SAFETY IN THE WORKPLACE

Northeast Wisconsin Technical College

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Safety in the Workplace (NWTC)

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Licensing

*A detailed breakdown of this resource's licensing can be found in **Back Matter/Detailed Licensing**.*

1: Valuing Work!

> *"The safety of the people shall be the highest law."*
>
> *Marcus Tullius Cicero, Roman philosopher born in 106 BC*

Overview

Let's face it, not many of us were born with the proverbial silver spoon in our mouths. We will at some point in our lives offer our minds, labor, knowledge and skills in exchange for some form of payment. The payment may be currency, acknowledgement, goods, services, etc. We may also volunteer or offer up our labor not seeking compensation but to support some higher purpose or call, to serve others, or just to learn more and improve our present and future circumstances. Humans were made for productivity. We were made to cultivate, to create, to teach and explore. We are workers and will fully utilize our faculties to survive.

Work is something we all have in common! In this course you will explore not only your relationship or ideas regarding work, but also the history, politics, and dignity of work. Most importantly you will learn how to work safely. In learning the origins of what makes a workplace safe and why your workplaces are required to be safe, you will understand and develop the skills necessary for becoming a more engaged, responsible, and safe worker in the 21st century.

But first the following will guide your understanding and then afterwards a bit of historical context! As a matter of organization all chapters will begin with an overview followed by chapter objective, learning outcome, key terms, and the title of the associated lecture.

Chapter Objective:

1. Explore and view work and worker safety through a historical context;
2. Assess how you view and value work and worker safety.

Learning Outcome:

1. Identify and understand the roots of social, economic, and environmental justice concerns in worker safety.

Key Terms:

COVID-19, Social Justice, Economic Justice, Environmental Justice, Work, Safety, Essential Workers, Union, Pandemic, COVID-19

1.1: Social Justice is Valuing Work!

Social Justice

There are numerous definitions or descriptions of the term ‘social justice’ most centering on remedying inequities in the human experience. The definition presented in this discussion on the history of work in the US is a broader characterization intended to weave a narrative from events, conditions, and norms in our society that will ultimately associate it with worker safety.

An article in Investopedia describes social justice as referring to “... a fair and equitable division of resources, opportunities, and privileges in society. Originally a religious concept, it has come to be conceptualized more loosely as the just organization of social institutions that deliver access to economic benefits. It is sometimes referred to as "distributive justice". 1, 2.

An open forum viewpoint on the meaning of social justice describes it as " a political and philosophical theory which asserts that there are dimensions to the concept of justice beyond those embodied in the principles of civil or criminal law, economic supply and demand, or traditional moral frameworks. Social justice tends to focus more on just relations between groups within society as opposed to the justice of individual conduct or justice for individuals." While somewhat disparate, the two perspectives suggest social justice focuses on just relationships and what is best for all.

The US has not always had the best reputation for protecting workers from harm, valuing all work and even valuing all lives. During darker chapters in our history including our very origins work was exploitative and many workers were devalued. Prison camp forced labor and slavery are primary examples of worker exploitation that has existed in the US and throughout human civilization. Exploited workers have always been workers doing the necessary and mundane, grueling, exhaustive, and dangerous work in society. Ask yourselves, who wants to be the worker cleaning up or attending to human waste? Who wants to be the worker lugging ½ ton stone or picking cotton, even strawberries in 100F heat, or slaughtering livestock for consumption? Many work tasks are not glamorous and many of us would probably choose other means to provide for ourselves and families.

Worker exploitation has often resulted in workers being exposed to hazards and dangerous working conditions that would lead to illness, injury, and death. When workers were plentiful and expendable this was considered acceptable for any number of reasons. Worker exploitation has also been about not receiving fair wages, fair treatment, safe working conditions, reasonable work schedules, health care and workers compensation. In many ways one could argue worker concerns have always been social concerns. Social in fact is defined as relating to human society, the welfare of humans as members of society. Productive work is social and integral to society.

A Division of Workers

The subject of forced labor or slave labor is only mentioned to shape the narrative of human civilizations relationship to work. Later in the discussion we will circle back to the legacy of slave labor in US work history. In fact it is not only in less modern times that work has been assigned a social hierarchy. This means that in more modern times, children of a certain age are not expected or required to be part of the labor force until they become adults and seniors typically do not have to work unto death unless they choose to do so or are forced out of the labor market for reasons associated with health and mental acuity. In more modern times the safety of youth and older workers is valued more than a perceived benefit of their contribution to the workforce.

Figure 1.1.1: (left) Child Labor Circa 1930 (Public Domain; Lewis H via Library of Congress) (right) Young worker at coffee shop (Brook Cagle-Unsplash)

The U.S. Department of Labor is the sole federal agency that monitors child labor and enforces child labor laws. The most sweeping federal law that restricts the employment and abuse of children workers is the Fair Labor Standards Act (FLSA). Child labor provisions under FLSA are designed to protect the educational opportunities of youth and prohibit their employment in jobs that are detrimental to their health and safety. FLSA restricts the hours that youth younger than 16 years of age can work and lists hazardous occupations too dangerous for young workers to perform. Enforcement of the FLSA's child labor provisions is handled by the Department's Wage and Hour Division.(DOL-Child Labor)

Prior to protections, from the period of the civil war through the 1930s children were an integral part of the US workforce. Many working in factories or family farms helped to fuel the US economy before and at the turn of the 20th Century. Young workers are still an integral part of the US workforce but with the protections introduced in the FLSA. California has a sizeable segment of teen workers in retail and food industries with resources available to help them understand the value they bring to the workforce. (youngworkers.org)

Older workers gained some special protections with the creation of the Social Security Administration when the Social Security Act of 1935 was signed into law. The Act established a system of Federal old-age benefits, and enabled States to make more adequate provision for aged persons, blind persons, dependent and crippled children, maternal and child welfare, public health, and the administration of unemployment benefits. Social Security allows workers of a certain age to continue working beyond retirement or to retire, ceasing work of any kind. One of the most enduring social safety nets, social security attempts to value both the longevity of work and the worker.

