

**Wisconsin Contractors Institute**  
**OSHA Training Series**

Dwelling Contractor Qualifier  
Continuing Education

**Lead in Construction**  
**(Course #12600) – 4 hours**

# Lead in Construction (OSHA)

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## **Health Hazards of Lead Exposure**

Pure lead (Pb) is a heavy metal at room temperature and pressure. A basic chemical element, it can combine with various other substances to form numerous lead compounds.

Lead has been poisoning workers for thousands of years. Lead can damage the central nervous system, cardiovascular system, reproductive system, hematological system, and kidneys. When absorbed into the body in high enough doses, lead can be toxic.

In addition, workers' lead exposure can harm their children's development.

Short-term (acute) overexposure—as short as days--can cause acute encephalopathy, a condition affecting the brain that develops quickly into seizures, coma, and death from cardio respiratory arrest. Short-term occupational exposures of this type are highly unusual but not impossible.

Extended, long-term (chronic) overexposure can result in severe damage to the central nervous system, particularly the brain. It can also damage the blood-forming, urinary, and reproductive systems.

There is no sharp dividing line between rapidly developing acute effects of lead and chronic effects that take longer to develop.

### **SYMPTOMS OF CHRONIC OVEREXPOSURE**

Some of the common symptoms include:

- Loss of appetite;
- Constipation;
- Nausea;
- Excessive tiredness;
- Headache;
- Fine tremors;
- Colic with severe abdominal pain;
- Metallic taste in the mouth;
- Weakness;
- Nervous irritability;
- Hyperactivity;
- Muscle and joint pain or soreness;
- Anxiety;
- Pallor;
- Insomnia;
- Numbness; and
- Dizziness

### **REPRODUCTIVE RISKS**

Lead is toxic to both male and female reproductive systems.

Lead can alter the structure of sperm cells and there is evidence of miscarriage and stillbirth in women exposed to lead or whose partners have been exposed. Children born to parents who were

exposed to excess lead levels are more likely to have birth defects, mental retardation, or behavioral disorders or to die during the first year of childhood.

Workers who desire medical advice about reproductive issues related to lead should contact qualified medical personnel to arrange for a job evaluation and medical follow-up--particularly if they are pregnant or actively seeking to have a child. Employers whose employees may be exposed to lead and who have been contacted by employees with concerns about reproductive issues must make medical examinations and consultations available.

### **CHELATING AGENTS**

Under certain limited circumstances, a physician may prescribe special drugs called chelating agents to reduce the amount of lead absorbed in body tissues. Using chelation as a preventive measure--that is, to lower blood level but continue to expose a worker--is prohibited and therapeutic or diagnostic chelations of lead that are required must be done under the supervision of a licensed physician in a clinical setting, with thorough and appropriate medical monitoring. The employee must be notified in writing before treatment of potential consequences and allowed to obtain a second opinion.

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**1.) Lead can damage which of the following:**

- a. Nervous system
- b. Cardiovascular system
- c. Reproductive system
- d. All of the above

**2.) Workers' lead exposure can harm their children's development.**

- a. True
- b. False

**3.) What does using a chelation agent as a preventive measure do to the body?**

- a. Raises blood level
  - b. Lowers blood level
  - c. Raises heart rate
  - d. Lowers heart rate
- 

### **Worker Exposure**

Lead is most commonly absorbed into the body by inhalation. When workers breathe in lead as a dust, fume, or mist, their lungs and upper respiratory tract absorb it into the body. They can also absorb lead through the digestive system if it enters the mouth and is ingested.

A significant portion of the lead inhaled or ingested gets into the bloodstream. Once in the bloodstream, lead circulates through the body and is stored in various organs and body tissues.

Some of this lead is filtered out of the body quickly and excreted, but some remains in the blood and tissues. As exposure continues, the amount stored will increase if the body absorbs more lead than it excretes. The lead stored in the tissue can slowly cause irreversible damage, first to individual cells, then to organs and whole body systems.

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**4.) Lead is most commonly absorbed into the body via:**

- a. Digesting
- b. Blood stream
- c. Inhalation
- d. None of the above
- e.

**5.) Lead that circulates through the body is entirely filtered out of the body quickly.**

- a. True
  - b. False
- 

## **Construction Workers and Lead Exposure**

### **HOW LEAD IS USED**

In construction, lead is used frequently for roofs, cornices, tank linings, and electrical conduits. In plumbing, soft solder, used chiefly for soldering tinplate and copper pipe joints, is an alloy of lead and tin. Soft solder has been banned for many uses in the United States. In addition, the Consumer Product Safety Commission bans the use of lead-based paint in residences. Because lead-based paint inhibits the rusting and corrosion of iron and steel, however, lead continues to be used on bridges, railways, ships, lighthouses, and other steel structures, although substitute coatings are available.

Construction projects vary in their scope and potential for exposing workers to lead and other hazards. Projects such as removing paint from a few interior residential doors may involve limited exposure. Others projects, however, may involve removing or stripping substantial quantities of lead-based paints on large bridges and other structures.

### **MOST VULNERABLE WORKERS**

Workers potentially at risk for lead exposure include those involved in iron work; demolition work; painting; lead-based paint abatement; plumbing; heating and air conditioning maintenance and repair; electrical work; and carpentry, renovation, and remodeling work. Plumbers, welders, and painters are among those workers most exposed to lead. Significant lead exposures also can arise from removing paint from surfaces previously coated with lead-based paint such as bridges, residences being renovated, and structures being demolished or salvaged. With the increase in highway work, bridge repair, residential lead abatement, and residential remodeling, the potential for exposure to lead-based paint has become more common.

Workers at the highest risk of lead exposure are those involved in:

- Abrasive blasting and
- Welding, cutting, and burning on steel structures.

Other operations with the potential to expose workers to lead include:

- Lead burning;
- Using lead-containing mortar;
- Power tool cleaning without dust collection systems;
- Rivet busting;
- Cleanup activities where dry expendable abrasives are used;
- Movement and removal of abrasive blasting enclosures;
- Manual dry scraping and sanding;
- Manual demolition of structures;
- Heat-gun applications;
- Power tool cleaning with dust collection systems; and
- Spray painting with lead-based paint.

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**6.) In construction, lead is frequently used for:**

- a. Roofs
- b. Tank Linings
- c. Electrical conduits
- d. All of the above

**7.) Which of the following uses of lead in construction is NOT banned:**

- a. Soft solder
- b. Lead-based paint
- c. Electrical conduits
- d. None of the above

**8.) Which of the following workers are exposed to lead:**

- a. Plumbers
- b. Welders
- c. Painters
- d. All of the above

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**OSHA's Lead Standard**

OSHA's Lead Standard for the Construction Industry, Title 29 Code of Federal Regulations 1926.62, covers lead in a variety of forms, including metallic lead, all inorganic lead compounds, and organic lead soaps.

**9.) What is the OSHA's Lead Standard for the construction industry?**

- a. 1926.62
- b. 1910.82
- c. 1926.42
- d. 1910.82

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**EXPOSURE LIMITS**

The standard establishes maximum limits of exposure to lead for all workers covered, including a permissible exposure limit (PEL) and **action level (AL)**.

The **permissible exposure limits (PEL)** sets the maximum worker exposure to lead: 50 micrograms of lead per cubic meter of air ( $50\mu\text{g}/\text{m}^3$ ) averaged over an eight-hour period. If employees are exposed to lead for more than eight hours in a workday, their allowable exposure as a time weighted average for that day must be reduced according to this formula:

Employee exposure (in  $\mu\text{g}/\text{m}^3$ ) = 400 divided by the hours worked in the day.

The AL, regardless of respirator use, is an airborne concentration of  $30\mu\text{g}/\text{m}^3$ , averaged over an eight-hour period. The AL is the level at which an employer must begin specific compliance activities outlined in the standard.

**APPLICABILITY TO CONSTRUCTION**

OSHA's lead in construction standard applies to all construction work where an employee may be exposed to lead. All work related to construction, alteration, or repair, including painting and decorating, is included. Under this standard, construction includes, but is not limited to:

- Demolition or salvage of structures where lead or materials containing lead are present;
- Removal or encapsulation of materials containing lead;
- New construction, alteration, repair, or renovation of structures, substrates, or portions or materials containing lead;
- Installation of products containing lead;
- Lead contamination from emergency cleanup;
- Transportation, disposal, storage, or containment of lead or materials containing lead where construction activities are performed; and
- Maintenance operations associated with these construction activities.

- 10.) **The permissible exposure limit sets the maximum worker exposure to lead (averaged over an eight-hour period):**
- 40 micrograms of lead per cubic meter of air
  - 50 micrograms of lead per cubic meter of air
  - 60 micrograms of lead per cubic meter of air
  - 70 micrograms of lead per cubic meter of air
- 11.) **The action level is an airborne concentration of \_\_\_\_\_, averaged over an eight-hour period.**
- 10 micrograms of lead per cubic meter of air
  - 20 micrograms of lead per cubic meter of air
  - 30 micrograms of lead per cubic meter of air
  - 40 micrograms of lead per cubic meter of air
- 12.) **OSHA's lead in construction standard applies to all construction work where an employee may be exposed to lead.**
- True
  - False
- 13.) **OSHA's lead standards apply in which of the following case:**
- Removal of materials containing lead
  - Installation of products containing lead
  - Lead contamination from emergency cleanup
  - All of the above

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## **Employer Responsibilities WORKER PROTECTIONS**

Employers of construction workers are responsible for developing and implementing a worker protection program. At a minimum, the employer's worker protection program for employees exposed to lead above the PEL should include:

- Hazard determination, including exposure assessment;
- Medical surveillance and provisions for medical removal;
- Job-specific compliance programs;
- Engineering and work practice controls;
- Respiratory protection;
- Protective clothing and equipment;
- Housekeeping;
- Hygiene facilities and practices;
- Signs;
- Employee information and training; and

- Recordkeeping.

Because lead is a cumulative and persistent toxic substance and health effects may result from exposure over prolonged periods, employers must use these precautions where feasible to minimize employee exposure to lead.

The employer should, as needed, consult a qualified safety and health professional to develop and implement an effective, site specific worker protection program. These professionals may work independently or may be associated with an insurance carrier, trade organization, or onsite consultation program.

### **ELEMENTS OF A COMPLIANCE PROGRAM**

For each job where employee exposure exceeds the PEL, the employer must establish and implement a written compliance program to reduce employee exposure to the PEL or below. The compliance program must provide for frequent and regular inspections of job sites, materials, and equipment by a competent person. Written programs, which must be reviewed and updated at least every six months, must include:

- A description of each activity in which lead is emitted (such as equipment used, material involved, controls in place, crew size, maintenance practices);
- The means to be used to achieve compliance and engineering plans and studies used to determine the engineering controls selected where they are required;
- Information on the technology considered to meet the PEL;
- Air monitoring data that document the source of lead emissions;
- A detailed schedule for implementing the program, including copies of documentation (such as purchase orders for equipment, construction contracts);
- A work practice program;
- An administrative control schedule, if applicable; and
- Arrangements made among contractors on multi-contractor sites to inform employees of potential lead exposure.

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**14.) An employer's worker protection program for employees exposed to lead should include:**

- a. Respiratory protection
- b. Signs
- c. Protective clothing and equipment
- d. All of the above

**15.) Written compliance programs must be reviewed and updated at least:**

- a. Every 6 months
  - b. Every 9 months
  - c. Every 12 months
  - d. Every 18 months
- 

### **Hazard Assessment**

An employer is required to conduct an initial employee exposure assessment of whether employees are exposed to lead at or above the AL based on:

- Any information, observation, or calculation that indicates employee exposure to lead;
- Any previous measurements of airborne lead; and
- Any employee complaints of symptoms attributable to lead exposure.

Objective data and historical measurements of lead may be used to satisfy the standard's initial monitoring requirements.

### **INITIAL EMPLOYEE EXPOSURE ASSESSMENT**

Initial monitoring may be limited to a representative sample of those employees exposed to the greatest concentrations of airborne lead. Representative exposure sampling is permitted when there are a number of employees performing the same job, with lead exposure of similar duration and level, under essentially the same conditions. For employees engaged in similar work, the standard requires that the members of the group reasonably expected to have the highest exposure levels be monitored. This result is then attributed to the other employees of the group.

The employer must establish and maintain an accurate record documenting the nature and relevancy of previous exposure data. Instead of performing initial monitoring, the employer may in some cases rely on objective data that demonstrate that a particular lead containing material or product cannot result in employee exposure at or above the action level when it is processed, used, or handled.

### **BIOLOGICAL MONITORING TESTS**

Analysis of blood lead samples must be conducted by an OSHA approved lab and be accurate (to a confidence level of 95 percent) within plus or minus 15 percent, or 6 µg/dl, whichever is greater. If an employee's airborne lead level is at or above the AL for more than 30 days in any consecutive 12 months, the employer must make biological monitoring available on the following schedule:

- At least every two months for the first six months and every six months thereafter for employees exposed at or above the action level for more than 30 days annually;

- At least every two months for employees whose last blood sampling and analysis indicated a blood lead level at or above 40 µg/dl; and
- At least monthly while an employee is removed from exposure due an elevated blood lead level.

### **PENDING EMPLOYEE EXPOSURE ASSESSMENT**

Until the employer performs an exposure assessment and documents that employees are not exposed above the PEL, OSHA requires some degree of interim protection for employees. This means providing respiratory protection, protective work clothing and equipment, hygiene facilities, biological monitoring, and training—as specified by the standards—for certain tasks prone to produce high exposure. These include:

- Manual demolition of structures such as dry wall, manual scraping, manual sanding, and use of a heat gun where lead containing coatings or paints are present;
- Power tool cleaning with or without local exhaust ventilation;
- Spray painting with lead-containing paint;
- Lead burning;
- Use of lead-containing mortar;
- Abrasive blasting, rivet busting, welding, cutting, or torch burning on any structure where lead-containing coatings or paint are present;
- Abrasive blasting enclosure movement and removal;
- Cleanup of activities where dry expendable abrasives are used; and
- Any other task the employer believes may cause exposures in excess of the PEL.

### **TEST RESULTS SHOWING NO OVEREXPOSURES**

If the initial assessment indicates that no employee is exposed above the AL, the employer may discontinue monitoring. Further exposure testing is not required unless there is a change in processes or controls that may result in additional employees being exposed to lead at or above the AL, or result in employees already exposed at or above the AL being exposed above the PEL. The employer must keep a written record of the determination, including the date, location within the work site, and the name and social security number of each monitored employee.

## **EMPLOYEE NOTIFICATION OF MONITORING RESULTS**

The employer must notify each employee in writing of employee exposure assessment results within five working days of receiving them. Whenever the results indicate that the representative employee exposure, without the use of respirators, is above the PEL, the employer must include a written notice stating that the employee's exposure exceeded the PEL and describing corrective action taken or to be taken to reduce exposure to or below the PEL.

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- 16.) **An employer is NOT required to conduct an initial employee exposure assessment of whether employees are exposed to lead at or above the action level.**
- True
  - False
- 17.) **Initial monitoring may be limited to a representative sample of those employees exposed to the greatest concentrations of airborne lead.**
- True
  - False
- 18.) **An employer must make biological monitoring available when an employee's airborne lead level is at or above the action level (AL) for:**
- More than 30 days in any consecutive 12 months
  - More than 45 days in any consecutive 12 months
  - More than 60 days in any consecutive 12 months
  - More than 90 days in any consecutive 12 months
- 19.) **Until the employer performs an exposure assessment, OSHA requires some degree of interim protection for employees for certain tasks prone to produce high exposure, including:**
- Spray painting with lead-containing paint
  - Use of lead-containing mortar
  - Lead burning
  - All of the above
- 20.) **If the initial assessment indicates that no employee is exposed above the action level (AL), the employer may NOT discontinue monitoring for lead exposure.**
- True
  - False

**21.) Employers must notify each employee in writing of employee exposure assessment results within how many days of receiving them?**

- a. 3 days
  - b. 4 days
  - c. 5 days
  - d. 7 days
- 

### **Medical Surveillance**

When an employee's airborne exposure is at or above the AL for more than 30 days in any consecutive 12 months, an immediate medical consultation is required when the employee notifies the employer that he or she:

- has developed signs or symptoms commonly associated with lead-related disease;
- has demonstrated difficulty in breathing during respirator use or a fit test;
- desires medical advice concerning the effects of past or current lead exposure on the employee's ability to have a healthy child; and
- is under medical removal and has a medically appropriate need.

### **MEDICAL EXAMS**

The best indicator of personal lead exposure is through a blood test to indicate elevated blood lead levels. A medical exam must also include:

- Detailed work and medical histories, with particular attention to past lead exposure (occupational and non-occupational), personal habits (smoking and hygiene), and past gastrointestinal, hematologic, renal, cardiovascular, reproductive, and neurological problems;
- A thorough physical exam, with particular attention to gums, teeth, hematologic, gastrointestinal, renal, cardiovascular, and neurological systems; evaluation of lung function if respirators are used;
- A blood pressure measurement;
- A blood sample and analysis to determine blood lead level;
  - Hemoglobin and hematocrit determinations, red cell indices, and an exam of peripheral smear morphology; and
  - Zinc protoporphyrin; blood urea nitrogen; and serum creatinine;
- A routine urinalysis with microscopic exam; and

- Any lab or other test the examining physician deems necessary.

### **INFORMATION FOR THE EXAMINING PHYSICIAN**

The employer must provide all examining physicians with a copy of the lead in construction standard, including all appendices, a description of the affected employee's duties as they relate to the employee's exposure, the employee's lead exposure level or anticipated exposure level, a description of personal protective equipment used or to be used, prior blood lead determinations, and all prior written medical opinions for the employee.

### **WHEN MONITORING SHOWS NO EMPLOYEE EXPOSURES ABOVE THE AL**

Employers must make available, at no cost to the employee, initial medical surveillance for employees exposed to lead on the job at or above the action level on any one day per year. This initial medical surveillance consists of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin (ZPP) levels. In addition, a medical surveillance program with biological monitoring must be made available to any employee exposed at or above the action level for more than 30 days in any consecutive 12 months.

### **AFTER THE MEDICAL EXAMINATION**

Employers must obtain and provide the employee a copy of a written opinion from each examining or consulting physician that contains only information related to occupational exposure to lead and must include:

- Whether the employee has any detected medical condition that would increase the health risk from lead exposure;
- Any special protective measures or limitations on the worker's exposure to lead,
- Any limitation on respirator use; and
- Results of the blood lead determinations.

