 in. x 10 ft. (min.)

(2) Load limit: carpenter's type = two workers and 75 lbs. of equipment ..... **1645(e)(4)**

h) Horse scaffolds **1647**
The specifications for horse scaffolds are as follows:

(1) Platform width:

(a) Light trades = 20 in. (min.); 10 in. if the platform is less than 4 ft. high

(b) Heavy trades = 4 ft. (min.) ..... **1647(e)(2)**

(2) Width of base legs = 1/2 x height (min.) ..... **1647(a)(3)**

(3) Height:

(a) Collapsible horse = 6 ft. (max.) ..... **1647(d)(2)**

(b) Single horse = 10 ft. (max.) ..... **1647(e)(1)**

(c) Two tiers (max.) = 10 ft. (max.) ..... **1647(e)(1)**

i) Ladder jack scaffolds **1648**

The specifications for ladder jack scaffold platforms are as follows:

(1) Span = 16 ft. (max.) ..... **1648(b)**

(2) Height = 16 ft. (max.) ..... **1648(a)**

(3) Width = 14 in. (min.) ..... **1648(b)**

(4) Load = two workers (max.) .. **1648(a)**

Note:

A. Ladders must be commercial grade. ..... **1648(d)**

B. A safety line is required for each worker. ..... **1648(c)**

j) Window jack scaffolds **1654**

The specifications for window jack scaffolds are as follows:

(1) Only one window per scaffold is permitted. ..... **1654(d)**

(2) The load limit is one person per scaffold. ..... **1654(d)**

(3) Fall protection or railings are required. ..... **1654(c)**

Silica Dust

Construction work that involves exposure to airborne sand and rock dust can expose employees to crystalline silica. Exposure to crystalline silica has been shown to cause silicosis, a lung disease. Although most cases of silicosis develop after years of exposure, instances of extremely high exposure have resulted in illness and even death in a matter of weeks. Hazardous activities include abrasive blasting with sand and loading, dumping, chipping, hammering, cutting, and drilling of rock, sand, or concrete.

Airborne permissible exposure limits (PELs) are established for several different forms of crystalline silica. These limits range from 0.05 to 0.1 mg/m^3 of respirable dust, expressed as an 8-hour TWA (see Table AC-1 of **5155**).

Generally during work on materials, such as rock or concrete, that contain a significant amount of silica (20% or greater), continuous exposure to a visible cloud of dust will probably result in levels of exposure that exceed the PELs. However, in some cases the PELs can be exceeded even when there is no visible cloud of dust. Before beginning work that could expose employees to crystalline silica, employers must comply with the following requirements:

A. Employers must measure and control employees' exposure to airborne contaminants. ..... **5155(c), (e)**

B. Employers must train employees in the hazards of crystalline silica exposure and the measures to control risk, including proper use of respirators when required. **5144, 5194**

C. Operations in which employees may be repeatedly exposed to rock dust or sand should be evaluated by a qualified industrial hygienist. Assistance can be obtained from the Cal/OSHA Consultation Service.

Stairways

Stairways are an acceptable method for gaining access to floors and working levels of buildings and scaffolds. They must be installed as follows:

A. In buildings of up to three stories or 36 ft. in height, at least one stairway is required. ..... **1629(a)(4)**

B. In buildings of more than three stories or 36 ft. in height, two or more stairways are required. ..... **1629(a)(4)**

C. A stairway to a second or higher floor must be installed before studs are raised to support the next higher floor. ..... **1629(b)(1)(A)**

D. In steel frame buildings, a stairway must be installed leading up to each planked floor. ..... **1629(b)(2)**

E. In concrete buildings, a stairway must be installed to the floor that supports the vertical shoring system. ..... **1629(b)(3)**

Note: In addition to the stairway required, buildings 60 ft. or more in height or 48 ft. below ground level require an elevator. ..... **1630(a)**