A Consequence of the Industrial Revolution

Industrialization in the US brought about many challenges to the concept of work. Humans have always used tools to assist with work productivity but industrialization had an exponential effect on efficiency and output. Machines rapidly took the place of manual labor increasing production even as human control and interface was still necessary. Machines reduced the brawn necessary for some types of work but also increased the necessity and opportunity of work for women and children in factories that were often dirty, dangerous, requiring long hours of grueling effort.

Workers were a commodity and their productive work fueled economic growth, population growth and sustained prosperity and wealth for the barons of industrialization. Yet, for a period of time the poor and working class were exploited and not cared for, did not truly see the results of their labors until losses of property and lives got the attention of the US populace and representatives of the Federal Government.

The Monongah Mine Disaster and Triangle Shirtwaist Factory Fire, both workplace catastrophes, occurred within five years of each other. The mine disaster was the worst in US history. Occurring on Dec 6 1907 in Monongah, W. Va., an explosion attributed to a spark that ignited methane gas killed more than 350 men and boys, killing some instantly and trapping many who ultimately died from toxic gas poisoning. Public outcry led to the creation of the Bureau of Mines in 1910 by the Federal Government in response to this event and other similar catastrophes happening in the US and globally. Industrialization was actually fueled by the various coal mining operations needed to sustain the economic growth engine of energy and power production.

The Triangle Shirtwaist Factory Fire occurred on March 25, 1911, in Manhattan, NY. 146 mostly women and young girls, were trapped when a fire broke out on the 10th floor of the building, many jumping to their deaths or burned alive because exit doors were locked from the outside. This was done to keep workers from taking too many breaks, to keep out potential union organizers, and to possibly cut down on employee theft. Many of the women and men who died in this tragedy and the mining incident were immigrants of Italian and Jewish ancestry. Prejudice and bigotry added to class and caste distinctions which devalued worker contributions during a period of great change and knowledge attainment.

The Triangle Shirtwaist Factory Fire like the Monongah Mine Disaster resulted in the development of safety standards and government oversight. There was no criminal negligence attributed in either disaster although there was some civil liability in the Factory fire. Although these disasters fomented public outcry, which initiated many workplace safety initiatives, it did little to make work valued, equitable, and esteemed for all who labor for a living.

Figure 1.1.7: Black women working in construction trades. (source; orleans technical college webpage, orleanstech.edu)

1.2: Economic Justice is Valuing Work!

Economic Justice

Productive work creates and drives economies. Economies are about the efficient use of trade, capital, natural and human resources. The term ‘economic justice’ will be defined and described centering on the discussion of the history of work in the US and its association with worker safety.

Investopedia defines ‘economic justice’ as a component of social justice and welfare economics. It is a set of moral and ethical principles for building economic institutions, where the ultimate goal is to create an opportunity for each person to establish a sufficient material foundation upon which to have a dignified, productive, and creative life.

Much of the prior discussion has focused on human experiences and functions of society norms. The history of work in the US also includes government, commercial, and private institutions, regulatory and organizational structures. Most forms of government exists to provide order and to promote the common good.

Recognizing commerce and commercial enterprise garnered most of the attention of lawmakers who afforded the most protection to business and industry, advocates for labor began making waves immediately after the American Civil War in 1864. As referenced from historical text, government oversight of labor practices was initiated…when William Sylvis, the most important labor leader of his day, advocated for the creation of a Department of Labor (DOL). He protested that existing government departments threw their protective arms around every enterprise fostering wealth, while no department had as its "sole object the care and protection of labor." He and his followers petitioned President Andrew Johnson for a Secretary of Labor, chosen from the ranks of workingmen, to be labor's voice in the Cabinet.

It took nearly 50 years before an American President, Andrew Taft, signed a bill creating a cabinet level Department of Labor in 1913. The DOL established a bureau of labor statistics (BLS) to provide objective labor data not influenced by national politics. It took many more decades later for the BLS to not be influenced by social norms and today there is relative assurance that labor data is unbiased and accurate. The BLS provides important statistics on what is happening in workplaces such as pay and benefits, unemployment numbers, injury and illness data, employment projections, and productivity.

So, why is the DOL relevant to a discussion on economic justice and its ties to worker safety? In addition to the BLS, the DOL has under its arm a number of agencies such as the Occupational Safety and Health Administration (OSHA), the Mine Safety and Health Administration (MSHA), the Office of Workers Compensation Programs (OWCP), the Office of Labor-Management Standards (OLMS), the Wage and Hour Division (WHD), and the Employment and Training Administration (ETA). Of course OSHA and MSHA are centered on worker health and safety, however the other agencies collectively provide for ensuring a skilled and trained workforce, an ethically managed workforce, and a fairly compensated workforce.

Figure 1.2.1: A Skilled Craftsman and assorted tools (Copyright; Pixabay)

Unions and Skilled Labor

The history of work in the US would not be complete without mention of unions. Many who will review this textbook may, if not currently union members, join a union sometime in the future. Skilled labor professionals are the primary beneficiaries of labor unions with the first documented US trade union formed in 1794, the Federal Society of Journeymen Cordwainers (Shoemakers). So what exactly is a union?

Investopedia states labor unions are associations of workers formed to protect workers' rights and advance their interests. Unions negotiate with employers through a process known as collective bargaining. The resulting union contract specifies workers' pay, hours, benefits, and job health-and-safety policies.