In addition, the written statement may include a statement that the physician has informed the employee of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

The employer must instruct the physician that findings, including lab results or diagnoses unrelated to the worker's lead exposure, must not be revealed to the employer or included in the written opinion to the employer. The employer must also instruct the physician to advise employees of any medical condition, occupational or non-occupational, that necessitates further evaluation or treatment. In addition, some states also require laboratories and health care providers to report cases of elevated blood lead concentrations to their state health departments.

- 22.) **The best indicator of personal lead exposure is through a:**
- a. DNA test
  - b. Blood test
  - c. Physical exam
  - d. None of the above
- 23.) **If the exposure is above the allowable limits, a medical consultation is required when the employee notifies the employer of the following:**
- a. Developed symptoms commonly associated with lead-related disease
  - b. Demonstrated difficulty breathing during respirator use
  - c. Desires medical advice concerning the effects of lead exposure
  - d. All of the above
- 24.) **The employer is NOT required to provide the examining physician of an employee with any documentation.**
- a. True
  - b. False

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### **Medical Removal Provisions**

Temporary medical removal can result from an elevated blood level or a written medical opinion. More specifically, the employer is required to remove from work an employee with a lead exposure at or above the AL each time periodic and follow-up (within two weeks of the periodic test) blood sampling tests indicate that the employee's blood level is at or above 50 µg /dl. The employer also must remove from work an employee with lead exposure at or above the AL each time a final medical determination indicates that the employee needs reduced lead exposure for medical reasons. If the physician who is implementing the employer's medical program makes a final written opinion recommending the employee's removal or other special protective measures, the employer must implement the physician's recommendation.

For an employee removed from exposure to lead at or above the AL due to a blood lead level at or above 50 µg/dl, the employer may return that employee to former job status when two consecutive blood sampling tests indicate that the employee's blood lead level is below 40 µg /dl. For an employee removed from exposure to lead due to a final medical determination, the employee must be returned when a subsequent final medical determination results in a medical finding, determination, or opinion that the employee no longer has a detected medical condition that places the employee at increased risk of lead exposure.

The employer must remove any limitations placed on employees or end any special protective measures when a subsequent final medical determination indicates they are no longer necessary. If the former position no longer exists, the employee is returned consistent with whatever job assignment discretion the employer would have had if no removal occurred.

## **WORKER PROTECTIONS AND BENEFITS**

The employer must provide up to 18 months of medical removal protection (MRP) benefits each time an employee is removed from lead exposure or medically limited. As long as the position/job exists, the employer must maintain the earnings, seniority, and other employment rights and benefits as though the employee had not been removed from the job or otherwise medically limited. The employer may condition medical removal protection benefits on the employee's participation in follow-up medical surveillance.

If a removed employee files a worker's compensation claim or other compensation for lost wages due to a lead-related disability, the employer must continue medical removal protection benefits until the claim is resolved. However, the employer's MRP benefits obligation will be reduced by the amount that the employee receives from these sources. Also, the employer's MRP benefits obligation will be reduced by any income the employee receives from employment with another employer made possible by virtue of the employee's removal.

## **RECORDS REQUIREMENTS INVOLVING MEDICAL REMOVAL**

In the case of medical removal, the employer's records must include:

- The worker's name and social security number,
- The date of each occasion that the worker was removed from current exposure to lead,
- The date when the worker was returned to the former job status,
- A brief explanation of how each removal was or is being accomplished, and
- A statement indicating whether the reason for the removal was an elevated blood lead level.

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**25.) An employee may return to former job status when the following occurs:**

- a. 2 consecutive blood tests with a level below 40 µg/dl
- b. A blood test with a level below 40 µg/dl
- c. 2 consecutive blood tests with a level below 50 µg/dl
- d. May not return to work

**26.) What type of medical removal protection benefits are required each time an employee is removed due to lead exposure?**

- a. 6 months
- b. 12 months
- c. 18 months
- d. No benefits are required

- 27.) **As long as the position/job exists, the employer must maintain the earnings, seniority, and other employment rights and benefits as though the employee had not been removed from the job or otherwise medically limited.**
- a. True
  - b. False
- 28.) **If a removed employee files a worker's compensation claim due to lead, which of the following statements is false:**
- a. The employer must continue medical removal protection (MRP) benefits until the claim is resolved.
  - b. The MRP benefit will not be impacted by the amount received from a worker's compensation claim.
  - c. The MRP benefit will be reduced by any income the employee receives from other employment.
  - d. All of the above are true
- 29.) **The employer must maintain any employee exposure and medical records to:**
- a. Document ongoing employee exposure
  - b. Medical monitoring
  - c. Medical removal of workers
  - d. All of the above

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## **Recordkeeping**

### **EMPLOYER REQUIREMENTS**

The employer must maintain any employee exposure and medical records to document ongoing employee exposure, medical monitoring, and medical removal of workers. This data provides a baseline to evaluate the employee's health properly. Employees or former employees, their designated representatives, and OSHA must have access to exposure and medical records in accordance with 29 CFR 1910.1020. Rules of agency practice and procedure governing OSHA access to employee medical records are found in 29 CFR 1913.10.

### **EXPOSURE ASSESSMENT RECORDS**

The employer must establish and maintain an accurate record of all monitoring and other data used to conduct employee exposure assessments as required by this standard and in accordance with 29 CFR 1910.1020. The exposure assessment records must include:

- The dates, number, duration, location, and results of each sample taken, including a description of the sampling procedure used to determine representative employee exposure;

- A description of the sampling and analytical methods used and evidence of their accuracy;
- The type of respiratory protection worn, if any;
  
- The name, social security number, and job classification of the monitored employee and all others whose exposure the measurement represents; and
  
- Environmental variables that could affect the measurement of employee exposure.

### **MEDICAL SURVEILLANCE RECORDS**

The employer must maintain an accurate record for each employee subject to medical surveillance, including:

- The name, social security number, and description of the employee's duties;
- A copy of the physician's written opinions;
- The results of any airborne exposure monitoring done for the employee and provided to the physician; and
- Any employee medical complaints related to lead exposure.

In addition, the employer must keep or ensure that the examining physician keeps the following medical records:

- A copy of the medical examination results including medical and work history;
- A description of the laboratory procedures and a copy of any guidelines used to interpret the test results; and
- A copy of the results of biological monitoring. The employer or physician or both must maintain medical records in accordance with 29 CFR 1910.1020.

### **DOCUMENTS FOR EMPLOYEES SUBJECT TO MEDICAL REMOVAL**

The employer must maintain--for at least the duration of employment--an accurate record for each employee subject to medical removal, including:

- The name and social security number of the employee;
- The date on each occasion that the employee was removed from current exposure to lead and the corresponding date which the employee was returned to former job status;
- A brief explanation of how each removal was or is being accomplished; and

- A statement about each removal indicating whether the reason for removal was an elevated blood level.

### **EMPLOYER REQUIREMENTS RELATED TO OBJECTIVE DATA**

The employer must establish and maintain an accurate record documenting the nature and relevancy of objective data relied on to assess initial employee exposure in lieu of exposure monitoring. The employer must maintain the record of objective data relied on for at least 30 years.

### **DOCUMENTS FOR OSHA AND NIOSH REVIEW**

The employer must make all records--including exposure monitoring, objective data, medical removal, and medical records--available upon request to affected employees, former employees, and their designated representatives and to the OSHA Assistant Secretary and the Director of the National Institute for Occupational Safety and Health (NIOSH) for examination and copying in accordance with 29 CFR 1910.1020.

### **WHEN CLOSING A BUSINESS**

When an employer ceases to do business, the successor employer must receive and retain all required records. If no successor is available, these records must be sent to the Director of NIOSH.

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- 30.) The employer must maintain an accurate record of each employee subject to medical removal for how long?**
- a. 1 year
  - b. 5 years
  - c. 10 years
  - d. The duration of employment
- 31.) The employer must establish and maintain an accurate record documenting the nature and relevancy of objective data for how long?**
- a. 10 years
  - b. 20 years
  - c. 30 years
  - d. 40 years
- 32.) An employer must make all records available upon request to the following:**
- a. Affected employees
  - b. Unaffected employees
  - c. OSHA Assistant Secretary
  - d. Only A and C

**33.) When an employer ceases to do business and no successor is available, any lead records should:**

- a. Be sent to the OSHA Assistant Secretary
- b. Be sent to the Director of NIOSH
- c. Shredded and properly disposed
- d. None of the above

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## **Exposure Reduction and Employee Protection**

The most effective way to protect workers is to minimize their exposure through engineering controls, good work practices and training, and use of personal protective clothing and equipment, including respirators, where required. The employer needs to designate a competent person capable of identifying existing and predictable lead hazards and who is authorized to take prompt corrective measures to eliminate such problems. The employer should, as needed, consult a qualified safety and health professional to develop and implement an effective worker protection program. These professionals may work independently or may be associated with an insurance carrier, trade organization, or onsite consultation program.

## **Engineering Controls**

Engineering measures include local and general exhaust ventilation, process and equipment modification, material substitution, component replacement, and isolation or automation. Examples of recommended engineering controls that can help reduce worker exposure to lead are described as follows.

### **EXHAUST VENTILATION**

Equip power tools used to remove lead-based paint with dust collection shrouds or other attachments so that paint is exhausted through a high-efficiency particulate air (HEPA) vacuum system. For operations such as welding, cutting/burning, or heating, use local exhaust ventilation. Use HEPA vacuums during cleanup operations.

For abrasive blasting operations, build a containment structure that is designed to optimize the flow of clean ventilation air past the workers' breathing zones. This will help reduce the exposure to airborne lead and increase visibility. Maintain the affected area under negative pressure to reduce the chances that lead dust will contaminate areas outside the enclosure. Equip the containment structure with an adequately sized dust collector to control emissions of particulate matter into the environment.

### **ENCLOSURE OR ENCAPSULATION**

One way to reduce the lead inhalation or ingestion hazard posed by lead-based paint is to encapsulate it with a material that bonds to the surface, such as acrylic or epoxy coating or flexible wall coverings. Another option is to enclose it using systems such as gypsum wallboard, plywood paneling, and aluminum, vinyl, or wood exterior siding. Floors coated with lead-based paint can be covered using vinyl tile or linoleum.

The building owner or other responsible person should oversee the custodial and maintenance staffs and contractors during all activities involving enclosed or encapsulated lead-based paint. This will minimize the potential for an inadvertent lead release during maintenance, renovation, or demolition.

### **SUBSTITUTION**

Choose materials and chemicals that do not contain lead for construction projects. Among the options are:

- Use zinc-containing primers covered by an epoxy intermediate coat and polyurethane topcoat instead of lead-containing coatings.
- Substitute mobile hydraulic shears for torch cutting under certain circumstances.
- Consider surface preparation equipment such as needle guns with multiple reciprocating needles completely enclosed within an adjustable shroud, instead of abrasive blasting under certain conditions. The shroud captures dust and debris at the cutting edge and can be equipped with a HEPA vacuum filtration with a self-drumming feature. One such commercial unit can remove lead-based paint from flat steel and concrete surfaces, outside edges, inside corners, and pipes.
- Choose chemical strippers in lieu of hand scraping with a heat gun for work on building exteriors, surfaces involving carvings or molding, or intricate iron work. Chemical removal generates less airborne lead dust. (Be aware, however, that these strippers themselves can be hazardous and that the employer must review the material safety data sheets (MSDSs) for these stripping agents to obtain information on their hazards.)

### **COMPONENT REPLACEMENT**

Replace lead-based painted building components such as windows, doors, and trim with new components free of lead-containing paint. Another option is to remove the paint offsite and then repaint the components with zinc-based paint before replacing them.

### **PROCESS OR EQUIPMENT MODIFICATION**

When applying lead paints or other lead-containing coatings, use a brush or roller rather than a sprayer. This application method introduces little or no paint mist into the air to present a lead inhalation hazard. (Note that there is a ban on the use of lead-based paint in residential housing.)

Use non-silica-containing abrasives such as steel or iron shot/grit sand instead of sand in abrasive blasting operations when practical. The free silica portion of the dust presents a respiratory health hazard.

When appropriate for the conditions, choose blasting techniques that are less dusty than open-air abrasive blasting. These include hydro- or wet-blasting using high-pressure water with or without an abrasive or surrounding the blast nozzle with a ring of water, and vacuum blasting

where a vacuum hood for material removal is positioned around the exterior of the blasting nozzle.

When using a heat gun to remove lead-based paints in residential housing units, be sure it is of the flameless electrical softener type. Heat guns should have electronically controlled temperature settings to allow usage below 700 degrees F. Equip heat guns with various nozzles to cover all common applications and to limit the size of the heated work area.

When using abrasive blasting with a vacuum hood on exterior building surfaces, ensure that the configuration of the heads on the blasting nozzle match the configuration of the substrate so that the vacuum is effective in containing debris.

Ensure that HEPA vacuum cleaners have the appropriate attachments for use on unusual surfaces. Proper use of brushes of various sizes, crevice and angular tools, when needed, will enhance the quality of the HEPA-vacuuming process and help reduce the amount of lead dust released into the air.

## **ISOLATION**

Although it is not feasible to enclose and ventilate some abrasive blasting operations completely, it is possible to isolate many operations to help reduce the potential for lead exposure. Isolation consists of keeping employees not involved in the blasting operations as far away from the work area as possible, reducing the risk of exposure.

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**34.) The only way to reduce the lead inhalation or ingestion hazard posed by lead-based paint is to encapsulate it with a material that bonds to the surface.**

- a. True
- b. False

**35.) When applying lead paint to a residential house, the following is recommended:**

- e. Apply the paint with a brush or roller
- f. Apply the paint with a sprayer
- g. Use of lead-based paint in residential housing is prohibited
- h. All of the above

---

## **Housekeeping and Personal Hygiene**

Lead is a cumulative and persistent toxic substance that poses a serious health risk. A rigorous housekeeping program and the observance of basic personal hygiene practices will minimize employee exposure to lead. In addition, these two elements of the worker protection program help prevent workers from taking lead contaminated dust out of the worksite and into their homes where it can extend the workers' exposures and potentially affect their families' health.

## **HOUSEKEEPING PRACTICES**

An effective housekeeping program involves a regular schedule to remove accumulations of lead dust and lead-containing debris. The schedule should be adapted to exposure conditions at a particular worksite. OSHA's Lead Standard for Construction requires employers to maintain all surfaces as free of lead contamination as practicable. Vacuuming lead dust with HEPA-filtered equipment or wetting the dust with water before sweeping are effective control measures. Compressed air may not be used to remove lead from contaminated surfaces unless a ventilation system is in place to capture the dust generated by the compressed air.

In addition, put all lead-containing debris and contaminated items accumulated for disposal into sealed, impermeable bags or other closed impermeable containers. Label bags and containers as lead-containing waste. These measures provide additional help in controlling exposure.

## **PERSONAL HYGIENE PRACTICES**

Emphasize workers' personal hygiene such as washing their hands and face after work and before eating to minimize their exposure to lead. Provide and ensure that workers use washing facilities. Provide clean change areas and readily accessible eating areas. If possible, provide a parking area where cars will not be contaminated with lead. These measures:

- Reduce workers' exposure to lead and the likelihood that they will ingest lead,
- Ensure that the exposure does not extend beyond the worksite,
- Reduce the movement of lead from the worksite, and
- Provide added protection to employees and their families.

## **CHANGE AREAS**

The employer must provide a clean change area for employees whose airborne exposure to lead is above the PEL. The area must be equipped with storage facilities for street clothes and a separate area with facilities for the removal and storage of lead-contaminated protective work clothing and equipment. This separation prevents cross contamination of the employee's street and work clothing.

Employees must use a clean change area for taking off street clothes, suiting up in clean protective work clothing, donning respirators before beginning work, and dressing in street clothes after work. No lead-contaminated items should enter this area.

Work clothing must not be worn away from the jobsite. Under no circumstances should lead-contaminated work clothes be laundered at home or taken from the worksite, except to be laundered professionally or for disposal following applicable federal, state, and local regulations.

## **SHOWERS AND WASHING FACILITIES**

When feasible, showers must be provided for use by employees whose airborne exposure to lead is above the permissible exposure limit so they can shower before leaving the worksite. Where showers are provided, employees must change out of their work clothes and shower before changing into their street clothes and leaving the worksite. If employees do not change into clean clothing before leaving the worksite, they may contaminate their homes and automobiles with lead dust, extending their exposure and exposing other members of their household to lead.

In addition, employers must provide adequate washing facilities for their workers. These facilities must be close to the worksite and furnished with water, soap, and clean towels so employees can remove lead contamination from their skin.

Contaminated water from washing facilities and showers must be disposed of in accordance with applicable local, state, or federal regulations.

## **PERSONAL PRACTICES**

The employer must ensure that employees do not enter lunchroom facilities or eating areas with protective work clothing or equipment unless surface lead dust has been removed. HEPA vacuuming and use of a downdraft booth are examples of cleaning methods that limit the dispersion of lead dust from contaminated work clothing.

In all areas where employees are exposed to lead above the PEL, employees must observe the prohibition on the presence and consumption or use of food, beverages, tobacco products, and cosmetics. Employees whose airborne exposure to lead is above the PEL must wash their hands and face before eating, drinking, smoking, or applying cosmetics.

## **END-OF-DAY PROCEDURES**

Employers must ensure that workers who are exposed to lead above the permissible exposure limit follow these procedures at the end of their workday:

- Place contaminated clothes, including work shoes and personal in a properly labeled closed container.
- Take a shower and wash their hair. Where showers are not provided, employees must wash their hands and face at the end of the work shift.
- Change into street clothes in clean change areas.

---

**36.) Employers must ensure that workers follow the following procedures (who are exposed to a high level of lead) at the end of their workday?**

- a. Place contaminated clothes in a properly labeled closed container
- b. Take a shower or wash their hands and face
- c. Change into street clothes in a clean change area
- d. All of the above

## **Protective Clothing and Equipment**

### **EMPLOYER REQUIREMENTS**

Employers must provide workers who are exposed to lead above the PEL or for whom the possibility of skin or eye irritation exists with clean, dry protective work clothing and equipment that are appropriate for the hazard. Employers must provide these items at no cost to employees. Appropriate protective work clothing and equipment used on construction sites includes:

- Coveralls or other full-body work clothing;
- Gloves, hats, and shoes or disposable shoe coverlets;
- Vented goggles or face shields with protective spectacles or goggles;
- Welding or abrasive blasting helmets; and
- Respirators.