F. Stairs must be at least 24 in. wide and equipped with treads and handrails. ..... **1629(a)(2)**

G. Handrails must be 30 in. to 34 in. above the tread nosing and not less than 2" x 4" or equivalent. The uprights supporting the railing must be not less than 2" x 4" at 8 ft. o.c. ..... **1626(a)**

H. Railings and toeboards must be installed around stairwells. ..... **1626(b)**

I. Landings for temporary stairways must be located at every floor or level, and at least one landing must be installed for every 12 ft. of vertical rise. ..... **1629(a)(2)**

J. Landings for temporary stairways must be at least 30 in. wide. ..... **1629(a)(2)**

K. Stair steps must be illuminated (with at least 5-ft. candles of light) and all lamps must be guarded. ..... **1626(c)**

Toeboards

Regulations concerning toeboards include the following:

A. Toeboards must be provided on all open sides and ends of railed scaffolds at locations where persons are required to work or to pass under the scaffold and at all interior floor, roof, and shaft openings. ..... **1621(b)**

B. **Specifications** for toeboards are as follows:

1. A toeboard must be securely fastened at a minimum of 4 in. (nominal) in height from its top edge to the level of the floor, platform, runway, or ramp. A toeboard must have not more than a $^1/_4$-in. clearance above the floor level. It may be made of any substantial material, either solid, or with openings not more than 1 in. in greatest dimension. ..... **1621(b)**
2. Where material is piled to such a height that a standard toeboard does not provide protection, paneling or screening from floor to intermediate rail or top rail shall be provided. ..... **1621(c)**

Toilets/Sanitation

Regulations concerning toilets and sanitation include the following:

A. Toilet facilities are required at the job site. ..... **1526(b)**

B. A toilet is required for each 20 employees or fraction thereof of each sex; urinals may be substituted for half of the units. ..... **1526(a)**

> *Exception:* Sites with fewer than five employees are not required to provide separate toilets for each sex; however, toilets must be lockable from the inside. ..... **1526(a)**

C. Toilets must be kept clean and supplied with toilet paper. ..... **1526(d)**

D. Toilets are not required for mobile crews if transportation to nearby toilets is available. ..... **1526(e)**

E. Adequate washing facilities must be provided when employees are engaged in operations involving harmful contaminants, paints, or coatings. ..... **1527(a)**

F. An adequate supply of potable (drinkable) water must be provided at each job site. ..... **1524(a)(1)**

Tools

Tools must be kept clean and in good repair. **1699**

Only trained or experienced employees may operate tools, machines, or equipment. ..... **1510(b)**

A. **Power-operated tools** must be grounded or of the double-insulated type. They should be kept out of wet locations. **2395.45**

B. **Guards** required by the SOs must not be removed or deactivated. **3942**

C. **Control switches (powered hand tools)** are subject to the regulations noted below:

1. The following tools must be equipped with a constant-contact (dead-man) on-off switch: ..... **3557(a)**
   a) Drills
   b) Tappers
   c) Fastener drivers
   d) Grinders
   e) Disc and belt sanders

f) Reciprocating saws
g) Circular saws
h) Chain saws
i) Concrete vibrators
j) Concrete breakers
k) Concrete trowels
l) Powered tampers
m) Jack hammers
n) Rock drills
o) Tools similar to those above

2. Hoisting or lowering electric tools by their cords is prohibited. ..... **1707(a)**

D. **Powder-actuated tools (PAT)** must meet the ANSI A10.3 1977 standard or have a California approval number. ..... **1684(a)(1), (2)**

1. Only trained workers holding a valid operator's card may use a PAT. ... **1685(a)(1)**
2. Containers must be lockable and bear a label that says POWDER-ACTUATED TOOL on the outside.