Modern union contracts also add provisions for education, training, and certification requirements as well as stipulations for adverse or disciplinary actions and probationary waiting periods for full union benefits. The first trade unions were no different from most early American institutions in their exclusionary, discriminatory practices and denial of membership to ethnic minorities, African Americans, Asian Americans, and women. The first trade unions did not value all workers. Groups excluded from the membership of unions supporting only Anglo-Saxon and Protestant males, formed their own unions. During the civil rights years unions saw some relaxation of exclusionary practices however even at peak union membership in the 1980s, minorities and women were still underrepresented in some of the largest trade unions. There is still work to do in this area and promoted by active recruitment of women and minorities.

A number of the largest trade unions associated with skilled labor professionals include the International Brotherhood of Electrical Workers (IBEW), International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers Ironworkers (IW), International Association of Sheet Metal, Air, Rail and Transportation Workers (SMART), United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada (UA), United Automobile, Aerospace and Agricultural Implement Workers of America International Union (UAW), United Brotherhood of Carpenters and Joiners of America (UBC), United Steelworkers (USW), International Association of Machinists and Aerospace Workers (IAM), and American Nurses Association (ANA).

Labor unions not trade oriented include the Amalgamated Transit Union (ATU), International Union of Operating Engineers (IUOE), Service Employees International Union (SEIU), International Brotherhood of Teamsters (IBT), and the Fraternal Order of Police (FOP) just to name a few. These are fully funded and influential unions often joining together on the national stage supporting legislation that implements labor policy favorable to workers.

Trade unions have played an important role in creating and elevating the economic status of the poor and working class to the middle class. Trade unions fight for safe working conditions and are responsible for helping to formulate many of the health and safety standards presented in this textbook. Unions continue to provide input and content for education requirements and training programs establishing trade certification and safety guidelines. Unions elevate the trades through apprenticeship programs supporting competitive living wages, bargaining for favorable retirement benefits, and advocating for superior medical benefits not often available to the average worker. Unions reduce wage inequality because they raise wages more for low- and middle-wage workers than for higher-wage workers, more for blue-collar than for white-collar workers, and more for workers who do not have a college degree. Strong unions set a pay standard that nonunion employers follow. Labor unions have been good for the trades and nonunion alike and crucial to economic justice despite exclusionary practices in the formative years.

Figure 1.2.2 Logo for California Teachers Association (Copyright; CTA)

Community College and Trade Schools

A persistent and equally effective means for economic justice is the community college and trade school. Community colleges and trade schools prepare workers with the education and training needed to enter the workforce as skilled laborers and excel in high paying and rewarding careers. The history of work in the US would not be complete without bringing attention to the alternative that low cost career and technical education programs have presented for improving living standards and skilled worker outcomes. Free, low cost, or subsidized training programs offer a good return on investment and are well suited for introducing students/workers to workplace safety standards and the methods for developing safe work practices and sustaining safe workplaces.

Fair pay, living wages, education and training, safe and healthy working conditions are core tenets upon which to correlate economic justice to worker safety. So how are healthy working conditions established? What are the criteria for worker safety and health? We will discuss in the next section how our desire to protect the environment addresses these questions.

CHAPTER OVERVIEW

2: Introduction to OSHA

> *"Safety doesn't happen by accident." – Author Unknown*

Overview

The Occupational Safety and Health Administration just celebrated 50 years! There are several generations of workers currently in the workplace. The oldest generation, the baby boomers (1946-1964) have had the longest tenure under an era of legislated workplace safety and generation Z (1997-2009) the shortest. For some of you in this very moment the realization that what you see manifested in the workplace with respect to safety, what you expect in the workplace regarding safety does not have a long history. So let that sink in. Prior to the Williams-Steiger Occupational Safety and Health Act of 1970, workers' were not guaranteed, nor had the right to expect safe working conditions in which to provide for self, family, and community.

The act also created the OSHA research arm, the National Institute for Occupational Safety and Health (NIOSH) currently part of the Center for Disease Control (CDC) which relies heavily on information farmed by the Environmental Protection Agency (EPA) which was also created immediately prior to the signing of the OSH Act. Collectively, these organizations have been responsible for ensuring the health and safety of the public at large for the past 50 years. As skilled workers you should understand how these organizations support overall worker safety and health setting the stage for sustaining the next 50 years of safe workplaces.

In this chapter you will increase not only your awareness of the origins of occupational safety and health in the US but also gain a better understanding of how you as a skilled worker will contribute to safe working environments.

Chapter Objective:

1. Understand when and how OSHA was established.
2. Review the OSHA Act, OSHA's Mission, Objectives and Administrative Protocols.
3. Discuss employee rights to a safe workplace.
4. Discuss employer responsibilities for ensuring safe workplaces.

Learning Outcome:

1. Identify and understand both employer and employee responsibilities for keeping workplaces safe.
2. Describe structure, arrangement and order of OSHA Standards.

Standard: 29CFR1910 OSHA Standards for General Industry, 29CRF1926 OSHA Standards for Construction

Key Terms:

ANSI, CDC, CFR, DOL, NIOSH, NRTL, OSHA, codify, consensus, proprietary, standards, subpart

Mini-Lecture: Introduction to OSHA

Required Time: 1 hour; Independent Study and reflection 1 ½ hour.

2.1: History and Origins

OSHA History

In 1970, the United States Congress was confronted with some horrific statistics: Job-related accidents that year accounted for more than 14,000 worker deaths, nearly 2 million disabled workers, and 300,000 estimated new cases of occupational diseases. As a result of these statistics, the Occupational Safety and Health Act of 1970, signed by President Richard M. Nixon established among other things, The Occupational Safety and Health Administration (OSHA).