Clean work clothing must be issued daily for employees whose exposure levels to lead are above 200  $\mu\text{g}/\text{m}^3$ , weekly if exposures are above the PEL but at or below 200  $\mu\text{g}/\text{m}^3$  or where the possibility of skin or eye irritation exists.

### **HANDLING CONTAMINATED PROTECTIVE CLOTHING**

Workers must not be allowed to leave the worksite wearing lead contaminated protective clothing or equipment. This is an essential step in reducing the movement of lead contamination from the workplace into the worker's home and provides added protection for employees and their families.

Disposable coveralls and separate shoe covers may be used, if appropriate, to avoid the need for laundering. Workers must remove protective clothing in change rooms provided for that purpose.

Employers must ensure that employees leave the respirator use area to wash their faces and respirator face pieces as necessary. In addition, employers may require their employees to use HEPA vacuuming, damp wiping, or another suitable cleaning method before removing a respirator to clear loose particle contamination on the respirator and at the face-mask seal.

Place contaminated clothing that is to be cleaned, laundered, or disposed of by the employer in closed containers. Label containers with the warning: "Caution: Clothing contaminated with lead. Do not remove dust by blowing or shaking. Dispose of lead-contaminated wash water in accordance with applicable local, state, or federal regulations."

Workers responsible for handling contaminated clothing, including those in laundry services or subcontractors, must be informed in writing of the potential health hazard of lead exposure. At no time shall lead be removed from protective clothing or equipment by brushing, shaking, or blowing. These actions disperse the lead into the work area.

## **PREVENTING HEAT STRESS**

Workers wearing protective clothing, particularly in hot environments or within containment structures, can face a risk from heat stress if proper control measures are not used.

Heat stress is caused by several interacting factors, including environmental conditions, type of protective clothing worn; the work activity required and anticipated work rate, and individual employee characteristics such as age, weight, and fitness level. When heat stress is a concern, the employer should choose lighter, less insulating protective clothing over heavier clothing, as long as it provides adequate protection. Other measures the employer can take include: discussing the possibility of heat stress and its signs and symptoms with all workers; using appropriate work/rest regimens; and providing heat stress monitoring that includes measuring employees' heart rates, body temperatures, and weight loss. Employers must provide a source of water or electrolyte drink in a non-contaminated eating and drinking area close to the work area so workers can drink often throughout the day. Workers must wash their hands and face before drinking any fluid if their airborne exposure is above the PEL.

---

**37.) Employers must provide employees that are exposed to high levels of lead protective clothing:**

- a. At no cost to employees
- b. At the cost (no markup) the employer paid
- c. The employer is not required to provide it
- d. None of the above

**38.) The best way to remove lead from protective clothing or equipment is by:**

- a. Brushing it off
  - b. Shaking it off
  - c. Blowing it off
  - d. None of the above
- 

## **Respiratory Protection**

Although engineering and work practice controls are the primary means of protecting workers from exposure to lead, source control at construction sites sometimes is insufficient to control exposure. In these cases, airborne lead concentrations may be high or may vary widely.

Respirators often must be used to supplement engineering controls and work practices to reduce worker lead exposures below the PEL. When respirators are required, employers must provide them at no cost to workers.

The standard requires that respirators be used during periods when an employee's exposure to lead exceeds the PEL, including

- Periods necessary to install or implement engineering or work practice controls, and

- Work operations for which engineering and work practice controls are insufficient to reduce employee exposures to or below the PEL.

Respirators also must be provided upon employee request. A requested respirator is included as a requirement to provide increased protection for those employees who wish to reduce their lead burden below what is required by the standard, particularly if they intend to have children in the near future. In addition, respirators must be used when performing previously indicated high exposure or "trigger" tasks, before completion of the initial assessment.

### **PROVIDING ADEQUATE RESPIRATORY PROTECTION**

Before any employee first starts wearing a respirator in the work environment, the employer must perform a fit test. For all employees wearing negative or positive pressure tight-fitting face piece respirators, the employer must perform either qualitative or quantitative fit tests using an OSHA-accepted fit testing protocol. In addition, employees must be fit tested whenever a different respirator face piece is used, and at least annually thereafter.

Where daily airborne exposure to lead exceeds 50  $\mu\text{g}/\text{m}^3$ , affected workers must don respirators before entering the work area and should not remove them until they leave the high exposure area or have completed a decontamination procedure. Employers must assure that the respirator issued to the employee is selected and fitted properly to ensure minimum leakage through the face piece-to-face seal.

### **RESPIRATORY PROTECTION PROGRAMS**

When respirators are required at a worksite, the employer must establish a respiratory protection program in accordance with the OSHA standard on respiratory protection, 29 CFR 1910.134. At a minimum, an acceptable respirator program for lead must include:

- Procedures for selecting respirators appropriate to the hazard;
- Fit testing procedures;
- Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations, including cartridge change schedules;
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators;
- Training of employees in the respiratory hazard to which they are potentially exposed during routine and emergency situations;
- Training of employees in the proper use of respirators, including putting on and removing them, any limitations of their use, and their maintenance;
- Procedures for regularly evaluating the effectiveness of the program;
- Procedures to ensure air quality when supplied air is used;

- A written program and designation of a program administrator; and
- Record-keeping procedures.

In addition, the construction industry lead standard stipulates medical evaluations of employees required to use respirators.

If an employee has difficulty in breathing during a fit test or while using a respirator, the employer must make a medical examination available to that employee to determine whether he or she can wear a respirator safely.

### **SELECTING A RESPIRATOR**

The employer must select the appropriate respirator from Table 1 of the lead standard, 29 CFR 1926.62(f)(3)(i). The employer must provide a powered air-purifying respirator when an employee chooses to use this respirator and it will provide the employee adequate protection. A NIOSH-certified respirator must be selected and used in compliance with the conditions of its certification. In addition, if exposure monitoring or experience indicates airborne exposures to contaminants other than lead such as silica, solvents, or polyurethane coatings, these exposures must be considered when selecting respiratory protection.

Select type CE respirators approved by NIOSH for abrasive blasting operations. Currently, there are two kinds of CE respirators with the following assigned protection factors (APFs): a continuous flow respirator with a loose-fitting hood, APF 25; and a full face-piece supplied-air respirator operated in a positive-pressure mode, APF 2,000.

For any airline respirator, it is important to follow the manufacturer's instructions regarding air quality, air pressure, and inside diameter and length of hoses. Be aware that using longer hoses or smaller inside diameter hoses than the manufacturer specifies or hoses with bends or kinks may reduce or restrict the airflow to a respirator.

- 
- 39.) Before any employee first starts wearing a respirator in the work environment, the employer must perform a:**
- a. Mask test
  - b. Fit test
  - c. Air test
  - d. Breathing test

---

### **Employee Information and Training**

The employer must inform employees about lead hazards according to the requirement of OSHA's Hazard Communication standard for the construction industry, 29 CFR 1926.59,

including--but not limited to--the requirements for warning signs and labels, material safety data sheets (MSDSs), and employee information and training.

### **PROGRAM REQUIREMENTS**

Employers must institute an information and training program and ensure that all employees subject to exposure to lead or lead compounds at or above the action level on any day participate. Also covered under information and training are employees who may suffer skin or eye irritation from lead compounds. Initial training must be provided before the initial job assignment. Training must be repeated at least annually and, in brief summary must include:

- The content of the OSHA lead standard and its appendices;
- The specific nature of operations that could lead to lead exposure above the action level;
- The purpose, proper selection, fit, use, and limitations of respirators;
- The purpose and a description of the medical surveillance program, and the medical removal protection program;
- Information concerning the adverse health effects associated with excessive lead exposure;
- The engineering and work practice controls associated with employees' job assignments;
- The contents of any lead-related compliance plan in effect;
- Instructions to employees that chelating agents must not be used routinely to remove lead from their bodies and when necessary only under medical supervision and at the direction of a licensed physician; and
- The right to access records under "Access to Employee Exposure and Medical Records," 29 CFR 1910.1020.

All materials relating to the training program and a copy of the standard and its appendices must be made readily available to all affected employees.

### **WARNING SIGNS**

Employers are required to post these warning signs in each work area where employee exposure to lead is above the PEL:

- WARNING
- LEAD WORK AREA
- POISON
- NO SMOKING OR EATING

All signs must be well lit and kept clean so that they are easily visible. Statements that contradict or detract from the signs' meaning are prohibited. Signs required by other statutes, regulations, or ordinances, however, may be posted in addition to, or in combination with, this sign.

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**40.) Employers are required to post which of the following signs in each work area where employee exposure to lead is above the permissible exposure limit?**

- a. Wash your hands before returning to work
  - b. Caution
  - c. Lead Work Area
  - d. All of the above
-

WISCONSIN CONTRACTORS INSTITUTE – ANSWER SHEET

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_ Date: \_\_\_\_\_

Address: \_\_\_\_\_ State: \_\_\_\_\_ ZIP: \_\_\_\_\_

WI Prof. License #: \_\_\_\_\_

Phone: \_\_\_\_\_ Email: \_\_\_\_\_

**Lead Safety**

T F

1.  a  b  c  d

2.  a  b  c  d

3.  a  b  c  d

4.  a  b  c  d

5.  a  b  c  d

6.  a  b  c  d

7.  a  b  c  d

8.  a  b  c  d

9.  a  b  c  d

10.  a  b  c  d

11.  a  b  c  d

12.  a  b  c  d

13.  a  b  c  d

14.  a  b  c  d

15.  a  b  c  d

16.  a  b  c  d

17.  a  b  c  d

18.  a  b  c  d

19.  a  b  c  d

20.  a  b  c  d

**Lead Safety**

T F

21.  a  b  c  d

22.  a  b  c  d

23.  a  b  c  d

24.  a  b  c  d

25.  a  b  c  d

26.  a  b  c  d

27.  a  b  c  d

28.  a  b  c  d

29.  a  b  c  d

30.  a  b  c  d

31.  a  b  c  d

32.  a  b  c  d

33.  a  b  c  d

34.  a  b  c  d

35.  a  b  c  d

36.  a  b  c  d

37.  a  b  c  d

38.  a  b  c  d

39.  a  b  c  d

40.  a  b  c  d

# **Wisconsin Contractors Institute**

## **OSHA Training Series**

Dwelling Contractor Qualifier

Continuing Education

**Personal Protective Equipment**

**(Course #12607) – 4 hours**

# Personal Protective Equipment

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## **Introduction**

Hazards exist in every workplace in many different forms: sharp edges, falling objects, flying sparks, chemicals, noise and a myriad of other potentially dangerous situations. The Occupational Safety and Health Administration (OSHA) requires that employers protect their employees from workplace hazards that can cause injury.

Controlling a hazard at its source is the best way to protect employees. Depending on the hazard or workplace conditions, OSHA recommends the use of engineering or work practice controls to manage or eliminate hazards to the greatest extent possible. For example, building a barrier between the hazard and the employees is an engineering control; changing the way in which employees perform their work is a work practice control.

When engineering, work practice and administrative controls are not feasible or do not provide sufficient protection, employers must provide personal protective equipment (PPE) to their employees and ensure its use. Personal protective equipment, commonly referred to as "PPE", is equipment worn to minimize exposure to a variety of hazards. Examples of PPE include such items as gloves, foot and eye protection, protective hearing devices (earplugs, muffs) hard hats, respirators and full body suits.

This course will help both employers and employees do the following:

- Understand the types of PPE.
- Know the basics of conducting a "hazard assessment" of the workplace.
- Select appropriate PPE for a variety of circumstances.
- Understand what kind of training is needed in the proper use and care of PPE.

## **The Requirement for PPE**

To ensure the greatest possible protection for employees in the workplace, the cooperative efforts of both employers and employees will help in establishing and maintaining a safe and healthful work environment.

In general, employers are responsible for:

- ✓ Performing a "hazard assessment" of the workplace to identify and control physical and health hazards.
- ✓ Identifying and providing appropriate PPE for employees.
- ✓ Training employees in the use and care of the PPE.
- ✓ Maintaining PPE, including replacing worn or damaged PPE.

- ✓ Periodically reviewing, updating and evaluating the effectiveness of the PPE program.

In general, employees should:

- ✓ Properly wear PPE,
- ✓ Attend training sessions on PPE,
- ✓ Care for, clean and maintain PPE, and
- ✓ Inform a supervisor of the need to repair or replace PPE.

Specific requirements for PPE are presented in many different OSHA standards, published in 29 CFR. Some standards require that employers provide PPE at no cost to the employee while others simply state that the employer must provide PPE.

---

**1.) The following is an example of personal protective equipment:**

- Gloves
  - Eye protection
  - Hard hats
  - All of the above
- 

**The Hazard Assessment**

A first critical step in developing a comprehensive safety and health program is to identify physical and health hazards in the workplace. This process is known as a "hazard assessment."

Potential hazards may be physical or health-related and a comprehensive hazard assessment should identify hazards in both categories. Examples of physical hazards include moving objects, fluctuating temperatures, high intensity lighting, rolling or pinching objects, electrical connections and sharp edges. Examples of health hazards include overexposure to harmful dusts, chemicals or radiation.

The hazard assessment should begin with a walk-through survey of the facility to develop a list of potential hazards in the following basic hazard categories:

- Impact,
- Penetration,
- Compression (roll-over),
- Chemical,
- Heat/cold,
- Harmful dust,
- Light (optical) radiation, and

- Biologic.

In addition to noting the basic layout of the facility and reviewing any history of occupational illnesses or injuries, things to look for during the walk-through survey include:

- Sources of electricity.
- Sources of motion such as machines or processes where movement may exist that could result in an impact between personnel and equipment.
- Sources of high temperatures that could result in burns, eye injuries or fire.
- Types of chemicals used in the workplace.
- Sources of harmful dusts.
- Sources of light radiation, such as welding, brazing, cutting, furnaces, heat treating, high intensity lights, etc.
- The potential for falling or dropping objects.
- Sharp objects that could poke, cut, stab or puncture.
- Biologic hazards such as blood or other potentially infected material.

When the walk-through is complete, the employer should organize and analyze the data so that it may be efficiently used in determining the proper types of PPE required at the worksite. The employer should become aware of the different types of PPE available and the levels of protection offered. It is definitely a good idea to select PPE that will provide a level of protection greater than the minimum required to protect employees from hazards.

The workplace should be periodically reassessed for any changes in conditions, equipment or operating procedures that could affect occupational hazards. This periodic reassessment should also include a review of injury and illness records to spot any trends or areas of concern and taking appropriate corrective action. The suitability of existing PPE, including an evaluation of its condition and age, should be included in the reassessment.

Documentation of the hazard assessment is required through a written certification that includes the following information:

- Identification of the workplace evaluated;
- Name of the person conducting the assessment;
- Date of the assessment; and

- Identification of the document certifying completion of the hazard assessment.
- 

**2.) The process of identifying physical and health hazards in the workplace is known as:**

- a. Hazard Assessment
- b. Protection Program
- c. Laser Operations
- d. All of the above

**3.) An example of a physical hazards includes:**

- a. Overexposure to dust
- b. Overexposure to chemicals
- c. Moving objects
- d. All of the above

**4.) An example of a health hazard includes:**

- a. High intensity lighting
- b. Overexposure to harmful radiation
- c. Rolling objects
- d. Sharp edges

**5.) Documentation of the hazard assessment is required through a written certification that includes the following information:**

- a. Identification of the workplace evaluated
  - b. Name of the person conducting the assessment
  - c. Date of the assessment
  - d. All of the above
- 

### **Selecting PPE**

All PPE clothing and equipment should be of safe design and construction, and should be maintained in a clean and reliable fashion. Employers should take the fit and comfort of PPE into consideration when selecting appropriate items for their workplace. PPE that fits well and is comfortable to wear will encourage employee use of PPE. Most protective devices are available in multiple sizes and care should be taken to select the proper size for each employee. If several different types of PPE are worn together, make sure they are compatible. If PPE does not fit properly, it can make the difference between being safely covered or dangerously exposed. It may not provide the level of protection desired and may discourage employee use.

OSHA requires that many categories of PPE meet or be equivalent to standards developed by the American National Standards Institute (ANSI). ANSI has been preparing safety standards since

the 1920s, when the first safety standard was approved to protect the heads and eyes of industrial workers. Employers who need to provide PPE in the categories listed below must make certain that any new equipment procured meets the cited ANSI standard. Existing PPE stocks must meet the ANSI standard in effect at the time of its manufacture or provide protection equivalent to PPE manufactured to the ANSI criteria. Employers should inform employees who provide their own PPE of the employer's selection decisions and ensure that any employee-owned PPE used in the workplace conforms to the employer's criteria, based on the hazard assessment, OSHA requirements and ANSI standards. OSHA requires PPE to meet the following ANSI standards:

- Eye and Face Protection: ANSI Z87.1-1989 (USA Standard for Occupational and Educational Eye and Face Protection).
- Head Protection: ANSI Z89.1-1986.
- Foot Protection: ANSI Z41.1-1991.

For hand protection, there is no ANSI standard for gloves but OSHA recommends that selection be based upon the tasks to be performed and the performance and construction characteristics of the glove material. For protection against chemicals, glove selection must be based on the chemicals encountered, the chemical resistance and the physical properties of the glove material.

---

**6.) For hand protection, which is the ANSI standard that applies for gloves:**

- a. Z89.1-1986
- b. Z41.1-1991
- c. Z27.1-1990
- d. There is no ANSI standard for gloves

---

**Training Employees in the Proper Use of PPE**

Employers are required to train each employee who must use PPE. Employees must be trained to know at least the following:

- When PPE is necessary.
- What PPE is necessary.
- How to properly put on, take off, adjust and wear the PPE.
- The limitations of the PPE.
- Proper care, maintenance, useful life and disposal of PPE.

Employers should make sure that each employee demonstrates an understanding of the PPE training as well as the ability to properly wear and use PPE before they are allowed to perform work requiring the use of the PPE. If an employer believes that a previously trained employee is not demonstrating the proper understanding and skill level in the use of PPE, that employee should receive retraining. Other situations that require additional or retraining of employees include the following circumstances: changes in the workplace or in the type of required PPE that make prior training obsolete.