   The storage container must be kept under lock and key. ..... **1687(a)**
3. The PAT must be provided with the following:
   a) An operating and service manual
   b) A power load and fastener chart
   c) An inspection and service record
   d) Repair and servicing tools ..... **1687(b)**

4. Limitations on the use of PATs are as follows:
   a) Workers must not leave the tool unattended. ..... **1690(b)**
   b) Workers must not use the tool:
      (1) In an explosive environment ... **1690(a)**
      (2) On hard or brittle material ..... **1690(c)**
      (3) On unbacked, thin, or soft material ..... **1690(d)**
      (4) Within a ½ in. of the edge of steel ..... **1690(e)**
      (5) Within 3 in. of the edge of masonry ..... **1690(f)**
      (6) On thin concrete ..... **1690(g)**
      (7) On spalled areas ..... **1690(h)**
      (8) On existing holes ..... **1690(i)**
5. Requirements for operating PATs are as noted:
   a) Eye or face protection is required for operators and assistants. ..... **1691(b)**
   b) Operators must inspect the tool before using it. ..... **1691(c)**
   c) Defective tools must not be used. ..... **1691(d)**
   d) Tools must not be loaded until ready for use. ..... **1691(g)**
   e) Tools must be unloaded if work is interrupted. ..... **1691 (h)**
   f) Operators must never point a loaded tool or an empty tool at anyone. ..... **1691(i)**
   g) The tool must be held in place for 30 seconds on misfire. ..... **1691(l)**

h) Different power loads must be kept in separate compartments. ..... **1691(m)**

i) Warning signs that say POWDER-ACTUATED TOOLS IN USE must be conspicuously displayed within 50 ft. of a PAT operation. ..... **1691(n)**

j) Misfires and skipped power charges must be stored and disposed of properly. ..... **1689(c), 1691(a)**

E. **Concrete-finishing tools** must be equipped with a dead-man-type control. ..... **1698(d)**

F. **Airless spray guns** must have an automatic- or visible manual-release safety device or a diffuser nut and tip guard. ..... **3559.1(a)**

G. **Portable circular power saws** are regulated as follows:

1. Teeth on the upper half of the saw blade must be permanently guarded. ..... **4307(a)**
2. Teeth on the lower half of the saw blade must be guarded with a telescopic or hinged guard. ..... **4307(b)**
3. Saw guards must not be blocked open to prevent guards from functioning. ..... **4307(c)**

H. **Miter (chop) saws** are regulated as follows: **4307.1**

1. With the carriage in the full cut position, a guard must enclose the upper half of the blade and at least 50 percent of the arbor end. ..... **4307.1(a)**
2. With the carriage in the full retract (raised) position, lower blade teeth must be fully

guarded, and the guard must extend at least 3/4 in. beyond the teeth. ..... **4307.1(b)**

3. Employers shall instruct employees to keep hands and fingers outside the area below the blade until the blade has come to a complete stop. ..... **4307.1(c)**

I. **Radial arm (horizontal pull) saws** are regulated as follows:

1. The upper half of the saw blade and arbor ends must be completely covered. .. **4309(a)**
2. An anti-kickback device must be used during ripping operations. ..... **4309(c)**
3. Saws must return automatically to the table's back when released. ..... **4309(d)**
4. Saws must have a stop provided to prevent the saw blade from passing the front edge of the table. ..... **4309(b)**

J. **Table saws** are regulated as follows:

1. A hood must cover the saw to at least the depth of the teeth. ..... **4300(a)**
2. Table saws must be equipped with an anti-kickback device during ripping operations. ..... **4300(d)**

Note: The arbor speed of circular saw blades shall not exceed speeds recommended by the manufacturer.

K. **Band saws** are regulated as follows:

1. All portions of the band saw blade must be guarded except between the guide rolls and the table. ..... **4310(a)(1)**

2. Band saw wheels must be enclosed. ..... **4310(a)(2)**

L. **Chain saws** are regulated as follows:

1. Chain saws must be equipped with a constant-pressure control that returns the saw to idling speed when released. .... **3425(a)(2)**
2. Chain saws must have a clutch adjusted to prevent the chain drive from engaging at idling speed. ..... **3425(a)(3)**