The stated purpose of the OSHA Act is to provide "so far as possible, every working man and woman in the nation, safe and healthful working conditions." To meet this stated purpose, Congress imposed dual obligations on employers to comply with a general duty clause and a specific duty clause, The general duty clause requires each employer to furnish to each of his employees a place of employment which is free from recognized hazards that are causing or are likely to cause death or serious physical harm to his/her employees, The specific duty clause requires the employer to comply with occupational safety and health standards issued by OSHA.

Occupational Safety and Health Act

What is covered?

The OSH Act covers all employers and their employees in the 50 states, the District of Columbia, Puerto Rico and all territories under Federal Government jurisdiction.

What is not covered?

The OSH Act does not cover any State, political subdivision of a State, or the United States. In addition, self-employed persons, family operated farms and other jobsites covered by other federal agencies are not covered by the Act.

State Plans

States may choose to adopt their own OSHA plans. If they do so, they must guarantee employer and employee rights as does OSHA. This means the State plans must be at least as effective as Federal OSHA. State plans must be monitored and approved by Federal OSHA.

Origin of OSHA standards

Initially, the OSHA standards were taken from three sources: consensus standards, proprietary standards, and federal laws in effect when the Occupational Safety and Health Act became law.

Consensus standards are developed by industry-wide standard-developing organizations and are discussed and substantially agreed upon through consensus by industry. OSHA has incorporated the standards of the two primary standards groups, the American National Standards Institute (ANSI) and the National Fire Protection Association (NFPA), into its set of standards.

Proprietary standards are prepared by professional experts within specific industries, professional societies, and associations. The proprietary standards are determined by a straight membership vote, not by consensus.

Incorporation by reference

OSHA standards follow a model of providing design or performance criteria or obligations. Although OSHAs responsibility is to develop and promulgate safety standards the organization does not do this in a vacuum. Where OSHA is not the authority on matters of specific protocols that cover other federal agencies, specific industries, equipment, or type of work, they will rely on the expertise of organizations responsible for leading or developing courses of action.

Recognizing the diversity and sheer number of design and performance measures covering all industries, OSHA does at its discretion completely incorporates by reference, i.e. simply referencing the title of a standard, bases document, etc in section 1910.6 Incorporation by Reference, without duplicating in its entirety the details of that reference. In some standards the details are the standard but when there is too much specific information referencing the standard is sufficient.

The abbreviated text of the incorporation by reference standard states: The standards of agencies of the U.S. Government, and organizations which are not agencies of the U.S. Government which are incorporated by reference, have the same force and effect as other standards in this part. Only the mandatory provisions (i.e., provisions containing the word "shall" or other mandatory

language) of standards incorporated by reference are adopted as standards under the Occupational Safety and Health Act. Any changes in the standards incorporated by reference and an official historic file of such changes are available for inspection in the Docket Office at the national office of the Occupational Safety and Health Administration. The standards listed in the section are incorporated by reference into the part with the approval of the Director of the Federal Register. To enforce any edition other than that specified in this section, OSHA must publish a document in the Federal Register and the material must be available to the public.

Nationally Recognized Testing Laboratories (NRTLs)

Nationally Recognized Testing Laboratories are defined by OSHA as organizations that provides third party quality assurance of equipment with safety performance characteristics or requirements. NRTLs are responsible for testing and examining of equipment and materials for workplace safety purposes to determine conformance with appropriate test standards or provide for experimental testing and examining of equipment and materials for workplace safety purposes to determine conformance with appropriate test standards or performance in a specified manner and under specified conditions.

NRTL's list or label or accept, equipment or materials in accordance with design and performance criteria. OSHA approves and certifies testing laboratories meet standards for ensuring testing protocols and procedures follow industry guidelines, test equipment is calibrated, testing staff is trained and knowledgeable in the performance of their duties. NRTL's may inspect and monitor fabrication processes, factories of manufacturer's that carry the listing and labeling markings and must maintain complete objectivity in the quality assurance process. NRTL's are neither contracted by OSHA or the manufacturers whose equipment is being tested.

Standards by Application

Standards are sometimes referred to as being either "horizontal or "vertical" in their application. Most standards are horizontal or "general," which means they apply to any employer in any industry. Standards relating to fire protection, working surfaces and first aid are examples of horizontal standards.

Some standards, though, are relevant only to a particular industry, and are called vertical or "particular" standards. Examples are standards applying to the longshoring industry or the construction industry, and to the special industries covered in Subpart R of Part 1910.

Employer variances

Employers may seek a variance from any standard or regulation promulgated by OSHA. Variances are issued if the employer cannot fully comply with the regulations for some reason, or if they can prove that their methods of operation are at least as effective as those required by OSHA. There are two types of variances: temporary and permanent. A temporary variance may be granted for the period of time needed to achieve compliance or for one year, whichever is shorter. Permanent variances are granted to employers who demonstrate that their procedures are as effective as OSHA's.

2.2: OSHA Procedures

OSHA Procedures

OSHA has set procedures for conducting worksite inspections, assessing civil penalties for compliance violations, delegating employer and employee responsibilities, filing complaints, promoting changes and rulemaking, codifying requirements, recordkeeping and reporting.

OSHA Inspections

To enforce its standards, OSHA has the authority to conduct inspections. Every place of employment covered by OSHA is subject to inspection. OSHA has the authority to enter without delay, at reasonable times, to inspect and investigate any place of employment. Inspections are conducted without advance notice. If an employee refuses to admit an OSHA compliance officer, OSHA will pursue legal actions, such as obtaining a search warrant.