The employer must document the training of each employee required to wear or use PPE by preparing a certification containing the name of each employee trained, the date of training and a clear identification of the subject of the certification.

---

**7.) Employers are required to train each employee who must use PPE:**

- a. True
  - b. False
- 

### **Eye and Face Protection**

Employees can be exposed to a large number of hazards that pose danger to their eyes and face. OSHA requires employers to ensure that employees have appropriate eye or face protection if they are exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, potentially infected material or potentially harmful light radiation.

Many occupational eye injuries occur because workers are not wearing any eye protection while others result from wearing improper or poorly fitting eye protection. Employers must be sure that their employees wear appropriate eye and face protection and that the selected form of protection is appropriate to the work being performed and properly fits each worker exposed to the hazard.

### **Prescription Lenses**

Everyday use of prescription corrective lenses will not provide adequate protection against most occupational eye and face hazards, so employers must make sure that employees with corrective lenses either wear eye protection that incorporates the prescription into the design or wear additional eye protection over their prescription lenses. It is important to ensure that the protective eyewear does not disturb the proper positioning of the prescription lenses so that the employee's vision will not be inhibited or limited. Also, employees who wear contact lenses must wear eye or face PPE when working in hazardous conditions.

### **Eye Protection for Exposed Workers**

OSHA suggests that eye protection be routinely considered for use by carpenters, electricians, machinists, mechanics, millwrights, plumbers and pipefitters, sheet metal workers and tinsmiths, assemblers, sanders, grinding machine operators, sawyers, welders, laborers, chemical process operators and handlers, and timber cutting and logging workers. Employers of workers in other

job categories should decide whether there is a need for eye and face PPE through a hazard assessment.

Examples of potential eye or face injuries include:

- Dust, dirt, metal or wood chips entering the eye from activities such as chipping, grinding, sawing, hammering, the use of power tools or even strong wind forces.
- Chemical splashes from corrosive substances, hot liquids, solvents or other hazardous solutions.
- Objects swinging into the eye or face, such as tree limbs, chains, tools or ropes.
- Radiant energy from welding, harmful rays from the use of lasers or other radiant light (as well as heat, glare, sparks, splash and flying particles).

### **Types of Eye Protection**

Selecting the most suitable eye and face protection for employees should take into consideration the following elements:

1. Ability to protect against specific workplace hazards.
2. Should fit properly and be reasonably comfortable to wear.
3. Should provide unrestricted vision and movement.
4. Should be durable and cleanable.
5. Should allow unrestricted functioning of any other required PPE.

The eye and face protection selected for employee use must clearly identify the manufacturer. Any new eye and face protective devices must comply with ANSI Z87.1-1989 or be at least as effective as this standard requires. Any equipment purchased before this requirement took effect on July 5, 1994, must comply with the earlier ANSI Standard (ANSI Z87.1-1968) or be shown to be equally effective.

An employer may choose to provide one pair of protective eyewear for each position rather than individual eyewear for each employee. If this is done, the employer must make sure that employees disinfect shared protective eyewear after each use. Protective eyewear with corrective lenses may only be used by the employee for whom the corrective prescription was issued and may not be shared among employees.

Some of the most common types of eye and face protection include the following:

- **Safety spectacles.** These protective eyeglasses have safety frames constructed of metal or plastic and impact-resistant lenses. Side shields are available on some models.

- **Goggles.** These are tight-fitting eye protection that completely cover the eyes, eye sockets and the facial area immediately surrounding the eyes and provide protection from impact, dust and splashes. Some goggles will fit over corrective lenses.
- **Welding shields.** Constructed of vulcanized fiber or fiberglass and fitted with a filtered lens, welding shields protect eyes from burns caused by infrared or intense radiant light; they also protect both the eyes and face from flying sparks, metal spatter and slag chips produced during welding, brazing, soldering and cutting operations. OSHA requires filter lenses to have a shade number appropriate to protect against the specific hazards of the work being performed in order to protect against harmful light radiation.
- **Laser safety goggles.** These specialty goggles protect against intense concentrations of light produced by lasers. The type of laser safety goggles an employer chooses will depend upon the equipment and operating conditions in the workplace.
- **Face shields.** These transparent sheets of plastic extend from the eyebrows to below the chin and across the entire width of the employee's head. Some are polarized for glare protection. Face shields protect against nuisance dusts and potential splashes or sprays of hazardous liquids but will not provide adequate protection against impact hazards. Face shields used in combination with goggles or safety spectacles will provide additional protection against impact hazards.

Each type of protective eyewear is designed to protect against specific hazards. Employers can identify the specific workplace hazards that threaten employees' eyes and faces by completing a hazard assessment as outlined in the earlier section.

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- 8.) **Everyday use of prescription corrective lenses provides adequate protection against most occupational eye and face hazards.**
- True
  - False
- 9.) **An example of a potential eye or face injury includes:**
- Wood chips entering the eye from chipping or sawing
  - Chemical splashes
  - Objects swinging into the eye or face
  - All of the above
- 10.) **The following is a true statement about eye protection EXCEPT the following:**
- Eye protection must identify the manufacturer
  - An employer must provide eyewear for each employee
  - An employer must provide eyewear for each position
  - Any new eye devices must comply with ANSI

**11.) These protective eyeglasses have safety frames constructed of metal or plastic and impact-resistant lenses:**

- a. Safety spectacles
- b. Goggles
- c. Face shields
- d. Welding shields

**12.) These are tight-fitting eye protection that completely cover the eyes, eye sockets and the facial area immediately surrounding the eyes and provide protection from impact, dust and splashes:**

- a. Safety spectacles
- b. Goggles
- c. Face shields
- d. Welding shields

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### **Welding Operations**

The intense light associated with welding operations can cause serious and sometimes permanent eye damage if operators do not wear proper eye protection. The intensity of light or radiant energy produced by welding, cutting or brazing operations varies according to a number of factors including the task producing the light, the electrode size and the arc current. The following table shows the minimum protective shades for a variety of welding, cutting and brazing operations in general industry and in the shipbuilding industry.

**Table 1**  
**Filter Lenses for Protection Against Radiant Energy**

<b>Operations</b>	<b>Electrode size in 1/32" (0.8mm)</b>	<b>Arc current</b>	<b>Minimum* protective Shade</b>
Shielded metal arc welding	< 3	< 60	7
	3 - 5	60 - 160	8
	5 - 8	160 - 250	10
...	> 8	250 - 550	11
Gas metal arc welding and flux cored arc welding		< 60	7
		60 - 160	10
		160 - 250	10
...		250 - 500	10
Gas tungsten arc welding		< 50	8
		50 - 150	8
...		150 - 500	10
Air carbon (light)		< 500	10
Arc cutting (heavy)		500 - 1,000	11
Plasma arc welding		< 20	6
		20 - 100	8
		100 - 400	10
...		400 - 800	11
Plasma arc cutting (light)**		< 300	8
(medium)**		300 - 400	9
(heavy)**		400 - 800	10
Torch brazing			3
Torch soldering			2
Carbon arc welding			14

**Table 1 (continued)**  
**Filter Lenses for Protection Against Radiant Energy**

<b>Operations</b>	<b>Plate thickness inches</b>	<b>Plate thickness mm</b>	<b>Minimum* protective shade</b>
Gas welding: Light	< 1/8	< 3.2	4
Gas welding: Medium	1/8 - 1/2	3.2 - 12.7	5
Gas welding: Heavy	> 1/2	> 12.7	6
Oxygen cutting: Light	< 1	< 25	3
Oxygen cutting: Medium	1 - 6	25 - 150	4
Oxygen cutting: Heavy	> 6	> 150	5

Source: 29 CFR 1910.133(a)(5).

\* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxy-fuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

\*\* These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the work piece. The construction industry has separate requirements for filter lens protective levels for specific types of welding operations, as indicated in the table below:

**Table 2**

**Construction Industry Requirements for Filter Lens Shade Numbers for Protection Against Radiant Energy**

<b>Welding Operation</b>	<b>Shade Number</b>
Shielded metal-arc welding 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	10
Gas-shielded arc welding (nonferrous) 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	11
Gas-shielded arc welding (ferrous) 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	12
Shielded metal-arc welding 3/16-, 7/32-, 1/4-inch diameter electrodes	12
5/16-, 3/8-inch diameter electrodes	14
Atomic hydrogen welding	10 – 14
Carbon-arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 to 6 inches	4 or 5
Heavy cutting, more than 6 inches	5 or 6
Gas welding (light), up to 1/8-inch	4 or 5
Gas welding (medium), 1/8- to 1/2-inch	5 or 6
Gas welding (heavy), more than 1/2-inch	6 or 8

Source: 29 CFR 1926.102(b)(1).

13.) For heavy gas welding, what is the minimum protective shade number required for filter lenses?

- a. 3
- b. 4
- c. 5
- d. 6

14.) For carbon arc welding, what is the minimum protective shade number required for filter lenses?

- a. 12
- b. 13
- c. 14
- d. 15

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### Laser Operations

Laser light radiation can be extremely dangerous to the unprotected eye and direct or reflected beams can cause permanent eye damage. Laser retinal burns can be painless, so it is essential that all personnel in or around laser operations wear appropriate eye protection.

Laser safety goggles should protect for the specific wavelength of the laser and must be of sufficient optical density for the energy involved. Safety goggles intended for use with laser beams must be labeled with the laser wavelengths for which they are intended to be used, the optical density of those wavelengths and the visible light transmission.

The table below lists maximum power or energy densities and appropriate protection levels for optical densities 5 through 8.

**Table 3**  
**Selecting Laser Safety Glass**

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Intensity, CW maximum power density (watts/cm <sup>2</sup> ) (O.D.)	<u>Attenuation</u>	
	Optical density	Attenuation factor
10-2	5	105
10-1	6	106
1.0	7	107
10.0	8	108

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Source: 29 CFR 1926.102(b)(2).

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**15.) It is essential that all personnel in or around laser operations wear appropriate eye protection.**

- a. True
  - b. False
- 

## **Head Protection**

Protecting employees from potential head injuries is a key element of any safety program. A head injury can impair an employee for life or it can be fatal. Wearing a safety helmet or hard hat is one of the easiest ways to protect an employee's head from injury. Hard hats can protect employees from impact and penetration hazards as well as from electrical shock and burn hazards.

Employers must ensure that their employees wear head protection if any of the following apply:

- Objects might fall from above and strike them on the head;
- They might bump their heads against fixed objects, such as exposed pipes or beams; or
- There is a possibility of accidental head contact with electrical hazards.

Some examples of occupations in which employees should be required to wear head protection include construction workers, carpenters, electricians, linemen, plumbers and pipefitters, timber and log cutters, welders, among many others. Whenever there is a danger of objects falling from above, such as working below others who are using tools or working under a conveyor belt, head protection must be worn. Hard hats must be worn with the bill forward to protect employees properly.

In general, protective helmets or hard hats should do the following:

- Resist penetration by objects.
- Absorb the shock of a blow.
- Be water-resistant and slow burning.
- Have clear instructions explaining proper adjustment and replacement of the suspension and headband.

Hard hats must have a hard outer shell and a shock-absorbing lining that incorporates a headband and straps that suspend the shell from 1 to 1 1/4 inches (2.54 cm to 3.18 cm) away from the head. This type of design provides shock absorption during an impact and ventilation during normal wear.

Protective headgear must meet ANSI Standard Z89.1-1986 (Protective Headgear for Industrial Workers) or provide an equivalent level of protection. Helmets purchased before July 5, 1994 must comply with the earlier ANSI Standard (Z89.1-1969) or provide equivalent protection.

### **Types of Hard Hats**

There are many types of hard hats available in the marketplace today. In addition to selecting protective headgear that meets ANSI standard requirements, employers should ensure that employees wear hard hats that provide appropriate protection against potential workplace hazards. It is important for employers to understand all potential hazards when making this selection, including electrical hazards. This can be done through a comprehensive hazard analysis and an awareness of the different types of protective headgear available.

Hard hats are divided into three industrial classes:

- **Class A hard hats** provide impact and penetration resistance along with limited voltage protection (up to 2,200 volts).
- **Class B hard hats** provide the highest level of protection against electrical hazards, with high-voltage shock and burn protection (up to 20,000 volts). They also provide protection from impact and penetration hazards by flying/falling objects.
- **Class C hard hats** provide lightweight comfort and impact protection but offer no protection from electrical hazards.

Another class of protective headgear on the market is called a “bump hat,” designed for use in areas with low head clearance. They are recommended for areas where protection is needed from head bumps and lacerations. These are not designed to protect against falling or flying objects and are not ANSI approved. It is essential to check the type of hard hat employees are using to ensure that the equipment provides appropriate protection. Each hat should bear a label inside the shell that lists the manufacturer, the ANSI designation and the class of the hat.

### **Size and Care Considerations**

Head protection that is either too large or too small is inappropriate for use, even if it meets all other requirements. Protective headgear must fit appropriately on the body and for the head size of each individual. Most protective headgear comes in a variety of sizes with adjustable headbands to ensure a proper fit (many adjust in 1/8-inch increments). A proper fit should allow sufficient clearance between the shell and the suspension system for ventilation and distribution of an impact. The hat should not bind, slip, fall off or irritate the skin.

Some protective headgear allows for the use of various accessories to help employees deal with changing environmental conditions, such as slots for earmuffs, safety glasses, face shields and mounted lights. Optional brims may provide additional protection from the sun and some hats have channels that guide rainwater away from the face. Protective headgear accessories must not compromise the safety elements of the equipment.

Periodic cleaning and inspection will extend the useful life of protective headgear. A daily inspection of the hard hat shell, suspension system and other accessories for holes, cracks, tears or other damage that might compromise the protective value of the hat is essential. Paints, paint thinners and some cleaning agents can weaken the shells of hard hats and may eliminate electrical resistance. Consult the helmet manufacturer for information on the effects of paint and cleaning materials on their hard hats. Never drill holes, paint or apply labels to protective headgear as this may reduce the integrity of the protection. Do not store protective headgear in direct sunlight, such as on the rear window shelf of a car, since sunlight and extreme heat can damage them.

Hard hats with any of the following defects should be removed from service and replaced:

- Perforation, cracking, or deformity of the brim or shell;
- Indication of exposure of the brim or shell to heat, chemicals or ultraviolet light and other radiation (in addition to a loss of surface gloss, such signs include chalking or flaking).

Always replace a hard hat if it sustains an impact, even if damage is not noticeable. Suspension systems are offered as replacement parts and should be replaced when damaged or when excessive wear is noticed. It is not necessary to replace the entire hard hat when deterioration or tears of the suspension systems are noticed.

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**16.) Which of the following are true statements about safety helmets or hard hats:**

- a. Protect employees from impact hazards
- b. Protect from electrical shock
- c. One of the easiest ways to protect your head
- d. All of the above

**17.) Employers must ensure employees wear head protection if any of the following apply:**

- a. Objects fall from above
- b. They might bump their heads against pipes or beams
- c. Possibility of accidental head contact with electrical hazards
- d. All of the above

**18.) Hard hats must have straps that suspend the shell from \_\_\_\_\_ away from the head:**

- a. 1 to 1 ¼ inches
- b. 1 ¼ to 1 ½ inches
- c. 1 ½ to 1 ¾ inches
- d. 1 ¾ to 3 inches

- 19.) **For protective headgear, which is the ANSI standard that applies:**
- a. Z89.1-1986
  - b. Z41.1-1991
  - c. Z27.1-1990
  - d. There is no ANSI standard for headgear
- 20.) **Hard hats that provide impact and penetration resistance along with limited voltage protection (up to 2,200 volts) are:**
- a. Class A hard hats
  - b. Class B hard hats
  - c. Class C hard hats
  - d. None of the above
- 21.) **Hard hats that provide the highest level of protection against electrical hazards, with high-voltage shock and burn protection (up to 20,000 volts) are:**
- a. Class A hard hats
  - b. Class B hard hats
  - c. Class C hard hats
  - d. None of the above
- 22.) **Hard hats that provide lightweight comfort and impact protection but offer no protection from electrical hazards are:**
- a. Class A hard hats
  - b. Class B hard hats
  - c. Class C hard hats
  - d. None of the above
- 23.) **Bump hats are designed for the following:**
- a. Use in areas with low head clearance
  - b. Designed to protect against falling objects
  - c. Are ANSI approved
  - d. All of the above
- 24.) **Which of the following statements is FALSE about protective headgear:**
- a. Do not store in direct sunlight
  - b. Periodically paint headgear for a longer life
  - c. Never drill holes in headgear
  - d. None of the above
-

## Foot and Leg Protection

Employees, who face possible foot or leg injuries from falling or rolling objects, or from crushing or penetrating materials, should wear protective footwear. Also, employees whose work involves exposure to hot substances or corrosive or poisonous materials must have protective gear to cover exposed body parts, including legs and feet. If an employee's feet may be exposed to electrical hazards, non-conductive footwear should be worn. On the other hand, workplace exposure to static electricity may necessitate the use of conductive footwear.

Examples of situations in which an employee should wear foot and/or leg protection include:

- When heavy objects such as barrels or tools might roll onto or fall on the employee's feet;
- Working with sharp objects such as nails or spikes that could pierce the soles or uppers of ordinary shoes;
- Exposure to molten metal that might splash on feet or legs;
- Working on or around hot, wet or slippery surfaces; and
- Working when electrical hazards are present.

Safety footwear must meet ANSI minimum compression and impact performance standards in ANSI Z41-1991 (American National Standard for Personal Protection-Protective Footwear) or provide equivalent protection. Footwear purchased before July 5, 1994, must meet or provide equivalent protection to the earlier ANSI Standard (ANSI Z41.1-1967). All ANSI approved footwear has a protective toe and offers impact and compression protection. But the type and amount of protection is not always the same.

Different footwear protects in different ways. Check the product's labeling or consult the manufacturer to make sure the footwear will protect the user from the hazards they face.

Foot and leg protection choices include the following:

- **Leggings** protect the lower legs and feet from heat hazards such as molten metal or welding sparks. Safety snaps allow leggings to be removed quickly.
- **Metatarsal guards** protect the instep area from impact and compression. Made of aluminum, steel, fiber or plastic, these guards may be strapped to the outside of shoes.
- **Toe guards** fit over the toes of regular shoes to protect the toes from impact and compression hazards. They may be made of steel, aluminum or plastic.
- **Combination foot and shin guards** protect the lower legs and feet, and may be used in combination with toe guards when greater protection is needed.