M. **Pneumatic tools** are regulated as follows:

1. Safety clips are required on pneumatic tools to prevent dies from being accidentally expelled from the barrel. ..... **3559(a)**
2. Pneumatic nailers and staplers that operate at more than 100 psi of pressure must have a safety device that prevents the tool from operating when the muzzle is not in contact with the surface. ..... **3559(c), 1704(a)**
3. Pneumatic nailers and staplers must be disconnected from the air supply when not in use. ..... **1704(b)**
4. The air hose of a tool must be secured at roof level to provide ample but not excessive amounts of hose when an operator works on a roof of 3:12 pitch or steeper. ..... **1704(d)**
5. An operator must wear fall protection when using pneumatic tools on roofs of 4:12 pitch and steeper.
6. All tools with air hoses having diameters larger than a 1/2 in. must have a pressure reduction safety device at the source of compressed air. ..... **1704(c)**

7. Jack hammer operators must wear personal protective equipment when required, including foot protection and hearing protection when noise levels exceed allowable exposure levels (see pages 105–6). ..... **3385, 5096(a)**

Traffic Control

Regulations concerning traffic control are noted below:

A. Where hazards to workers exist because of vehicular traffic, traffic controls must be used in accordance with the *Manual of Traffic Controls for Construction and Maintenance Work Zones,* published in 1996 by Caltrans. Additional controls, such as detours, warning signs, or barricades, may be used. ..... **1598(a)**

B. Workers who are on foot and exposed to vehicular traffic must wear orange or strong yellow-green warning garments, such as vests, jackets, shirts, or rainwear. ..... **1598(c)**

C. Flaggers are required when the controls cited above are inadequate (see pages 76–77). ..... **1599(a)**

Training

Each year several serious and fatal accidents are caused by inadequately trained employees, including employees who are newly hired, employees with newly assigned duties, and employees who are using tools and equipment with which they are unfamiliar. For this reason employers must assess the skill level of their employees and provide training

accordingly. Selected regulatory requirements for training are listed below. Workers must be trained in safe work practices and in the hazards and safety precautions applicable to the job:

- When they are first hired ..... **1510(a), 3203(a)**
- When they will operate machinery and equipment (see the "Qualified Person" section on page 109)
- When they are given a new job assignment for which they have not previously received training ..... **3202(a)**
- When they are exposed to known job-site hazards, such as poisons, hazardous materials and gases, toxic plants and animals, etc. ..... **1510(c)**
- Whenever new substances, processes, procedures, or equipment are introduced to the workplace and represent a new hazard
- Whenever the employer is made aware of a new or previously unrecognized hazard
- Whenever supervisors need to familiarize themselves with the safety and health hazards to which employees under their immediate direction and control may be exposed
- During tailgate or toolbox safety meetings, which should be held at least every ten working days ..... **1509(e)**

Exception: For tunneling operations tailgate meetings must be held weekly. ..... **8406(e)**

Note: Some SOs have additional training requirements not listed here.

Tunnels and Tunneling

Employees working on tunneling operations are exposed to numerous hazards, including (1) tunnel collapses; (2) hazardous atmospheres; and (3) explosive atmospheres. When employees work in tunnels and in underground chambers of any depth and in shafts exceeding 20 ft. in depth, the following operations are subject to the TSOs:

- Pipejacking and boring
- Microtunneling
- Mechanized tunneling
- Drill and blast work
- Excavation
- Ground support work
- Repair and maintenance
- Tunnel renovations

The Mining and Tunneling (M&T) Unit of Cal/OSHA enforces these safety orders, which include:

A. **Classifications:** The M&T Unit is required to classify the gas hazards of each tunnel. These classifications are (1) non-gassy; (2) potentially gassy; (3) gassy; and (4) extra hazardous. ..... **8422 (a), (b)**

> *Note:* The request for classification must be sent to the nearest M&T Unit office.