Inspection priorities

Because of the vast amount of jobsites and the shortage of OSHA compliance personnel, OSHA has inspection priorities. The first priority is for imminent danger conditions. These are situations where there is reasonable certainty that a danger exists which can be expected to cause or is causing serious physical harm or death. The second priority is given to jobsite catastrophes and fatalities. The third priority is given to investigating employee complaints and the last priority is for programmed high-hazard inspections. OSHA also includes as part of the last priority, follow-up visits for compliance with abatement and mitigation of citations.

Inspection procedures

When an inspection occurs, OSHA has a set of procedures it follows. After the OSHA inspector shows his or her credentials and announces the inspection, an Opening Conference is held with the employer to explain the purpose of the visit, the scope of the inspection and the standards that apply. An employer representative and an employee representative are permitted to attend the conference and participate in the inspection. The Inspection Tour is the second step of the inspection. The OSHA officer and accompanying representatives proceed through the jobsite on the inspection. OSHA compliance officers are permitted to question employees during the tour and they will point out unsafe or unhealthy working conditions observed. The last step of the visit is the Closing Conference. The OSHA officer will discuss what was observed during the inspection and indicate all apparent violations for which a citation may be issued. The employer is told of his/her appeal rights.

No discussion of any proposed fines should occur at the conference. The OSHA area director is responsible for that determination only after having received a full report.

Penalty schedule

OSHA has established a penalty schedule based on the severity of the violation. Violations that are not likely to affect health and safety are classified as Other Than Serious and are subject to a proposed penalty of up to $13,653 for each violation. Violations where there is a probability that death or serious physical harm could occur are classified as Serious. A mandatory fine of $13,653 for each penalty is proposed. Willful violations occur when the employer intentionally and knowingly permits a hazardous condition to exist or makes no reasonable effort to abate such a hazard. Penalties of up to $136,532 per violation are proposed for willful violations. OSHA also has fines for Repeat violations ($136,532) and Failure to Correct Prior Violations ($13,653).

Employer Responsibilities

All employers have the primary responsibility to meet the provisions of the general duty clause, section 5(a)(1), by providing their employees a workplace that is free from recognized hazards that are causing or are likely to cause death or serious physical harm to their employees.

Employers must also comply with any standards, rules and regulations issued by OSHA. Employers must examine the workplace to make sure that all workplace conditions conform to the applicable standards. Employers must provide to their employees all of the necessary training required by OSHA standards.

Employee Responsibilities

While OSHA does not cite employees, employees have the responsibility to comply with all OSHA standards and all rules, regulations and orders issued by the OSHA Act. Every employee should follow the safety and health rules and regulations and

wear appropriate Personal Protective Equipment (PPE) where so required. Employees should report any job related injury or illness to the employer immediately.

Employees' Rights

Employees should always exercise their rights under the OSHA Act in a responsible manner. If an employee is exercising these or any other OSHA rights, the employer is not permitted to discriminate against that worker in any way, such as through firing, demotion, taking away benefits, transferring the worker to an undesirable job or shift, or threatening or harassing the worker.

Workers who believe that they have been punished or discriminated against for exercising their safety and health rights must contact the nearest OSHA office within 30 days of the time they learn of the alleged discrimination.

A union representative can file a complaint on behalf of the worker. The worker does not have to complete any forms. If necessary, OSHA will pursue legal action against the employer and the employee does not have to pay any legal fees.

OSHA has a 24-Hour Emergency Service Hotline for those who want to contact OSHA about life-threatening workplace hazards or serious health emergencies. 1-(800)-321-OSHA.

Development of OSHA regulations

OSHA regulations can be developed by OSHA itself, the Secretary of Health and Human Services, the National Institute for Occupational Safety and Health, state and local governments, nationally-recognized standards-producing organizations, employer or labor representatives or any other interested persons.

2.3: OSHA Subparts

OSHA Subparts

Chapter XVII of Title 29 Department of Labor section of the code of federal regulations (CFR) is designated for the Occupational Safety and Health Administration. In this textbook we will discuss two parts under Chapter XVII, Part 1910 is the standard for Occupational Safety and Health Standards for General Industry, and Part 1926 is the standard for Occupational Safety and Health Standards, commonly known as the "Construction Industry Standards." Under each part, major blocks of information are broken down into Subparts.

The major Subparts in the 1910 Standard includes:

- Subpart A - General
- Subpart B – Adoption and Extension of Federal Standards
- Subpart C – reserved
- Subpart D – Walking-Working Surfaces
- Subpart E – Means of Egress
- Subpart F – Powered Platforms, Manlifts
- Subpart G – Occupational Health and Environmental Control
- Subpart H – Hazardous Materials
- Subpart I – Personal Protective Equipment
- Subpart J- General Environmental Controls
- Subpart K- Medical and First Aid
- Subpart L – Fire Protection
- Subpart M – Compressed Gas and Compressed Air Equipment
- Subpart N- Materials handling and Storage
- Subpart O- Machinery and Machine Guarding
- Subpart P – Hand and Portable Power Tools
- Subpart Q- Welding, Cutting, and Brazing
- Subpart R – Special Industries
- Subpart S – Electrical
- Subpart T – Commercial Diving Operations
- Subpart U- COVID-19 Emergency Temporary Standard
- Subpart Z – Toxic and Hazardous Substances

The major Subparts in the 1926 Standard includes:

- Subpart A - General
- Subpart B - General Interpretation’s
- Subpart C - General Safety and Health Provisions
- Subpart D - Occupational Health and Environmental Controls
- Subpart E - Personal Protective and Life Saving Equipment
- Subpart F - Fire Protection and Prevention
- Subpart G - Signs, Signals and Barricades
- Subpart H - Materials Handling, Storage, Use and Disposal
- Subpart I - Tools - Hand and Power
- Subpart J - Welding and Cutting
- Subpart K – Electrical
- Subpart L – Scaffolds
- Subpart M – Fall Protection
- Subpart N - Helicopters, Hoists, Elevators and Conveyors
- Subpart 0 - Motor Vehicles, Mechanized Equipment and Marine Operations
- Subpart P - Excavations
- Subpart Q - Concrete and Masonry Construction
- Subpart R - Steel Erection