- **Safety shoes** have impact-resistant toes and heat-resistant soles that protect the feet against hot work surfaces common in roofing, paving and hot metal industries. The metal insoles of some safety shoes protect against puncture wounds. Safety shoes may also be designed to be electrically conductive to prevent the buildup of static electricity in areas with the potential for explosive atmospheres or nonconductive to protect workers from workplace electrical hazards.

### **Special Purpose Shoes**

**Electrically conductive shoes** provide protection against the buildup of static electricity. Employees working in explosive and hazardous locations such as explosives manufacturing facilities or grain elevators must wear conductive shoes to reduce the risk of static electricity buildup on the body that could produce a spark and cause an explosion or fire. Foot powder should not be used in conjunction with protective conductive footwear because it provides insulation, reducing the conductive ability of the shoes. Silk, wool and nylon socks can produce static electricity and should not be worn with conductive footwear. Conductive shoes must be removed when the task requiring their use is completed.

Note: Employees exposed to electrical hazards must never wear conductive shoes.

**Electrical hazard, safety-toe shoes** are nonconductive and will prevent the wearers' feet from completing an electrical circuit to the ground. These shoes can protect against open circuits of up to 600 volts in dry conditions and should be used in conjunction with other insulating equipment and additional precautions to reduce the risk of a worker becoming a path for hazardous electrical energy. The insulating protection of electrical hazard, safety-toe shoes may be compromised if the shoes become wet, the soles are worn through, metal particles become embedded in the sole or heel, or workers touch conductive, grounded items.

Note: Nonconductive footwear must not be used in explosive or hazardous locations.

### **Foundry Shoes**

In addition to insulating the feet from the extreme heat of molten metal, foundry shoes keep hot metal from lodging in shoe eyelets, tongues or other shoe parts. These snug-fitting leather or leather-substitute shoes have leather or rubber soles and rubber heels. All foundry shoes must have built-in safety toes.

### **Care of Protective Footwear**

As with all protective equipment, safety footwear should be inspected prior to each use. Shoes and leggings should be checked for wear and tear at reasonable intervals. This includes looking for cracks or holes, separation of materials, broken buckles or laces.

The soles of shoes should be checked for pieces of metal or other embedded items that could present electrical or tripping hazards. Employees should follow the manufacturers' recommendations for cleaning and maintenance of protective footwear.

- 25.) **For safety footwear, which is the ANSI standard that applies:**
- a. Z89-1986
  - b. Z41-1991
  - c. Z27-1990
  - d. There is no ANSI standard for footwear
- 26.) \_\_\_\_\_ **protect the lower legs and feet from heat hazards such as molten metal or welding sparks.**
- a. Toe guards
  - b. Metatarsal guards
  - c. Leggings
  - d. Combination foot and shin guards
- 27.) \_\_\_\_\_ **protect the lower legs and feet, and may be used in combination with toe guards when greater protection is needed.**
- a. Toe guards
  - b. Metatarsal guards
  - c. Leggings
  - d. Combination foot and shin guards
- 28.) \_\_\_\_\_ **fit over the toes of regular shoes to protect the toes from impact and compression hazards. They may be made of steel, aluminum or plastic.**
- a. Toe guards
  - b. Metatarsal guards
  - c. Leggings
  - d. Combination foot and shin guards
- 29.) \_\_\_\_\_ **protect the instep area from impact and compression. Made of aluminum, steel, fiber or plastic, these guards may be strapped to the outside of shoes.**
- a. Toe guards
  - b. Metatarsal guards
  - c. Leggings
  - d. Combination foot and shin guards

**30.) The following type of shoes must keep hot metal from lodging in shoe eyelets and protect from the extreme heat of molten metal:**

- a. Safety shoes
- b. Electrically conductive shoes
- c. Toe guards
- d. Foundry shoes

**31.) Electrical hazard, safety-toe shoes can protect against open circuits of up to \_\_\_\_\_ volts in dry conditions:**

- a. 500
- b. 600
- c. 750
- d. 1,000

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## **Hand and Arm Protection**

If a workplace hazard assessment reveals that employees face potential injury to hands and arms that cannot be eliminated through engineering and work practice controls, employers must ensure that employees wear appropriate protection. Potential hazards include skin absorption of harmful substances, chemical or thermal burns, electrical dangers, bruises, abrasions, cuts, punctures, fractures and amputations. Protective equipment includes gloves, finger guard and arm coverings or elbow-length gloves.

Employers should explore all possible engineering and work practice controls to eliminate hazards and use PPE to provide additional protection against hazards that cannot be completely eliminated through other means. For example, machine guards may eliminate a hazard. Installing a barrier to prevent workers from placing their hands at the point of contact between a table saw blade and the item being cut is another method.

### **Types of Protective Gloves**

There are many types of gloves available today to protect against a wide variety of hazards. The nature of the hazard and the operation involved will affect the selection of gloves. The variety of potential occupational hand injuries makes selecting the right pair of gloves challenging. It is essential that employees use gloves specifically designed for the hazards and tasks found in their workplace because gloves designed for one function may not protect against a different function even though they may appear to be an appropriate protective device.

The following are examples of some factors that may influence the selection of protective gloves for a workplace.

- Type of chemicals handled.
- Nature of contact (total immersion, splash, etc.).

- Duration of contact.
- Area requiring protection (hand only, forearm, arm).
- Grip requirements (dry, wet, oily).
- Thermal protection.
- Size and comfort.
- Abrasion/resistance requirements.

Gloves made from a wide variety of materials are designed for many types of workplace hazards. In general, gloves fall into four groups:

1. Gloves made of leather, canvas or metal mesh;
2. Fabric and coated fabric gloves;
3. Chemical- and liquid-resistant gloves;
4. Insulating rubber gloves

### **Leather, Canvas or Metal Mesh Gloves**

Sturdy gloves made from metal mesh, leather or canvas provides protection against cuts and burns. Leather or canvass gloves also protect against sustained heat.

- **Leather gloves** protect against sparks, moderate heat, blows, chips and rough objects.
- **Aluminized gloves** provide reflective and insulating protection against heat and require an insert made of synthetic materials to protect against heat and cold.
- **Aramid fiber gloves** protect against heat and cold, are cut-resistant and abrasive-resistant. They also wear well.
- **Synthetic gloves** of various materials offer protection against heat and cold are cut-resistant and abrasive-resistant and may withstand some diluted acids. These materials do not stand up against alkalis and solvents.

### **Fabric and Coated Fabric Gloves**

Fabric and coated fabric gloves are made of cotton or other fabric to provide varying degrees of protection.

- **Fabric gloves** protect against dirt, slivers, chafing and abrasions. They do not provide sufficient protection for use with rough, sharp or heavy materials. Adding a plastic coating will strengthen some fabric gloves.
- **Coated fabric gloves** are normally made from cotton flannel with napping on one side. By coating the unnapped side with plastic, fabric gloves are transformed into general-purpose hand protection offering slip-resistant qualities. These gloves are used for tasks ranging from handling bricks and wire to chemical laboratory containers. When selecting gloves to protect against chemical exposure hazards, always check with the manufacturer or review the manufacturer's product literature to determine the gloves' effectiveness against specific workplace chemicals and conditions.

### **Chemical- and Liquid-Resistant Gloves**

Chemical-resistant gloves are made with different kinds of rubber: natural, butyl, neoprene, nitrile and fluorocarbon (viton); or various kinds of plastic: polyvinyl chloride (PVC), polyvinyl alcohol and polyethylene. These materials can be blended or laminated for better performance. As a general rule, the thicker the glove material, the greater the chemical resistance but thick gloves may impair grip and dexterity, having a negative impact on safety.

Some examples of chemical-resistant gloves include:

- **Butyl gloves** are made of a synthetic rubber and protect against a wide variety of chemicals, such as peroxide, rocket fuels, highly corrosive acids (nitric acid, sulfuric acid, hydrofluoric acid and red-fuming nitric acid), strong bases, alcohols, aldehydes, ketones, esters and nitro compounds. Butyl gloves also resist oxidation, ozone corrosion and abrasion, and remain flexible at low temperatures. Butyl rubber does not perform well with aliphatic and aromatic hydrocarbons and halogenated solvents.
- **Natural (latex) rubber gloves** are comfortable to wear, which makes them a popular general-purpose glove. They feature outstanding tensile strength, elasticity and temperature resistance. In addition to resisting abrasions caused by grinding and polishing, these gloves protect workers' hands from most water solutions of acids, alkalis, salts and ketones. Latex gloves have caused allergic reactions in some individuals and may not be appropriate for all employees. Hypoallergenic gloves, glove liners and powderless gloves are possible alternatives for workers who are allergic to latex gloves.
- **Neoprene gloves** are made of synthetic rubber and offer good pliability, finger dexterity, and high density and tear resistance. They protect against hydraulic fluids, gasoline, alcohols, organic acids and alkalis. They generally have chemical and wear resistance properties superior to those made of natural rubber.
- **Nitrile gloves** are made of a copolymer and provide protection from chlorinated solvents such as trichloroethylene and perchloroethylene. Although intended for jobs requiring dexterity and sensitivity, nitrile gloves stand up to heavy use even after prolonged exposure to substances that cause other gloves to deteriorate. They offer protection when working with oils, greases, acids, caustics and alcohols but are generally not

recommended for use with strong oxidizing agents, aromatic solvents, ketones and acetates.

Note: When selecting chemical-resistant gloves be sure to consult the manufacturer's recommendations, especially if the gloved hand(s) will be immersed in the chemical.

### **Care of Protective Gloves**

Protective gloves should be inspected before each use to ensure that they are not torn, punctured or made ineffective in any way. A visual inspection will help detect cuts or tears but a more thorough inspection by filling the gloves with water and tightly rolling the cuff towards the fingers will help reveal any pinhole leaks. Gloves that are discolored or stiff may also indicate deficiencies caused by excessive use or degradation from chemical exposure.

Any gloves with impaired protective ability should be discarded and replaced. Reuse of chemical-resistant gloves should be evaluated carefully, taking into consideration the absorptive qualities of the gloves. A decision to reuse chemically-exposed gloves should take into consideration the toxicity of the chemicals involved and factors such as duration of exposure, storage and temperature.

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**32.) Which of the following is considered protective hand and arm protection?**

- a. Gloves
- b. Finger guards
- c. Arm coverings
- d. All of the above

**33.) The following are examples of factors that may influence the selection of protective gloves:**

- a. Type of chemicals handled
- b. Thermal protection
- c. Duration of contact
- d. All of the above

**34.) \_\_\_\_\_ protect against sparks, moderate heat, blows, chips and rough objects.**

- a. Leather gloves
- b. Aluminized gloves
- c. Aramid fiber gloves
- d. Synthetic gloves

35.) \_\_\_\_\_ provide reflective and insulating protection against heat and require an insert made of synthetic materials to protect against heat and cold.

- a. Leather gloves
- b. Aluminized gloves
- c. Aramid fiber gloves
- d. Synthetic gloves

36.) \_\_\_\_\_ of various materials offer protection against heat and cold are cut-resistant and abrasive-resistant and may withstand some diluted acids. These materials do not stand up against alkalis and solvents.

- a. Leather gloves
- b. Aluminized gloves
- c. Aramid fiber gloves
- d. Synthetic gloves

37.) \_\_\_\_\_ protect against heat and cold, are cut-resistant and abrasive-resistant. They also wear well.

- a. Leather gloves
- b. Aluminized gloves
- c. Aramid fiber gloves
- d. Synthetic gloves

38.) Some examples of chemical resistant gloves are:

- a. Neoprene gloves
- b. Coated fabric gloves
- c. Leather gloves
- d. All of the above

---

## **Body Protection**

---

Employees who face possible bodily injury of any kind that cannot be eliminated through engineering, work practice or administrative controls, must wear appropriate body protection while performing their jobs. In addition to cuts and radiation, the following are examples of workplace hazards that could cause bodily injury:

- Temperature extremes;
- Hot splashes from molten metal's and other hot liquids;
- Potential impacts from tools, machinery and materials;
- Hazardous chemicals.

There are many varieties of protective clothing available for specific hazards. Employers are required to ensure that their employees wear personal protective equipment only for the parts of the body exposed to possible injury. Examples of body protection include laboratory coats, coveralls, vests, jackets, aprons, surgical gowns and full body suits.

If a hazard assessment indicates a need for full body protection against toxic substances or harmful physical agents, the clothing should be carefully inspected before each use, it must fit each worker properly and it must function properly and for the purpose for which it is intended.

Protective clothing comes in a variety of materials, each effective against particular hazards, such as:

- **Paper-like fiber** used for disposable suits provides protection against dust and splashes.
- **Treated wool and cotton** adapts well to changing temperatures, is comfortable and fire-resistant and protects against dust, abrasions and rough and irritating surfaces.
- **Duck** is a closely woven cotton fabric that protects against cuts and bruises when handling heavy, sharp or rough materials.
- **Leather** is often used to protect against dry heat and flames.
- **Rubber, rubberized fabrics, neoprene and plastics** protect against certain chemicals and physical hazards. When chemical or physical hazards are present, check with the clothing manufacturer to ensure that the material selected will provide protection against the specific hazard.

## **Hearing Protection**

---

Determining the need to provide hearing protection for employees can be challenging. Employee exposure to excessive noise depends upon a number of factors, including:

- The loudness of the noise as measured in decibels (dB).
- The duration of each employee's exposure to the noise.
- Whether employees move between work areas with different noise levels.
- Whether noise is generated from one or multiple sources.

Generally, the louder the noise, the shorter the exposure time before hearing protection is required. For instance, employees may be exposed to a noise level of 90 dB for 8 hours per day (unless they experience a Standard Threshold Shift) before hearing protection is required. On the other hand, if the noise level reaches 115 dB hearing protection is required if the anticipated exposure exceeds 15 minutes.

Table 4, below, shows the permissible noise exposures that require hearing protection for employees exposed to occupational noise at specific decibel levels for specific time periods. Noises are considered continuous if the interval between occurrences of the maximum noise level is one second or less. Noises not meeting this definition are considered impact or impulse noises (loud momentary explosions of sound) and exposures to this type of noise must not exceed 140 dB. Examples of situations or tools that may result in impact or impulse noises are powder-actuated nail guns, a punch press or drop hammers.

**Table 4**  
**Permissible Noise Exposures**

Duration per day, in hours	Sound level in dB*
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

\*When measured on the A scale of a standard sound level meter at slow response.  
Source: 29 CFR 1910.95, Table G-16.

If engineering and work practice controls do not lower employee exposure to workplace noise to acceptable levels, employees must wear appropriate hearing protection. It is important to understand that hearing protectors reduce only the amount of noise that gets through to the ears. The amount of this reduction is referred to as attenuation, which differs according to the type of hearing protection used and how well it fits. Hearing protectors worn by employees must reduce an employee's noise exposure to within the acceptable limits noted in Table 5.

Manufacturers of hearing protection devices must display the device's NRR on the product packaging. If employees are exposed to occupational noise at or above 85 dB averaged over an eight hour period, the employer is required to institute a hearing conservation program that includes regular testing of employees' hearing by qualified professionals.

Some types of hearing protection include:

- **Single-use earplugs** are made of waxed cotton, foam, silicone rubber or fiberglass wool. They are self-forming and, when properly inserted, they work as well as most molded earplugs.

- **Pre-formed or molded earplugs** must be individually fitted by a professional and can be disposable or reusable. Reusable plugs should be cleaned after each use.
  - **Earmuffs** require a perfect seal around the ear. Glasses, facial hair, long hair or facial movements such as chewing may reduce the protective value of earmuffs.
- 

**39.) Employees must be exposed to the following decibels over an 8 period before hearing protection is required:**

- a. 90 dB
- b. 95 dB
- c. 100 dB
- d. 105 dB

**40.) Employees must be exposed to the following decibels over a 4 hour period before hearing protection is required:**

- a. 90 dB
  - b. 95 dB
  - c. 100 dB
  - d. 105 dB
- 

### **OSHA Assistance**

OSHA can provide extensive help through a variety of programs, including technical assistance about effective safety and health programs, state plans, workplace consultations, voluntary protection programs, strategic partnerships, training and education, and more. An overall commitment to workplace safety and health can add value to your business, to your workplace and to your life.

### **Safety and Health Program Management Guidelines**

Effective management of worker safety and health protection is a decisive factor in reducing the extent and severity of work-related injuries and illnesses and their related costs. In fact, an effective safety and health program forms the basis of good worker protection and can save time and money (about \$4 for every dollar spent) and increase productivity and reduce worker injuries, illnesses and related workers' compensation costs.

To assist employers and employees in developing effective safety and health programs, OSHA published recommended Safety and Health Program Management Guidelines. These voluntary guidelines apply to all places of employment covered by OSHA.

The guidelines identify four general elements critical to the development of a successful safety and health management program:

- Management leadership and employee involvement.
- Work analysis.
- Hazard prevention and control.
- Safety and health training.

The guidelines recommend specific actions, under each of these general elements, to achieve an effective safety and health program.

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## PERSONAL PROTECTIVE EQUIPMENT – ANSWER SHEET

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_ Date: \_\_\_\_\_

Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ ZIP: \_\_\_\_\_

Wisconsin ID (e.g. Master Plumber #): \_\_\_\_\_

Phone: \_\_\_\_\_ Email: \_\_\_\_\_

### PPE

T F

1.  a  b  c  d
2.  a  b  c  d
3.  a  b  c  d
4.  a  b  c  d
5.  a  b  c  d
6.  a  b  c  d
7.  a  b  c  d
8.  a  b  c  d
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16.  a  b  c  d
17.  a  b  c  d
18.  a  b  c  d
19.  a  b  c  d
20.  a  b  c  d

### PPE

T F

21.  a  b  c  d
  22.  a  b  c  d
  23.  a  b  c  d
  24.  a  b  c  d
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  36.  a  b  c  d
  37.  a  b  c  d
  38.  a  b  c  d
  39.  a  b  c  d
  40.  a  b  c  d
-

**Wisconsin Contractors Institute**  
**OSHA Training Series**

Dwelling Contractor Qualifier  
Continuing Education

**Fall Protection in Construction**

**(Course #12605) – 3 hours**

# Fall Protection in Construction

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## **Why Does OSHA Have a Standard for Fall Protection?**

In the construction industry in the U.S., falls are the leading cause of worker fatalities. Each year, on average, between 150 and 200 workers are killed and more than 100,000 are injured as a result of falls at construction sites. OSHA recognizes that accidents involving falls are generally complex events frequently involving a variety of factors. Consequently, the standard for fall protection deals with both the human and equipment-related issues in protecting workers from fall hazards.