B. **Pre-job safety conference:** Before underground excavation may begin, the M&T Unit must conduct an on-site, pre-job safety conference with the project owner, the general contractor, the

tunnel contractor, and the tunnel contractor's employees. The goal of the conference is to ensure that all of the employees are aware of the conditions under which the tunnel will be driven and that all of the safety issues are discussed and problems resolved. **8408**

C. **Certified persons:** Cal/OSHA requires the persons performing the duties of gas tester or safety representative to be certified by passing a written and an oral examination administered by the M&T Unit. ..... **8406(f), (h)**

1. A gas tester is required for the following operations:
   a) All classifications other than non-gassy
   b) Projects during which diesel equipment is used underground
   c) Hazardous underground gas conditions **8470**
2. A safety representative must direct the required safety and health program and must be on-site while employees are engaged in operations during which the TSOs apply. ..... **8406(f)**

   The safety representative must have knowledge in underground safety, must be able to recognize hazards, and must have the authority to correct unsafe conditions and procedures subject to the TSOs. ..... **8406(f)**

D. **Diesel engines:** Diesel engines are the only type of internal combustion engine acceptable for use during tunneling operations, provided that the following requirements are met:

1. Cal/OSHA must issue a permit for engine operation.
2. Conditions of the permit must be observed.
3. Ventilation and fresh air flow must meet the required minimum standards.
4. Air concentrations of nitrogen dioxide, carbon monoxide, and carbon dioxide in the tunnel must be determined at least once during each shift at the peak of diesel operation and kept at or below the PELs.
5. A written record must be kept of the above readings.
6. PELs of the above air contaminants or any other contaminants must not be exceeded.
7. A certified gas tester must conduct the testing (see additional requirements in **8470**).
8. An approved exhaust purifier must be installed and maintained (see the requirements in **8470**).

E. **Licensed blasters:** All blasting at tunnel sites shall be carried out or directed by California licensed blasters as required by **TSO 8560.**

Welding, Cutting, and Heating (Hot Work)

Each year numerous deaths from explosions, electrocutions, asphyxiation, falls, and crushing injuries are associated with welding activities. These deaths often involve confined or restricted spaces. In addition, numerous health hazards are associated with exposure to fumes, gases, and ionizing radiation formed or released during welding,

cutting, and brazing, including heavy metal poisoning, lung cancer, metal fume fever, flash burns, and welders flash (burn to the eyes).

A. Before workers begin a welding operation, the following controls must be established:
   1. No welding is permitted in an explosive environment. ..... **4848(a)(9)**
   2. A written "hot work" permit is recommended whenever a combustible environment may exist. **4848**
   3. All combustible materials in the work area must be removed or guarded. ..... **4848(a)(7)**
   4. Suitable fire extinguishers, water containers, water hoses, or sand must be provided in the work area. ..... **4848(a)(19)**
   5. Employers must instruct employees on hot work safety. ..... **4848(a)**
   6. Welders must be required to wear:
      a) Non-flammable gloves with gauntlets **1520**
      b) Appropriate foot protection **3385**
      c) Aprons (leather) and shirts that have sleeves and collars ..... **1522(a)**
      d) Helmets, hoods, and face shields suitable for head protection ..... **3381(a), 3382(a)**
      e) Suitable eye protection **3382**
      f) Respiratory protection (as required) **5144**
   7. Screens must be provided to protect the eyes of nonwelders from flash burns and ultraviolet light rays. ..... **3382(b)**

B. **Gas welding** is regulated as follows:

1. Fuel gas and oxygen hoses must be distinguished from each other. ..... **1742(a)**
2. Couplings must not disconnect by means of a straight-pull motion. ..... **4848(a), 1742(g)**
3. Oil or grease must never come into contact with oxygen equipment. ..... **1743(c)**
4. Oxygen from a system without a pressure regulation device must never be used. ..... **1743(e)**
5. Gas cylinders must be stored and used as follows:
   a) Cylinders must be protected from all heat sources. ..... **1740(a)**
   b) They must be secured upright and placed so they will not fall or be knocked over. ..... **1740(c)**
   c) Cylinders must be handled in suitable cradles, with their valve caps installed; they must never be lifted by magnet, rope, or chain. ..... **1740(c), (d)**
   d) They must be guarded so that they never form a part of any electrical circuit. ..... **1740(e)**
   e) Fuel gas cylinders in storage must be separated from oxygen cylinders by a minimum distance of 20 ft. or by a noncombustible barrier that is at least 5 ft. high and has a fire-resistance rating of a 1/2 hour. ..... **1740(g)**
   f) Valve stem wrenches must be left in place while cylinders are in use. ..... **1743(g)**