- Subpart S - Underground Construction, Caissons, Cofferdams and Compressed Air
- Subpart T - Demolition
- Subpart U - Blasting and Use of Explosives
- Subpart V - Power Transmission and Distribution
- Subpart W - Rollover Protective Structures; Overhead Protection
- Subpart X – Stairways and Ladders
- Subpart Y – Diving
- Subpart Z – Toxic and Hazardous Substances
- Subpart CC - Cranes and Derricks in Construction

Each Subpart may be further divided into more detailed sections, such as the following example from the construction standard:

Subpart D

Occupational Health and Environmental Controls

Table Subpart D Sections

1926.50	Medical Services and First Aid.
1926.51	Sanitation.
1926.52	Occupational Noise Exposure.
1926.53	Ionizing Radiation.
1926.54	Non-ionizing Radiation.
1926.55	Gases, Vapors, Fumes Dusts and Mists.
1926.56	Illumination.
1926.57	Ventilation.
1926.58	Asbestos, Tremolite, Anthophyllite and Actinolite.
1926.59	Hazard Communication.

Paragraph Numbering System

Using section 59 of the 1926 standard, let's examine the structure and workings of the numbering system.

29 CFR 1926.59(h)(2)(ii)

Employee training shall include at least the physical and health hazards of the chemicals in the work area.

Description of Paragraph Numbering System

Title	Code of Federal Regulations	Part	Section
29	CFR	1926	.59

The first number 29 represents the title.

Next we have CFR, which represents the Code of Federal Regulations. Next we have 1926, which is Part 1926.

Next is the section number, in this case Section 59 for hazard communication. If the number were 150, you would relate it to fire protection. Section 451 relates to scaffolding.

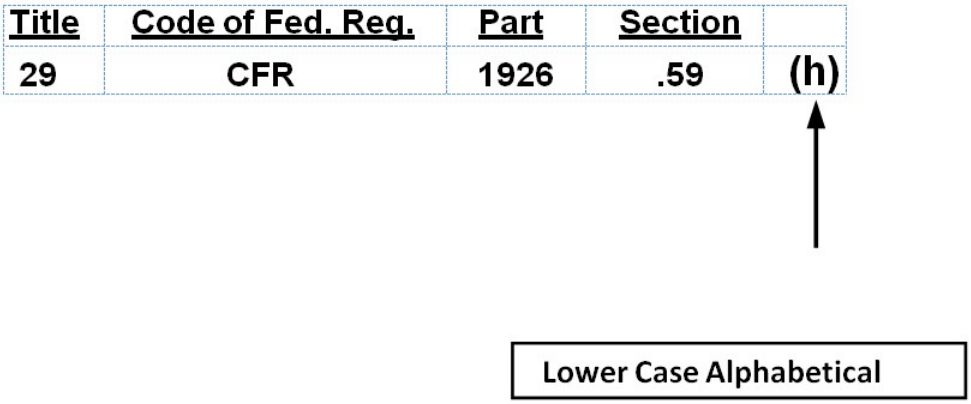

Figure 2.3.1

Breakdown of standard numbering part 1. (source: this text)

The next division is the paragraph. As you can see, the first tier of paragraphs beneath the section level will be numbered in parentheses (a), (b), (c), (d), etc. as will all further designations. If you only had three major paragraphs of information under a section, they would be numbered 59(a), 59(b), 59(c).

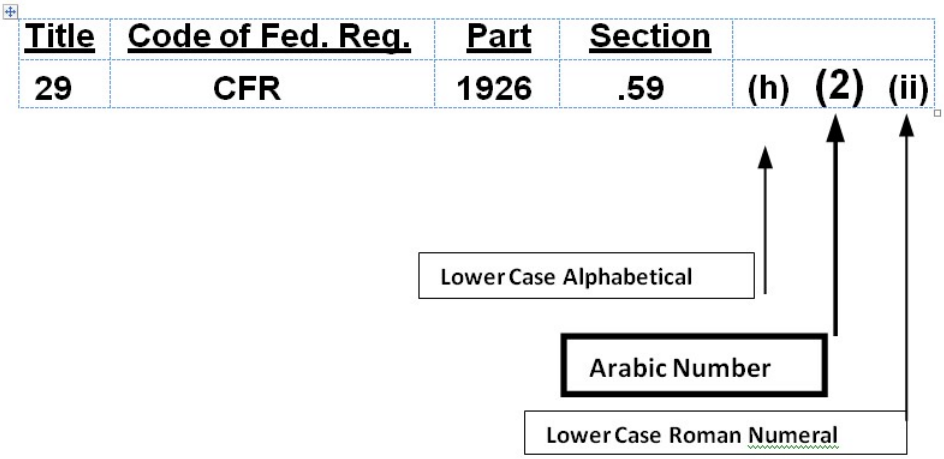

Figure 2.3.2 Breakdown of standard numbering part 2. (source; this text)

The next level of numbering involves the use of Arabic numbers in parentheses. As illustrated, if there were three paragraphs of information between subheadings (a) and (b), they would be numbered (a)(l), (a)(2), and (a)(3).