For example, employers and employees need to do the following:

- Select fall protection systems appropriate for given situations.
- Use proper construction and installation of safety systems.
- Supervise employees properly.
- Use safe work procedures.
- Train workers in the proper selection, use, and maintenance of fall protection systems.

A number of factors are often involved in falls, including unstable work surfaces, misuse or failure to use fall protection equipment and human error. Studies have shown that using guardrails, fall arrest systems, safety nets, covers and restraint systems can prevent many deaths and injuries from falls.

The purpose of this course is to get you familiar with OSHA's construction safety standard for fall protection 29 CFR, Subpart M.

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**1.) According to OSHA, approximately how many workers are injured each year due to falls at construction sites?**

- a. 100
- b. 1,000
- c. 10,000
- d. 100,000

**2.) OSHA's construction safety standard for fall from protection can be found in which Subpart of 29 CFR?**

- a. L
- b. M
- c. N
- d. O

**3.) According to OSHA, approximately how many workers are killed at construction sites due to falls?**

- a. Between 15 and 20
- b. Between 150 and 200
- c. Over 500
- d. Zero

**4.) Which of the following can be a factor that results in a fall?**

- a. Unstable work surface
- b. Misuse of equipment
- c. Human error
- d. All of the above

---

## **Fall Protection in Construction**

OSHA has construction industry safety standards, set forth in *Title 29 Code of Federal Regulations*, Subpart M, Fall Protection, 1926.500(a), 1926.501, 1926.502, and 1926.503, and developed systems and procedures designed to prevent employees from falling off, onto, or through working levels and to protect employees from being struck by falling objects. The performance-oriented requirements make it easier for employers to provide the necessary protection.

The rule covers most construction workers except those inspecting, investigating, or assessing workplace conditions prior to the actual start of work or after all work has been completed.

The rule identifies areas or activities where fall protection is needed. These include, but are not limited to, ramps, runways, and other walkways, excavations, hoist areas, holes, formwork and reinforcing steel, leading edge work, unprotected sides and edges, overhand bricklaying and related work, roofing work, precast concrete erection, wall openings, residential construction, and other walking/working surfaces. The rule sets a uniform threshold height of 6 feet (1.8 meters), thereby providing consistent protection. This means that construction employers must protect their employees from fall hazards and falling objects whenever an affected employee is 6 feet (1.8 meters) or more above a lower level. Protection also must be provided for construction workers who are exposed to the hazard of falling into dangerous equipment.

Under the standard, employers are able to select fall protection measures compatible with the type of work being performed. Fall protection generally can be provided through the use of guardrail systems, safety net systems, personal fall arrest systems, positioning device systems, and warning line systems, among others.

The OSHA rule clarifies what an employer must do to provide fall protection for employees, such as identifying and evaluating fall hazards and providing specific training. Requirements to

provide fall protection for workers on scaffolds and ladders and for workers engaged in steel erection of buildings are covered in other subparts of OSHA regulations.

The standard prescribes the duty to provide fall protection, sets the criteria and practices for fall protection systems, and requires training. It covers hazard assessment and fall protection and safety monitoring systems. Also addressed are controlled access zones, safety nets, and guardrail, personal fall arrest, warning line, and positioning device systems.

Under *29 CFR Subpart M, Fall Protection, 1926.501*, employers must assess the workplace to determine if the walking or working surfaces on which employees are to work have the strength and structural integrity to safely support workers. Employees are not permitted to work on those surfaces until it has been determined that the surfaces have the requisite strength and structural integrity to support the workers. Once employers have determined that the surface is safe for employees to work on, the employer must select one of the options listed for the work operation if a fall hazard is present.

For example, if an employee is exposed to falling 6 feet (1.8 meters) or more from an unprotected side or edge, the employer must select a guardrail system, safety net system, or personal fall arrest system to protect the worker.

Similar requirements are prescribed for other fall hazards as follows:

---

**5.) Construction employers are required to protect employees from fall hazards \_\_\_\_\_ feet or more above a lower level?**

- a. 4
- b. 5
- c. 6
- d. 7

---

**Controlled Access Zones - 1926.502(g)**

A controlled access zone is a work area designated and clearly marked in which certain types of work (such as overhand bricklaying) may take place without the use of conventional fall protection systems—guardrail, personal arrest or safety net—to protect the employees working in the zone.

Controlled access zones are used to keep out workers other than those authorized to enter work areas from which guardrails have been removed. Where there are no guardrails, masons are the only workers allowed in controlled access zones.

**What Are the Requirements of the Standard?**

Controlled access zones, when created to limit entrance to areas where leading edge work and other operations are taking place, must be defined by a control line or by any other means that

restrict access. Control lines shall consist of ropes, wires, tapes or equivalent materials, and supporting stanchions, and each must be:

- Flagged or otherwise clearly marked at not more than 6-foot (1.8 meters) intervals with high-visibility material.
- Rigged and supported in such a way that the lowest point (including sag) is not less than 39 inches (1 meter) from the walking/working surface and the highest point is not more than 45 inches (1.3 meters)—nor more than 50 inches (1.3 meters) when overhand bricklaying operations are being performed—from the walking/working surface.
- Strong enough to sustain stress of not less than 200 pounds. Control lines shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge.
- Control lines also must be connected on each side to a guardrail system or wall.

When control lines are used, they shall be erected not less than 6 feet (1.8 meters) nor more than 25 feet (7.6 meters) from the unprotected or leading edge, except when precast concrete members are being erected. In the latter case, the control line is to be erected not less than 6 feet (1.8 meters) or more than 60 feet (18 meters) or half the length of the member being erected, whichever is less, from the leading edge.

Controlled access zones when used to determine access to areas where overhand bricklaying and related work are taking place are to be defined by a control line erected not less than 10 feet (3 meters) nor more than 15 feet (4.6 meters) from the working edge. Additional control lines must be erected at each end to enclose the controlled access zone. Only employees engaged in overhand bricklaying or related work is permitted in the controlled access zones.

On floors and roofs where guardrail systems are not in place prior to the beginning of overhand bricklaying operations, controlled access zones must be enlarged as necessary to enclose all points of access, material handling areas, and storage areas.

On floors and roofs where guardrail systems are in place, but need to be removed to allow overhand bricklaying work or leading edge work to take place, only that portion of the guardrail necessary to accomplish that day's work shall be removed.

---

**6.) In a controlled access zone with no guardrails, which profession are the only workers allowed in the zone?**

- a. Masons
- b. Plumbers
- c. Electricians
- d. All of the above

**7.) Control lines in a controlled access zone must be flagged or clearly marked at what intervals?**

- a. Not more than 5 foot
- b. Not more than 6 foot
- c. Not more than 7 foot
- d. Not more than 8 foot

**8.) Control lines in a controlled access zone must be strong enough to sustain stress of how much weight?**

- a. Not less than 200 pounds
- b. Not less than 250 pounds
- c. Not less than 300 pounds
- d. Not less than 400 pounds

**9.) Control lines must be connected on each side to a guardrail system or wall.**

- a. True
- b. False

---

### **Excavations - 1926.501(b)(7)**

Each employee at the edge of an excavation 6 feet (1.8 meters) or more deep shall be protected from falling by guardrail systems, fences, barricades, or covers. Where walkways are provided to permit employees to cross over excavations, guardrails are required on the walkway if the fall would be 6 feet (1.8 meters) or more to the lower level.

### **Fall Protection Systems Criteria and Practices**

#### ***Covers - 1926.502(i)***

Covers located in roadways and vehicular aisles must be able to support at least twice the maximum axle load of the largest vehicle to which the cover might be subjected. All other covers must be able to support at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time. To prevent accidental displacement resulting from wind, equipment, or workers' activities, all covers must be secured. All covers shall be color coded or bear the markings "HOLE" or "COVER."

#### ***Guardrail Systems - 1926.501(502(b)***

If the employer chooses to use guardrail systems to protect workers from falls, the systems must meet the following criteria. Toprails and midrails of guardrail systems must be at least one-quarter inch (0.6 centimeters) nominal diameter or thickness to prevent cuts and lacerations. If wire rope is used for toprails, it must be flagged at not more 6 feet intervals (1.8 meters) with high-visibility material. Steel and plastic banding cannot be used as toprails or midrails. Manila, plastic, or synthetic rope used for toprails or midrails must be inspected as frequently as necessary to ensure strength and stability.

The top edge height of top rails or (equivalent) guardrails must be 42 inches (1.1 meters) plus or minus 3 inches (8 centimeters), above the walking/working level. When workers are using stilts, the top edge height of the top rail, or equivalent member, must be increased an amount equal to the height of the stilts.

Screens, midrails, mesh, intermediate vertical members, or equivalent intermediate structural members must be installed between the top edge of the guardrail system and the walking/working surface when there are no walls or parapet walls at least 21 inches (53 centimeters) high. When midrails are used, they must be installed at a height midway between the top edge of the guardrail system and the walking/working level. When screens and mesh are used, they must extend from the top rail to the walking/working level and along the entire opening between top rail supports. Intermediate members, such as balusters, when used between posts, shall not be more than 19 inches (48 centimeters) apart.

Other structural members, such as additional midrails and architectural panels, shall be installed so that there are no openings in the guardrail system more than 19 inches (48 centimeters).

The guardrail system must be capable of withstanding a force of at least 200 pounds applied within 2 inches of the top edge in any outward or downward direction. When the 200 pound test is applied in a downward direction, the top edge of the guardrail must not deflect to a height less than 39 inches (1 meter) above the walking/working level.

Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members shall be capable of withstanding a force of at least 150 pounds applied in any downward or outward direction at any point along the midrail or other member.

Guardrail systems shall be surfaced to protect workers from punctures or lacerations and to prevent clothing from snagging.

The ends of top rails and midrails must not overhang terminal posts, except where such an overhang does not constitute a projection hazard.

When guardrail systems are used at hoisting areas, a chain, gate or removable guardrail section must be placed across the access opening between guardrail sections when hoisting operations are not taking place.

At holes, guardrail systems must be set up on all unprotected sides or edges. When holes are used for the passage of materials, the hole shall have not more than two sides with removable guardrail sections. When the hole is not in use, it must be covered or provided with guardrails along all unprotected sides or edges.

If guardrail systems are used around holes that are used as access points (such as ladderways), gates must be used or the point of access must be offset to prevent accidental walking into the hole.

If guardrails are used at unprotected sides or edges of ramps and runways, they must be erected on each unprotected side or edge.

---

- 10.) Covers located in roadways and vehicular aisles must be able to support at least three times the maximum axle load of the largest vehicle to which the cover might be subjected.**
- a. True
  - b. False
- 11.) The top edge height of toprails or guardrails must be \_\_\_\_\_ (plus or minus 3 inches) above walking/working level?**
- a. 30 inches
  - b. 34 inches
  - c. 38 inches
  - d. 42 inches
- 12.) When midrails are used, they must be installed at a height midway between the top edge of the guardrail system and the walking/working level.**
- a. True
  - b. False
- 13.) When the 200 pound test is applied to a guardrail system, the top edge of the guardrail must not deflect to a height less than \_\_\_\_\_ above the walking/working level?**
- a. 36 inches
  - b. 39 inches
  - c. 42 inches
  - d. 48 inches
- 14.) When guardrail systems are used at hoisting areas, the following must be placed across the access opening when the hoisting operations are not taking place?**
- a. Chain
  - b. Gate
  - c. Removable guardrail section
  - d. Any of the above
-

***Personal Fall Arrest Systems - 1926.502(d)***

These consist of an anchorage, connectors, and a body harness and may include a deceleration device, lifeline, or suitable combinations. If a personal fall arrest system is used for fall protection, it must do the following:

- Limit maximum arresting force on an employee to 1,800 pounds when used with a body harness;
- Be rigged so that an employee can neither free fall more than 6 feet (1.8 meters) nor contact any lower level;
- Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07 meters); and
- Have sufficient strength to withstand twice the potential impact energy of an employee free-falling a distance of 6 feet (1.8 meters) or the free fall distance permitted by the system, whichever is less.

The use of a body belt for fall arrest is prohibited; however, the use of a body belt in a positioning device system is acceptable.

Personal fall arrest systems must be inspected prior to each use for wear damage, and other deterioration. Defective components must be removed from service. Dee-rings and snaphooks must have a minimum tensile strength of 5,000 pounds. Dee-rings and snaphooks shall be proof-tested to a minimum tensile load of 3,600 pounds without cracking, breaking, or suffering permanent deformation.

Snaphooks shall be sized to be compatible with the member to which they will be connected, or shall be of a locking configuration.

Unless the snaphook is a locking type and designed for the following connections, they shall not be engaged (a) directly to webbing, rope, or wire rope; (b) to each other; (c) to a dee-ring to which another snaphook or other connector is attached; (d) to a horizontal lifeline; or (e) to any object incompatible in shape or dimension relative to the snaphook, thereby causing the connected object to depress the snaphook keeper and release unintentionally.

OSHA considers a hook to be compatible when the diameter of the dee-ring to which the snaphook is attached is greater than the inside length of the snaphook when measured from the bottom (hinged end) of the snaphook keeper to the inside curve of the top of the snaphook. Thus, no matter how the dee-ring is positioned or moved (rolls) with the snaphook attached, the dee-ring cannot touch the outside of the keeper, thus depressing it open. The use of non-locking snaphooks is prohibited.

On suspended scaffolds or similar work platforms with horizontal lifelines that may become vertical lifelines, the devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline.

Horizontal lifelines shall be designed, installed, and used under the supervision of a qualified person, as part of a complete personal fall arrest system that maintains a safety factor of at least two. Lifelines shall be protected against being cut or abraded.

Self-retracting lifelines and lanyards that automatically limit free fall distance to 2 feet (0.61 meters) or less shall be capable of sustaining a minimum tensile load of 3,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.

Self-retracting lifelines and lanyards that do not limit free fall distance to 2 feet (0.61 meters) or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.

Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses shall be made of synthetic fibers.

Anchorage shall be designed, installed, and used under the supervision of a qualified person, as part of a complete personal fall arrest system that maintains a safety factor of at least two, i.e., capable of supporting at least twice the weight expected to be imposed upon it. Anchorages used to attach personal fall arrest systems shall be independent of any anchorage being used to support or suspend platforms and must be capable of supporting at least 5,000 pounds per person attached.

Lanyards and vertical lifelines must have a minimum breaking strength of 5,000 pounds.

---

**15.) If a personal fall arrest system is used for fall protection, it must do the following:**

- a. Not allow an employee to free fall more than 8 feet
- b. Limit arresting force on a body harness to 2,500 pounds
- c. Bring an employee to a complete stop
- d. All of the above

**16.) Which of the following is prohibited to use as a fall arrest system?**

- a. Body belt
- b. Body harness
- c. Anchorage
- d. None of the above

- 17.) **Ropes and straps used in lanyards, lifelines, and strength components of body belts and body harnesses shall be made of synthetic fibers.**
- True
  - False
- 18.) **Anchorage used to attach personal fall arrest systems must be capable of supporting at least \_\_\_\_\_ pounds per person attached.**
- 2,000 pounds
  - 3,000 pounds
  - 4,000 pounds
  - 5,000 pounds
- 19.) **Lanyards and vertical lifelines must have a minimum breaking strength of?**
- 4,000 pounds
  - 5,000 pounds
  - 6,000 pounds
  - 7,000 pounds

---

***Positioning Device Systems - 1926.502(e)***

These body belt or body harness systems are to be set up so that a worker can free fall no farther than 2 feet (0.6 meters). They shall be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds, whichever is greater. Requirements for snaphooks, dee-rings, and other connectors used with positioning device systems must meet the same criteria as those for personal fall arrest systems.

***Safety Monitoring Systems - 1926.502(h)***

When no other alternative fall protection has been implemented, the employer shall implement a safety monitoring system. Employers must appoint a competent person to monitor the safety of workers and the employer shall ensure that the safety monitor:

- Is competent in the recognition of fall hazards,
- Is capable of warning workers of fall hazard dangers and in detecting unsafe work practices,
- Is operating on the same walking/working surfaces of the workers and can see them, and
- Is close enough to work operations to communicate orally with workers and has no other duties to distract from the monitoring function.

Mechanical equipment shall not be used or stored in areas where safety monitoring systems are being used to monitor employees engaged in roofing operations on low-sloped roofs.

No worker, other than one engaged in roofing work (on low sloped roofs) or one covered by a fall protection plan, shall be allowed in an area where an employee is being protected by a safety monitoring system.

All workers in a controlled access zone shall be instructed to promptly comply with fall hazard warnings issued by safety monitors.

***Safety Net Systems - 1926.502(c)***

Safety nets must be installed as close as practicable under the walking/working surface on which employees are working and never more than 30 feet (9.1 meters) below such levels. Defective nets shall not be used. Safety nets shall be inspected at least once a week for wear, damage, and other deterioration. The maximum size of each safety net mesh opening shall not exceed 36 square inches (230 square centimeters) nor be longer than 6 inches (15 centimeters) on any side, and the openings, measured center-to-center, of mesh ropes or webbing, shall not exceed 6 inches (15 centimeters). All mesh crossings shall be secured to prevent enlargement of the mesh opening.

Each safety net or section shall have a border rope for webbing with a minimum breaking strength of 5,000 pounds. Connections between safety net panels shall be as strong as integral net components and be spaced no more than 6 inches (15 centimeters) apart.

Safety nets shall be installed with sufficient clearance underneath to prevent contact with the surface or structure below.

When nets are used on bridges, the potential fall area from the walking/working surface to the net shall be unobstructed.