g) A fire extinguisher rated at least 10 B:C must be kept near the operation. ..... **1743(j)**

h) Backflow protection is required. ..... **4845(b)**

C. **Arc welding** is regulated as follows:

1. Cables in poor condition must not be used; no cable may be spliced within 10 ft. of the electrode holder. ..... **4851(e)(2)**
2. The frames of arc welding and cutting machines must be grounded. ..... **4851(f)(5)**
3. Electrodes and holders that are not in use shall be protected so they cannot make electrical contact with employees or conducting objects. ..... **4851(g)**
4. Defective equipment must not be used. ..... **4851(j)**

D. **Ventilation requirements** for welding, cutting, and brazing operations aim to minimize the worker's exposure to hazardous fumes, gases, and vapors. **1536, 1537**

1. Outdoor operations

   Respirators are required for any operation involving beryllium, cadmium, lead, or mercury. For other operations and materials, respirators are not required when natural or mechanical ventilation is sufficient to prevent exposure to airborne contaminants in excess of the PELs noted in **5155**. ... **1536(c)**

2. Indoor operations

   Respirators shall be used when local exhaust or mechanical ventilation is not feasible or

able to prevent exposures that exceed limits specified in **5155.**

E. **In enclosed spaces** supplied-air respirators shall be used when local exhaust ventilation is not an effective means for preventing potentially hazardous exposures. ..... **1536(b), 5152**

Wood Preservative Chemicals

Wood preservatives that contain creosote, pentachlorophenol, or inorganic arsenic are widely used. Because these chemicals are carcinogens, care must be taken to prevent exposure to them. When the probability of skin or eye irritation exists, workers must use appropriate protective clothing and equipment, such as coveralls, gloves, shoes, face shields, or impervious clothing. Use of MSHA/NIOSH-approved respirators is required when it is infeasible to eliminate harmful airborne exposures to these chemicals. .. **5141, 5144(a), 5214**

Index

List of Acronyms

AB 1127: Assembly Bill 1127
ACCM: asbestos-containing construction material
ACM: asbestos-containing material
AEGC program: assured equipment grounding conductor program
ANSI: American National Standards Institute
Ca PE: California Registered Professional Engineer
CASOs: Compressed Air Safety Orders
CAZ: controlled access zone
CCR: California Code of Regulations
CFR: Code of Federal Regulations
CSHIP: Construction Safety and Health Inspection Project
CSOs: Construction Safety Orders
dBA: a unit of sound level as measured on the A-scale of a standard sound level meter
DOSH: Division of Occupational Safety and Health
EMS: emergency medical service
ESOs: Electrical Safety Orders
FP: fall protection
FPP: fall protection plan
GFCI: ground-fault circuit interruptor
GISOs: General Industry Safety Orders
haz-com program: hazard communication program
HEPA: high-efficiency particulate air
HP: hearing protection
IIP Program: Injury and Illness Prevention Program
LAZ: limited access zone
MSDS: material safety data sheet
MSHA: Mine Safety and Health Administration

NIOSH: National Institute for Occupational Safety and Health

PACM: presumed asbestos-containing material

PAT: powder-actuated tool

PEL: permissible exposure limit

PFA: personal fall arrest

PFP: personal fall protection

PFR: personal fall restraint

QP: qualified person

RMI: repetitive motion injury

SO: safety order

T8 CCR: Title 8 of the *California Code of Regulations*

TSOs: Tunnel Safety Orders

TWA: time-weighted average

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