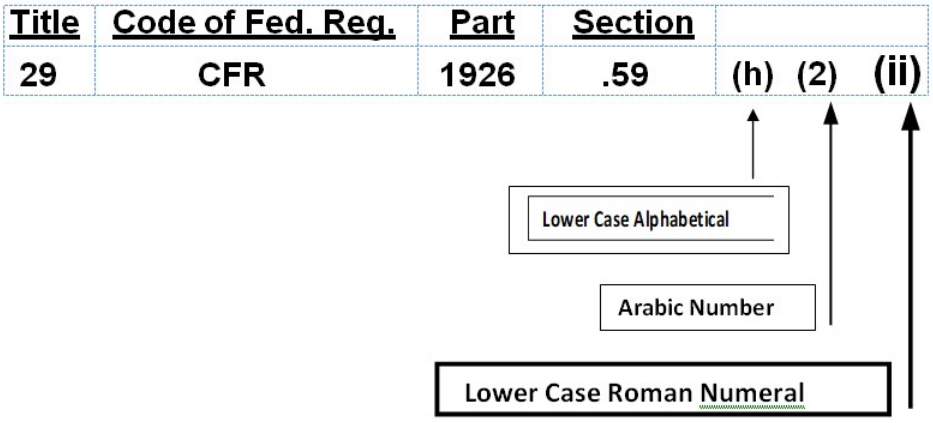

Figure 2.3.3 Breakdown of standard numbering part 3 (source; this text)

The next level uses the lowercase Roman numeral. An example would be between paragraphs (2) and (3); If there were five paragraphs of information pertaining to Arabic (2) they would be numbered (2)(i), (2)(ii), (2)(iii), (2)(iv), and (2)(v).

Most Frequently Cited Standards

OSHA statistics are updated annually. Use the following link Frequently Cited OSHA Standards to search for your industry. Enter "submit" for list of NAICS codes then enter the sector code. Use the following links to view annual report of OSHA's most frequently cited standards for 2021:

- All Industries

Required Recordkeeping

A major responsibility of OSHA involves recordkeeping and reporting. Employers of 11 or more employees must maintain occupational and injury records as they occur. Some employers, such as those in retail trade, finance, insurance, real estate, and service industries are not subject to a records request from OSHA.

Recordkeeping and reporting are one of the primary tools used to obtain statistical data on workplace accidents and is an effective tool for employer trending of safety related incidents at worksites.

Accidents

Any on-the-job accident that results in the death of an employee, or the hospitalization of three or more employees, must be reported to the nearest OSHA office within 8 hours.

These recordkeeping and recording statistics are maintained on a calendar year basis. OSHA requires that an annual log, (OSHA 300 Log) be kept and posted at each establishment.

2.A: Review Questions

Complete as directed:

1. OSHA will permit variances from their standards under specialize circumstances. The two types of variances OSHA issues are_____ and _____.

2. OSHA has established a penalty schedule for employer violations. The severity of the fine depends upon the severity of the violation. Penalties of up to $_____ per violation can be proposed for willful violations.

3. OSHA recordkeeping requirements specify that any on the job accidents that result in the death of_____or more employees or the hospitalization of_____or more employees must be reported to the nearest OSHA office within _____ hours.

4. What are the three most frequently cited serious OSHA violations for the construction industry? General Industry?

a.

b.

c.

d.

e.

f.

Multiple Choice:

5. Which of the following would receive OSHA's top priority in terms of inspection:

a. _____Catastrophes

b. _____ Fatalities

c. _____ Employee complaints

d. _____Imminent danger conditions

6. Employers may take which of the following actions against employees who file a complaint with OSHA:

a. _____Demotion

b. _____ Take away benefits

c. _____ Firing

d. _____Transferring to another job

e. _____Employers are not permitted to discriminate against workers with any of the above.

True or False: (Mark Correct Answer)

7. T or F

Employers must provide the employees all the necessary training required by the OSHA standards.

8. T or F

States may choose to adopt their own OSHA plans provided they ensure that the state plans are as effective as Federal OSHA.

9. T or F

All employees have the responsibility to comply with all OSHA regulations. Employees who don't comply with the OSHA regulations will be cited by OSHA.

10. T or F

OSHA may codify safety requirements from any standard or organization they choose.

CHAPTER OVERVIEW

3: General Safety and Health Provisions

> *“Teaching the world to be careful is a constructive service worthy of God’s great gift of life to man."*
>
> *U.S. Supreme Court Justice Harold H. Burton (1946)*

Overview

Most individuals beginning work for the first time do not give much thought to the typical “amenities” of the workplace. Adequate lighting, sanitation, and air quality for example are expected in most societies with fully developed infrastructures. Most if not all indoor facilities are designed for emergency egress and have capacity limits. If you walk into an establishment and trip or fall, cut or injure yourself you can expect first aid. We expect the workplace to not be scary or treacherous. We expect it to be safe.

General safety and health provisions are for every workplace. While not ‘home’ workplaces are where many of us will spend a good deal of our wake hours, must provide for basic human comforts and just as importantly be prepared for the unanticipated incident.

Chapter Objective:

1. Review the requirements of the Construction Standard Subpart C.
2. Compare Subpart C to related General Industry Standards.
3. Discuss the responsibilities of the employer for training employees on general safety and health provisions.
4. Define and understand the role of a "competent person."

Learning Outcome:

1. Recognize and identify good housekeeping practices for any worksite.
2. Recognize and identify key safety and health protocols for any worksite.

Standards: 1926.21 Safety Training and Education, 1926.23-First aid and medical attention, 1926.24-Fire protection and prevention, 1926.25-Housekeeping, 1926.26-Illumination, 1926.27-Sanitation, 1926.28-Personal Protective Equipment, 1926.29-Acceptable Certifications, 1926.31-Incorporation by reference, 1926.32-Definitions, 1926.33-Access to Employee exposure and Medical Records, 1926.34-Means of egress, 1926.35-Emergency action plans

Key Terms:

ANSI, NFPA, ASME, SAE, ASTM, NRTL, approved, authorized person, designated person, qualified, employee, employer, hazardous substance

Mini-Lecture: Every work place

Topic Required Time: 45 min; Independent Study and reflection 1 hour.