Safety nets must extend outward from the outermost projection of the work surface as follows:

<b>Vertical distance from working level to horizontal plane of net surface.</b>	<b>Minimum required horizontal distance of outer edge of net from edge of working surface.</b>
Up to 5 feet (1.5 meters).....	8 feet (2.4 meters)
More than 5 feet (1.5 meters) up to 10 feet (3 meters).....	10 feet (3 meters)
More than 10 feet (3 meters).....	13 feet (3.9 meters)

Safety nets shall be capable of absorbing an impact force of a drop test consisting of a 400-pound bag of sand 30 inches (76 centimeters) in diameter dropped from the highest walking/working surface at which workers are exposed, but not from less than 42 inches (1.1 meters) above that level.

Items that have fallen into safety nets including—but not restricted to, materials, scrap, equipment, and tools—must be removed as soon as possible and at least before the next work shift.

---

**20.) Safety nets must never be more than 50 feet below the walking/working surface?**

- a. True
- b. False

**21.) Safety nets must be inspected for wear and damage at least:**

- a. Once a week
  - b. Twice a week
  - c. Once a month
  - d. Once a year
- 

***Warning Line Systems - 1926.502(f)***

Warning line systems consist of ropes, wires, or chains, and supporting stanchions and are set up as follows:

- Flagged at not more than 6-foot (1.8 meters) intervals with high-visibility material.
- Rigged and supported so that the lowest point including sag is no less than 34 inches (0.9 meters) from the walking/ working surface and its highest point is no more than 39 inches (1 meter) from the walking/working surface.
- Stanchions, after being rigged with warning lines, shall be capable of resisting, without tipping over; a force of at least 16 pounds applied horizontally against the stanchion, 30 inches (0.8 meters) above the walking/working surface, perpendicular to the warning line and in the direction of the floor, roof, or platform edge.
- The rope, wire, or chain shall have a minimum tensile strength of 500 pounds, and after being attached to the stanchions, must support without breaking the load applied to the stanchions as prescribed above.
- Shall be attached to each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in the adjacent section before the stanchion tips over.

Warning lines shall be erected around all sides of roof work areas. When mechanical equipment is being used, the warning line shall be erected not less than 6 feet (1.8 meters) from the roof edge parallel to the direction of mechanical equipment operation, and not less than 10 feet (3 meters) from the roof edge perpendicular to the direction of mechanical equipment operation.

When mechanical equipment is not being used, the warning line must be erected not less than 6 feet (1.8 meters) from the roof edge.

---

**22.) Warning line systems consist of:**

- a. Safety nets
  - b. Ropes, wires, chains
  - c. Body harness or belt
  - d. Anchorages
- 

**Formwork and Reinforcing Steel - 1926.501(b)(5)**

For employees, while moving vertically and/or horizontally on the vertical face of rebar assemblies built in place, fall protection is not required when employees are moving. OSHA considers the multiple hand holds and foot holds on rebar assemblies as providing similar protection as that provided by a fixed ladder. Consequently, no fall protection is necessary while moving point to point for heights below 24 feet (7.3 meters). An employee must be provided with fall protection when climbing or otherwise moving at a height more than 24 feet (7.3 meters), the same as for fixed ladders.

**Hoist Areas - 1926.501(b)(3)**

Each employee in a hoist area shall be protected from falling 6 feet (1.8 meters) or more by guardrail systems or personal fall arrest systems. If guardrail systems (or chain gate or guardrail) or portions thereof must be removed to facilitate hoisting operations, as during the landing of materials, and a worker must lean through the access opening or out over the edge of the access opening to receive or guide equipment and materials, that employee must be protected by a personal fall arrest system.

**Holes - 1926.501(b)(4)**

Personal fall arrest systems, covers, or guardrail systems shall be erected around holes (including skylights) that are more than 6 feet (1.8 meters) above lower levels.

**Leading Edges - 1926.501(b)(2)**

Each employee who is constructing a leading edge 6 feet (1.8 meters) or more above lower levels shall be protected by guardrail systems, safety net systems, or personal fall arrest systems. If the employer can demonstrate that it is infeasible or creates a greater hazard to implement these systems, he or she must develop and implement a fall protection plan that meets the requirements of 29 CFR 1926.502(k).

**Overhand Bricklaying and Related Work - 1926.501(b)(9)**

Each employee performing overhand bricklaying and related work 6 feet (1.8 meters) or more above lower levels shall be protected by guardrail systems, safety net systems, or personal fall arrest systems, or shall work in a controlled access zone. All employees reaching more than 10 inches (25 centimeters) below the level of a walking/working surface on which they are working shall be protected by a guardrail system, safety net system, or personal fall arrest system.

**Precast Concrete Erection - 1926.501(b)(12)**

Each employee who is 6 feet (1.8 meters) or more above lower levels while erecting precast concrete members and related operations such as grouting of precast concrete members shall be protected by guardrail systems, safety net systems, or personal fall arrest systems. Where the employer can demonstrate, however, that it is infeasible or creates a greater hazard to use those systems, the employer must develop and implement a fall protection plan that meets the requirements of 29 CFR 1926.502(k).

**Protection from Falling Objects - 1926.502(j)**

When guardrail systems are used to prevent materials from falling from one level to another, any openings must be small enough to prevent passage of potential falling objects. No materials or equipment except masonry and mortar shall be stored within 4 feet (1.2 meters) of working edges. Excess mortar, broken or scattered masonry units, and all other materials and debris shall be kept clear of the working area by removal at regular intervals.

During roofing work, materials and equipment shall not be stored within 6 feet (1.8 meters) of a roof edge unless guardrails are erected at the edge, and materials piled, grouped, or stacked near a roof edge must be stable and self-supporting.

**Canopies - 1926.502(j)(8)**

When used as protection from falling objects canopies must be strong enough to prevent collapse and to prevent penetration by any objects that may fall onto them.

**Toeboards - 1926.502(j)(2), (3), and (4)**

When toeboards are used as protection from falling objects, they must be erected along the edges of the overhead walking or working surface for a distance sufficient to protect persons working below. Toeboards shall be capable of withstanding a force of at least 50 pounds applied in any downward or outward direction at any point along the toeboard. Toeboards shall be a minimum of 3.5 inches (9 centimeters) tall from their top edge to the level of the walking/working surface, have no more than 0.25 inches (0.6 centimeters) clearance above the walking/working surface, and be solid or have openings no larger than 1 inch (2.5 centimeters) in size.

Where tools, equipment, or materials are piled higher than the top edge of a toeboard, paneling or screening must be erected from the walking/working surface or toeboard to the top of a guardrail system's top rail or midrail, for a distance sufficient to protect employees below.

- 
- 23.) **When canopies are used as protection from falling objects, they must be:**
- a. Strong enough to prevent collapse
  - b. Strong enough to prevent penetration
  - c. Are not allowed to be used for fall protection
  - d. A and B

- 24.) **Toeboards shall be capable of withstanding a force of at least \_\_\_\_\_ pounds applied in any downward or outward direction at any point along the toeboard.**
- a. 30 pounds
  - b. 40 pounds
  - c. 50 pounds
  - d. 60 pounds
- 25.) **What is the minimum height of a toeboard from the top edge to the level of walking/working surface required?**
- a. 2.5 inches
  - b. 3.5 inches
  - c. 5 inches
  - d. 6 inches
- 

### **Training - 1926.503**

Employers must provide a training program that teaches employees who might be exposed to fall hazards how to recognize such hazards and how to minimize them. Employees must be trained in the following areas: (a) the nature of fall hazards in the work area; (b) the correct procedures for erecting, maintaining, disassembling, and inspecting fall protection systems; (c) the use and operation of controlled access zones and guardrail, personal fall arrest, safety net, warning line, and safety monitoring systems; (d) the role of each employee in the safety monitoring system when the system is in use; (e) the limitations on the use of mechanical equipment during the performance of roofing work on low-slope roofs; (f) the correct procedures for equipment and materials handling and storage and the erection of overhead protection; and, (g) employees' role in fall protection plans; and (h) the standards in this Subpart.

Employers must prepare a written certification that identifies the employee trained and the date of the training. The employer or trainer must sign the certification record. Retraining also must be provided when necessary.

---

- 26.) **Employees must be trained in the following areas:**
- a. Nature of fall hazards in the work area
  - b. Employees role in fall protection plans
  - c. OSHA standards in Subpart M
  - d. All of the above
- 

### **Ramps, Runways, and Other Walkways - 1926.501(b)(6)**

Each employee using ramps, runways, and other walkways shall be protected by guardrail systems against falling 6 feet (1.8 meters) or more.

## Roofing

### ***Low-Slope Roofs - 1926.501(b)(10)***

Each employee engaged in roofing activities on low-slope roofs with unprotected sides and edges 6 feet (1.8 meters) or more above lower levels shall be protected from falling by guardrail systems, safety net systems, personal fall arrest systems or a combination of a warning line system and guardrail system, warning line system and safety net system, warning line system and personal fall arrest system, or warning line system and safety monitoring system. On roofs 50 feet (15.25 meters) or less in width, the use of a safety monitoring system without a warning line system is permitted.

### ***Steep Roofs - 1926.501(b)(11)***

Each employee on a steep roof with unprotected sides and edges 6 feet (1.8 meters) or more above lower levels shall be protected by either guardrail systems with toeboards, a safety net system, or a personal fall arrest system.

- 
- 27.)        **On roofs \_\_\_\_\_ or less in width, the use of a safety monitoring system without a warning line system is permitted.**
- a. 50 feet
  - b. 75 feet
  - c. 100 feet
  - d. 150 feet
- 

### ***Wall Openings - 1926.501(b)(14)***

Each employee working on, at, above, or near wall openings (including those with chutes attached) where the outside bottom edge of the wall opening is 6 feet (1.8 meters) or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches (1.0 meter) above the walking/working surface must be protected from falling by the use of either a guardrail system, a safety net system, or a personal fall arrest system.

## Glossary

**Anchorage** — A secure point of attachment for lifelines, lanyards or deceleration devices.

**Body belt** — A strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

**Body harness** — Straps that may be secured about the person in a manner that distributes the fall-arrest forces over at least the thighs, pelvis, waist, chest, and shoulders with a means for attaching the harness to other components of a personal fall arrest system.

**Connector** — A device that is used to couple (connect) parts of a personal fall arrest system or positioning device system together.

**Controlled access zone** — A work area designated and clearly marked in which certain types of work (such as overhand bricklaying) may take place without the use of conventional fall protection systems—guardrail, personal arrest or safety net—to protect the employees working in the zone.

**Deceleration device** — Any mechanism—such as rope, grab, ripstitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards— which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on an employee during fall arrest.

**Deceleration distance** — The additional vertical distance a falling person travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which a deceleration device begins to operate.

**Guardrail system** — A barrier erected to prevent employees from falling to lower levels.

**Hole** — A void or gap 2 inches (5.1 centimeters) or more in the least dimension in a floor, roof, or other walking/working surface.

**Lanyard** — A flexible line of rope, wire rope, or strap that generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.

**Leading edge** — The edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed or constructed.

**Lifeline** — A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and that serves as a means for connecting other components of a personal fall arrest system to the anchorage.

**Low-slope roof** — A roof having a slope less than or equal to 4 in 12 (vertical to horizontal).

**Opening** — A gap or void 30 inches (76 centimeters) or more high and 18 inches (46 centimeters) or more wide, in a wall or partition, through which employees can fall to a lower level.

**Personal fall arrest system** — A system including but not limited to an anchorage, connectors, and a body harness used to arrest an employee in a fall from a working level.

**Positioning device system** — A body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning backwards.

**Rope grab** — A deceleration device that travels on a lifeline and automatically, by friction, engages the lifeline and locks to arrest a fall.

**Safety-monitoring system** — A safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.

**Self-retracting lifeline/lanyard** — A deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under minimal tension during normal employee movement and which, after onset of a fall, automatically locks the drum and arrests the fall.

**Snaphook** — A connector consisting of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released automatically closes to retain the object.

**Steep roof** — A roof having a slope greater than 4 in 12 (vertical to horizontal).

**Toeboard** — A low protective barrier that prevents material and equipment from falling to lower levels and which protects personnel from falling.

**Unprotected sides and edges** — Any side or edge (except at entrances to points of access) of a walking/working surface (e.g., floor, roof, ramp, or runway) where there is no wall or guardrail system at least 39 inches (1 meter) high.

**Walking/working surface** — Any surface, whether horizontal or vertical, on which an employee walks or works, including but not limited to floors, roofs, ramps, bridges, runways, formwork, and concrete reinforcing steel. Does not include ladders, vehicles, or trailers on which employees must be located to perform their work duties.

**Warning line system** — A barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge and which designates an area in which roofing work may take place without the use of guardrail, body belt, or safety net systems to protect employees in the area.

- 
- 28.) A “Hole” is defined as a void or gap \_\_\_\_ inches or more in the least dimension in a floor, roof, or other walking/working surface.
- a. 1
  - b. 2
  - c. 3
  - d. 4

- 29.) A low protective barrier that prevents material equipment from falling to lower levels and which protects personnel from falling is called a:**
- a. Rope grab
  - b. Toeboard
  - c. Warning line system
  - d. Lanyard
- 30.) A barrier erected to prevent employees from falling to lower levels is called a:**
- a. Lanyard
  - b. Toeboard
  - c. Guardrail system
  - d. Warning line system
- 31.) A secure point of attachment for lifelines, lanyards or deceleration devices is called:**
- a. Anchorage
  - b. Body belt
  - c. Connector
  - d. Lanyard
- 32.) A deceleration device that travels on a lifeline and automatically, by friction, engages the lifeline and locks to arrest a fall is called:**
- a. Anchorage
  - b. Rope grab
  - c. Connector
  - d. Lanyard
-

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**Fall Protection**

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**Fall Protection**

T F

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32.  a  b  c  d

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# Ladder and Stairway Safety

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## **Introduction**

Working on and around stairways and ladders is hazardous. Stairways and ladders are major sources of injuries and fatalities among construction workers for example, and many of the injuries are serious enough to require time off the job. OSHA estimates that there are almost 25,000 injuries and as many as 36 fatalities per year due to falls on stairways and ladders used in construction.

OSHA rules apply to all stairways and ladders used in construction, alteration, repair, painting, decorating and demolition of worksites covered by OSHA's construction safety and health standards.

This course is based on OSHA's 29 CFR 1926.1050-1060 (Subpart X).

---

**1.) OSHA rules on ladders can be found in which subpart of CFR 1926?**

- a. U
- b. V
- c. W
- d. X

**2.) According to OSHA estimates, how many injuries occur per year on ladders and stairways?**

- a. 25
  - b. 250
  - c. 2,500
  - d. 25,000
- 

## **General Requirements**

These rules specify when employers must provide stairways and ladders. In general, the standards require the following:

- When there is a break in elevation of 19 inches (48 cm) or more and no ramp, runway, embankment or personnel hoist is available, employers must provide a stairway or ladder at all worker points of access.

- When there is only one point of access between levels, employers must keep it clear of obstacles to permit free passage by workers. If free passage becomes restricted, employers must provide a second point of access and ensure that workers use it.
- When there are more than two points of access between levels, employers must ensure that at least one point of access remains clear.

In addition, employers must install all stairway and ladder fall protection systems required by these rules and ensure that their worksite meets all requirements of the stairway and ladder rules before employees use stairways or ladders.

Note: The standard does not apply to ladders specifically manufactured for scaffold access and egress, but does apply to job-made and manufactured portable ladders intended for general purpose use. Rules for ladders used on or with scaffolds are addressed in 29 CFR 1926.451 Subpart L.

- 
- 3.) When there is a break in elevation of \_\_\_ inches or more, and no ramp, runway, or personnel hoist is available, employers must provide a stairway or ladder.**
- a. 12 inches
  - b. 19 inches
  - c. 24 inches
  - d. 36 inches

---

## **Rules for Ladders**

### **All Ladders**

The following rules apply to all ladders:

- Maintain ladders free of oil, grease and other slipping hazards.
- Do not load ladders beyond their maximum intended load nor beyond their manufacturer's rated capacity.
- Use ladders only for their designed purpose.

- Use ladders only on stable and level surfaces unless secured to prevent accidental movement.
- Do not use ladders on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental movement.
- Do not use slip resistant feet as a substitute for exercising care when placing, lashing or holding a ladder upon slippery surfaces.
- Secure ladders placed in areas such as passageways, doorways or driveways, or where they can be displaced by workplace activities or traffic to prevent accidental movement. Or use a barricade to keep traffic or activity away from the ladder.
- Keep areas clear around the top and bottom of ladders.
- Do not move, shift or extend ladders while in use.
- Use ladders equipped with nonconductive side rails if the worker or the ladder could contact exposed energized electrical equipment.
- Face the ladder when moving up or down.
- Use at least one hand to grasp the ladder when climbing.
- Do not carry objects or loads that could cause loss of balance and falling.

In addition, the following general requirements apply to all ladders, including ladders built at the jobsite:

- Double-cleated ladders or two or more ladders must be provided when ladders are the only way to enter or exit a work area where 25 or more employees work or when a ladder serves simultaneous two-way traffic.
- Ladder rungs, cleats and steps must be parallel, level and uniformly spaced when the ladder is in position for use.
- Rungs, cleats and steps of portable and fixed ladders (except as provided below) must not be spaced less than 10 inches (25 cm) apart, nor more than 14 inches (36 cm) apart, along the ladder's side rails.

- Rungs, cleats and steps of step stools must not be less than 8 inches (20 cm) apart, nor more than 12 inches (31 cm) apart, between center lines of the rungs, cleats and steps.
- Rungs, cleats and steps at the base section of extension trestle ladders must not be less than 8 inches (20 cm) nor more than 18 inches (46 cm) apart, between center lines of the rungs, cleats and steps. The rung spacing on the extension section must not be less than 6 inches (15 cm) nor more than 12 inches (31 cm).
- Ladders must not be tied or fastened together to create longer sections unless they are specifically designed for such use.
- When splicing side rails, the resulting side rail must be equivalent in strength to a one-piece side rail made of the same material.
- Two or more separate ladders used to reach an elevated work area must be offset with a platform or landing between the ladders, except when portable ladders are used to gain access to fixed ladders.
- Ladder components must be surfaced to prevent snagging of clothing and injury from punctures or lacerations.
- Wood ladders must not be coated with any opaque covering except for identification or warning labels, which may be placed only on one face of a side rail.

Note: A competent person must inspect ladders for visible defects periodically and after any incident that could affect their safe use.

---

**4.) The following rules apply to all ladders**

- a. Maintain ladders free of oil and other slipping hazards
- b. Do not load ladders beyond their maximum intended load
- c. Use ladders for only their designed purpose
- d. All of the above

**5.) Which one of the statements below is NOT true about rules that apply to ladders**

- a. It is best to extend the ladder while in use
- b. Keep areas clear around the top and bottom of ladders
- c. Face the ladder when moving up or down
- d. Use at least one hand to grasp the ladder when climbing

**6.) Ladder components must be surfaced to prevent snagging of clothing and injury from punctures or lacerations. This statement is:**

- a. True
- b. False

**7.) Wood ladders must be coated entirely with an opaque covering :**

- a. True
- b. False

---

### **Specific Types of Ladders**

- Do not use single-rail ladders.
- Use non-self-supporting ladders at an angle where the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder.
- Use wooden ladders built at the jobsite with spliced side rails at an angle where the horizontal distance is one-eighth of the working length of the ladder.

In addition, the top of a non-self-supporting ladder must be placed with two rails supported equally unless it is equipped with a single support attachment.

### **Stepladders**

- Do not use the top or top step of a stepladder as a step.
- Do not use cross bracing on the rear section of stepladders for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.
- Metal spreader or locking devices must be provided on stepladders to hold the front and back sections in an open position when ladders are being used.

### **Portable Ladders**

The minimum clear distance between side rails for all portable ladders must be 11.5 inches (29 cm).

In addition, the rungs and steps of portable metal ladders must be corrugated, knurled, dimpled, coated with skid-resistant material or treated to minimize slipping.

Non-self-supporting and self-supporting portable ladders must support at least four times the maximum intended load; extra heavy-duty type 1A metal or plastic ladders must sustain 3.3 times the maximum intended load. To determine whether a self-supporting ladder can sustain a certain load, apply the load to the ladder in a downward vertical direction with the ladder placed at a horizontal angle of 75.5 degrees.

When portable ladders are used for access to an upper landing surface, the side rails must extend at least 3 feet (.9 m) above the upper landing surface. When such an extension is not possible, the ladder must be secured and a grasping device such as a grab rail must be provided to assist workers in mounting and dismounting the ladder. A ladder extension must not deflect under a load that would cause the ladder to slip off its supports.

---

**8.) What is the minimum clear distance between side rails for all portable ladders?**

- a. 9 inches
- b. 10.5 inches
- c. 11.5 inches
- d. 13 inches

**9.) When portable ladders are used for access to an upper landing surface, the side rails must extend:**

- a. 1 foot above the upper landing surface
- b. 2 feet above the upper landing surface
- c. 3 feet above the upper landing surface
- d. 4 feet above the upper landing surface

---

**Fixed Ladders**

- If the total length of the climb on a fixed ladder equals or exceeds 24 feet (7.3 m), the ladder must be equipped with ladder safety devices; or self-retracting lifelines and rest platforms at intervals not to exceed 150 feet (45.7 m); or a cage or well and multiple ladder sections with each ladder section not to exceed 50 feet (15.2 m) in length. These ladder sections must be offset from adjacent sections and landing platforms must be provided at maximum intervals of 50 feet (15.2 m). In addition, fixed ladders must meet the following requirements:

- Fixed ladders must be able to support at least two loads of 250 pounds (114 kg) each, concentrated between any two consecutive attachments. Fixed ladders also must support added anticipated loads caused by ice buildup, winds, rigging and impact loads resulting from using ladder safety devices.
- Individual rung/step ladders must extend at least 42 inches (1.1 m) above an access level or landing platform either by the continuation of the rung spacings as horizontal grab bars or by providing vertical grab bars that must have the same lateral spacing as the vertical legs of the ladder rails.
- Each step or rung of a fixed ladder must be able to support a load of at least 250 pounds (114 kg) applied in the middle of the step or rung.
- Minimum clear distance between the sides of individual rung/step ladders and between the side rails of other fixed ladders must be 16 inches (41 cm).
- Rungs of individual rung/step ladders must be shaped to prevent slipping off the end of the rungs.
- Rungs and steps of fixed metal ladders manufactured after March 15, 1991, must be corrugated, knurled, dimpled, coated with skid-resistant material or treated to minimize slipping.
- Minimum perpendicular clearance between fixed ladder rungs, cleats, and steps and any obstruction behind the ladder must be 7 inches (18 cm), except that the clearance for an elevator pit ladder must be 4.5 inches (11 cm).
- Minimum perpendicular clearance between the centerline of fixed ladder rungs, cleats and steps, and any obstruction on the climbing side of the ladder must be 30 inches (76 cm). If obstructions are unavoidable, clearance may be reduced to 24 inches (61 cm), provided a deflection device is installed to guide workers around the obstruction.
- Step-across distance between the center of the steps or rungs of fixed ladders and the nearest edge of a landing area must be no less than 7 inches (18 cm) and no more than 12 inches (30 cm). A landing platform must be provided if the step-across distance exceeds 12 inches (30 cm).
- Fixed ladders without cages or wells must have at least a 15-inch (38 cm) clearance width to the nearest permanent object on each side of the centerline of the ladder.

- Fixed ladders must be provided with cages, wells, ladder safety devices or self-retracting lifelines where the length of climb is less than 24 feet (7.3 m) but the top of the ladder is at a distance greater than 24 feet (7.3 m) above lower levels.
  - Side rails of through or side-step fixed ladders must extend 42 inches (1.1 m) above the top level or landing platform served by the ladder. Parapet ladders must have an access level at the roof if the parapet is cut to permit passage through it. If the parapet is continuous, the access level is the top of the parapet.
  - Steps or rungs for through-fixed-ladder extensions must be omitted from the extension; and the extension of side rails must be flared to provide between 24 inches (61 cm) and 30 inches (76 cm) clearance between side rails.
  - When safety devices are provided, the maximum clearance distance between side rail extensions must not exceed 36 inches (91 cm).
  - Fixed ladders must be used at a pitch no greater than 90 degrees from the horizontal, measured from the back side of the ladder.
- 

**10.) Minimum clear distance between the sides of individual rung/step ladders and between the side rails of other fixed ladders must be \_\_\_\_ inches.**

- a. 16 inches
- b. 20 inches
- c. 24 inches
- d. 29 inches

**11.) Fixed ladders without cages or wells must have at least a 20-inch clearance width to the nearest permanent object on each side of the centerline of the ladder.**

- a. True
  - b. False
- 

## **Cages for Fixed Ladders**

The requirements for cages for fixed ladders are as follows:

- Horizontal bands must be fastened to the side rails of rail ladders or directly to the structure, building or equipment for individual-rung ladders.
- Vertical bars must be on the inside of the horizontal bands and must be fastened to them.
- Cages must not extend less than 27 inches (68 cm), or more than 30 inches (76 cm) from the centerline of the step or rung and must not be less than 27 inches (68 cm) wide.
- Insides of cages must be clear of projections.
- Horizontal bands must be spaced at intervals not more than 4 feet (1.2 m) apart measured from centerline to centerline.
- Vertical bars must be spaced at intervals not more than 9.5 inches (24 cm), measured centerline to centerline.
- Bottoms of cages must be between 7 feet (2.1 m) and 8 feet (2.4 m) above the point of access to the bottom of the ladder. The bottom of the cage must be flared not less than 4 inches (10 cm) between the bottom horizontal band and the next higher band.
- Tops of cages must be a minimum of 42 inches (1.1 m) above the top of the platform or the point of access at the top of the ladder. There must be a way to access the platform or other point of access.

### **Wells for Fixed Ladders**

The requirements for wells for fixed ladders are as follows:

- Wells must completely encircle the ladder.
- Wells must be free of projections.
- Inside faces of wells on the climbing side of the ladder must extend between 27 inches (68 cm) and 30 inches (76 cm) from the centerline of the step or rung.
- Inside widths of wells must be at least 30 inches (76 cm).
- Bottoms of wells above the point of access to the bottom of the ladder must be between 7 feet (2.1 m) and 8 feet (2.4 m).

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**12.) The requirements for wells for fixed ladders are as follows:**

- a. Wells must completely encircle the ladder
- b. Wells must be free of projections
- c. Bottoms of wells above the points of access to the bottom of the ladder must be between 7 feet and 8 feet
- d. All of the above

**13.) The inside widths of wells for fixed ladders must be at least:**

- a. 20 inches
  - b. 30 inches
  - c. 40 inches
  - d. 50 inches
- 

### **Ladder Safety Devices and Related Support Systems for Fixed Ladders**

The connection between the carrier or lifeline and the point of attachment to the body belt or harness must not exceed 9 inches (23 cm) in length. In addition, ladder safety devices and related support systems on fixed ladders must conform to the following:

- All safety devices must be able to withstand, without failure, a drop test consisting of a 500-pound weight (226 kg) dropping 18 inches (41 cm).
- All safety devices must permit the worker to ascend or descend without continually having to hold, push or pull any part of the device, leaving both hands free for climbing.
- All safety devices must be activated within 2 feet (.61 m) after a fall occurs and limit the descending velocity of an employee to 7 feet/second (2.1 m/sec) or less.

### **Requirements for Mounting Ladder Safety Devices for Fixed Ladders**

The requirements for mounting ladder safety devices for fixed ladders are as follows:

- Mountings for rigid carriers must be attached at each end of the carrier, with intermediate mountings spaced along the entire length of the carrier, to provide the necessary strength to stop workers' falls.
- Mountings for flexible carriers must be attached at each end of the carrier. Cable guides for flexible carriers must be installed with a spacing between 25 feet (7.6 m) and 40 feet (12.2 m) along the entire length of the carrier, to prevent wind damage to the system.
- Design and installation of mountings and cable guides must not reduce the strength of the ladder.
- Side rails and steps or rungs for side-step fixed ladders must be continuous in extension.

## **Defective Ladders**

Ladders needing repairs are subject to the following rules:

- Portable ladders with structural defects—such as broken or missing rungs, cleats or steps, broken or split rails, corroded components or other faulty or defective components—must immediately be marked defective or tagged with "Do Not Use" or similar language and withdrawn from service until repaired.
- Fixed ladders with structural defects—such as broken or missing rungs, cleats or steps, broken or split rails or corroded components—must be withdrawn from service until repaired.
- Defective fixed ladders are considered withdrawn from use when they are immediately tagged with "Do Not Use" or similar language, or marked in a manner that identifies them as defective, or blocked—such as with a plywood attachment that spans several rungs.
- Ladder repairs must restore the ladder to a condition meeting its original design criteria before the ladder is returned to use.

- 
- 14.) Side rails and steps or rungs for side-step fixed ladders must be continuous in extension**
- a. True
  - b. False

- 15.) Ladder needing repair are subject to the following rule(s):**
- a. Portable ladders with structural defects must be marked with “Don Not Use”
  - b. Fixed ladders with structural defects must be withdrawn from service until repaired
  - c. Ladder repairs must restore the ladder to a condition meeting its original design criteria
  - d. All of the above

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## **Rules for Stairways**

The rules covering stairways and their components generally depend on how and when stairs are used. Specifically, there are rules for stairs used during construction and stairs used temporarily during construction, as well as rules governing stair rails and handrails.

### **Stairways Used During Construction**

The following requirements apply to all stairways used during construction:

- Stairways that will not be a permanent part of the building under construction must have landings at least 30 inches deep and 22 inches wide (76 x 56 cm) at every 12 feet (3.7 m) or less of vertical rise.
- Stairways must be installed at least 30 degrees—and no more than 50 degrees—from the horizontal.
- Variations in riser height or stair tread depth must not exceed 1/4 inch in any stairway system, including any foundation structure used as one or more treads of the stairs.
- Doors and gates opening directly onto a stairway must have a platform that extends at least 20 inches (51 cm) beyond the swing of the door or gate.
- Metal pan landings and metal pan treads must be secured in place before filling.
- Stairway parts must be free of dangerous projections such as protruding nails.
- Slippery conditions on stairways must be corrected.
- Workers must not use spiral stairways that will not be a permanent part of the structure.

## **Temporary Stairs**

The following requirements apply to stairways used temporarily during construction.

Except during construction of the stairway,

- Do not use stairways with metal pan landings and treads if the treads and/or landings have not been filled in with concrete or other materials unless the pans of the stairs and/or landings are temporarily filled in with wood or other materials. All treads and landings must be replaced when worn below the top edge of the pan.
- Do not use skeleton metal frame structures and steps (where treads and/or landings will be installed later) unless the stairs are fitted with secured temporary treads and landings.

Note: Temporary treads must be made of wood or other solid material and installed the full width and depth of the stair.

## **Stair Rails**

The following general requirements apply to all stair rails:

- Stairways with four or more risers or rising more than 30 inches (76 cm) in height—whichever is less—must be installed along each unprotected side or edge. When the top edge of a stair rail system also serves as a handrail, the height of the top edge must be no more than 37 inches (94 cm) nor less than 36 inches (91.5 cm) from the upper surface of the stair rail to the surface of the tread.
- Stair rails installed after March 15, 1991, must be not less than 36 inches (91.5 cm) in height.
- Top edges of stair rail systems used as handrails must not be more than 37 inches (94 cm) high nor less than 36 inches (91.5 cm) from the upper surface of the stair rail system to the surface of the tread. (If installed before March 15, 1991, not less than 30 inches).
- Stair rail systems and handrails must be surfaced to prevent injuries such as punctures or lacerations and to keep clothing from snagging.
- Ends of stair rail systems and handrails must be built to prevent dangerous projections, such as rails protruding beyond the end posts of the system.

In addition,

- Unprotected sides and edges of stairway landings must have standard 42-inch (1.1 m) guardrail systems.
- Intermediate vertical members, such as balusters used as guardrails, must not be more than 19 inches (48 cm) apart.
- Other intermediate structural members, when used, must be installed so that no openings are more than 19 inches (48 cm) wide.
- Screens or mesh, when used, must extend from the top rail to the stairway step and along the opening between top rail supports.

## **Handrails**

Requirements for handrails are as follows:

- Handrails and top rails of the stair rail systems must be able to withstand, without failure, at least 200 pounds (890 n) of weight applied within 2 inches (5 cm) of the top edge in any downward or outward direction, at any point along the top edge.
- Handrails must not be more than 37 inches (94 cm) high nor less than 30 inches (76 cm) from the upper surface of the handrail to the surface of the tread.
- Handrails must provide an adequate handhold for employees to grasp to prevent falls.
- Temporary handrails must have a minimum clearance of 3 inches (8 cm) between the handrail and walls, stair rail systems and other objects.
- Stairways with four or more risers, or that rise more than 30 inches (76 cm) in height—whichever is less—must have at least one handrail.
- Winding or spiral stairways must have a handrail to prevent use of areas where the tread width is less than 6 inches (15 cm).

## **Midrails**

Midrails, screens, mesh, intermediate vertical members or equivalent intermediate structural members must be provided between the top rail and stairway steps to the stair rail system. When midrails are used, they must be located midway between the top of the stair rail system and the stairway steps.

- 
- 16.) **Stairways that will not be a permanent part of the building under construction must have landings at least 30 inches deep and 22 inches wide at every 12 feet or less of vertical rise:**
- True
  - False
- 17.) **Workers must not use a spiral stairway that will not be a permanent part of the structure.**
- True
  - False
- 18.) **Stair rails installed after March 15, 1991, must not be less than:**
- 36 inches in height
  - 40 inches in height
  - 44 inches in height
  - 48 inches in height
- 19.) **The minimum clearance for temporary handrails between the handrail and the walls, stair rail systems and other objects must be:**
- 2 inches
  - 3 inches
  - 4 inches
  - 6 inches
- 20.) **Unprotected sides and edges of stairway landings must have standard \_\_\_\_\_ guardrail systems.**
- 32-inch
  - 36-inch
  - 42-inch
  - 46-inch
- 21.) **Winding or spiral stairways must have a handrail to prevent use of areas where the tread is less than:**
- 3 inches
  - 4 inches
  - 5 inches
  - 6 inches

- 22.) **Except during the construction of the stairway:**
- a. Do not use stairways with metal pan landings and treads if they haven't been filled in
  - b. All treads and landing must be replaced when worn below the top edge of the pan
  - c. Do not use skeleton metal frame structures and steps
  - d. All of the above

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## Training Requirements

Employers must train all employees to recognize hazards related to ladders and stairways, and instruct them to minimize these hazards. For example, employers must ensure that each employee is trained by a competent person in the following areas, as applicable:

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

Note: Employers must retrain each employee as necessary to maintain their understanding and knowledge on the safe use and construction of ladders and stairs.

## Glossary

**cleat** —A ladder crosspiece of rectangular cross section placed on edge upon which a person may step while ascending or descending a ladder.

**double-cleat ladder** —A ladder with a center rail to allow simultaneous two-way traffic for employees ascending or descending.

**failure** — Load refusal, breakage or separation of components.

**fixed ladder** — A ladder that cannot be readily moved or carried because it is an integral part of a building or structure.

**handrail** — A rail used to provide employees with a handhold for support.

**job-made ladder** — A ladder that is fabricated by employees, typically at the construction site; non-commercially manufactured. **load refusal** — The point where the structural members lose their ability to carry the load.

**point of access** — All areas used by employees for work-related passage from one area or level to another.

**portable ladder** — A ladder that can be readily moved or carried.

**riser height** — The vertical distance from the top of a tread or platform/landing to the top of the next higher tread or platform/landing.

**side-step fixed ladder** — A fixed ladder that requires a person to get off at the top to step to the side of the ladder side rails to reach the landing.

**single-cleat ladder** — A ladder consisting of a pair of side rails connected together by cleats, rungs or steps.

**stair rail system** — A vertical barrier erected along the unprotected sides and edges of a stairway to prevent employees from falling to lower levels.

**temporary service stairway** — A stairway where permanent treads and/or landings are to be filled in at a later date.

**through fixed ladder** — A fixed ladder that requires a person getting off at the top to step between the side rails of the ladder to reach the landing.

**tread depth** — The horizontal distance from front to back of a tread, excluding nosing, if any.

**WISCONSIN CONTRACTORS INSTITUTE – ANSWER SHEET**

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_ Date: \_\_\_\_\_

Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ ZIP: \_\_\_\_\_

WI Dwelling Contractor Qualifier #: \_\_\_\_\_

Phone: \_\_\_\_\_ Email: \_\_\_\_\_

**Ladders and Stairways Ladders and Stairways**

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