3.1: Introduction to General Safety and Health Provisions

Background

1926 Subpart C contains general safety and health provisions for such topics as first aid, fire protection, and personal protective equipment. More detailed information on these topics is covered in separate subparts. These identical provisions are also specific subparts in the General Industry Standard.

Under the provisions of Subpart C, every employer must ensure that their employees do not work in situations or under conditions which are unsanitary, hazardous or dangerous to their safety or health. Employers must ensure that any tool, machine or equipment that an employee must use is in good working condition and only those employees qualified by training or experience are allowed to operate such equipment.

Training

The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury.

Poisons, caustics, and other harmful substances

Employees required to handle or use poisons, caustics, and other harmful substances shall be instructed regarding safe handling and use, and be made aware of the potential hazards, personal hygiene, and personal protective measures required.

Flammable liquids, gases, or toxic materials

Employees required to handle or use flammable liquids, gases, or toxic materials shall be instructed in the safe handling and use of these materials and made aware of the specific requirements contained in Subparts D, F, and other applicable subparts of this part.

Confined or enclosed spaces

All employees required to enter into confined or enclosed spaces shall be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and in the use of protective and emergency equipment required. The employer shall comply with any specific regulations that apply to work in dangerous or potentially dangerous areas. For the purposes of this section, "confined or enclosed space," means any space having a limited means of egress which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere. Confined or enclosed spaces include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 feet in depth such as pits, tubs, vaults, and vessels.

First Aid and Medical Attention

First aid services and provisions for medical care shall be made available by the employer for all employees covered by these regulations. Regulations prescribing specific requirements for first aid, medical attention, and emergency facilities are contained in Subpart D.

Fire Protection and Prevention

The employer shall be responsible for the development and maintenance of an effective fire protection and prevention program at the job site throughout all phases of the construction, repair, alteration, or demolition work. The employer shall ensure the availability of the fire protection and suppression equipment required by Subpart F.

Housekeeping

During the course of construction, alteration, or repairs, forms and scrap lumber with protruding nails, and all other debris, shall be kept cleared from work areas, passageways, and stairs, in and around buildings or other structures.

Combustible scrap and debris shall be removed at regular intervals during the course of construction. Safe means shall be provided to facilitate such removal.

Containers shall be provided for the collection and separation of waste, trash, oily and used rags, and other refuse. Containers used for garbage and other oily, flammable, or hazardous wastes, such as caustics, acids, harmful dusts, etc. shall be equipped with covers. Garbage and other waste shall be disposed of at frequent and regular intervals.

Illumination

Construction areas, aisles, stairs, ramps, runways, corridors, offices, shops, and storage areas where work is in progress shall be lighted with either natural or artificial illumination. The minimum illumination requirements for work areas are contained in Subpart D.

Sanitation

Worksites must be kept in a clean and sanitary condition. Sanitary is generally defined by OSHA as being simply being a condition conducive to health. Maintaining sanitary conditions is not just about housekeeping. It includes ensuring levels of cleanliness that prevent the harboring of disease carry pests, biological hazards such as microbes, viruses, molds, and hygiene facilities such as restrooms and equivalents, potable water, rest and lunch areas, efficient disposal of waste.

Personal Protective Equipment

The employer is responsible for requiring the wearing of appropriate personal protective equipment in all operations where there is exposure to hazardous conditions or where this part indicates the need for using such equipment to reduce the hazards to the employees. Regulations governing the use, selection, and maintenance of personal protective and lifesaving equipment are described under Subpart E of this part.

3.2: Competent Person

OSHAs Competent Person

Section 1926.32 defines a "competent person" as one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. Keep in mind that the requirements of a competent person are different from standard to standard. A person can be a competent person for the purposes of Subpart P, Excavations, but not for Subpart N, Cranes. The other critical component of the definition is that the competent person must be capable of taking "prompt corrective measures" to eliminate any hazards. If the person has the knowledge, but not the authority to correct, they cannot be the competent person.

Acceptable Certifications

Some critical facility or plant equipment designed in accordance with engineering design and fabrication standards are required to have certifications that ensure worker safety.

Pressure vessels

Current and valid certification by an insurance company or regulatory authority shall be deemed as acceptable evidence of safe installation, inspection, and testing of pressure vessels provided by the employer.

Boilers

Boilers provided by the employer shall be deemed to be in compliance with the requirements of this part when evidence of current and valid certification by an insurance company or regulatory authority attesting to the safe installation, inspection, and testing is presented.

Other requirements

Regulations prescribing specific requirements for other types of pressure vessels and similar equipment are contained in Subparts F and O of this part.

Incorporation by reference

See discussion in chapter 1.

3.3: Employee Exposure

Employer Exposure and Medical Records Access

The medical record for each employee shall be preserved and maintained for at least the duration of employment, plus thirty (30) years, except that the following types of records need not be retained for any specified period:

1. Health insurance claims.
2. First aid records (not including medical histories) of one-time treatment.
3. The medical records of employees who have worked for less than one year.

Each employee exposure record shall be preserved and maintained for at least thirty (30) years, except that:

1. Background data to environmental (workplace) monitoring or measuring, such as laboratory reports and worksheets, need only be retained for one (1) year.
2. Safety data sheets.
3. Biological monitoring results designated as exposure records by specific occupational safety and health standards shall be preserved and maintained as required by the specific standard.

Access to records

Whenever an employee or designated representative requests access to a record, the employer shall assure that access is provided in a reasonable time, place, and manner. If the employer cannot reasonably provide access to the record within fifteen (15) working days, the employer shall within the fifteen (15) working days apprise the employee or designated representative requesting the record of the reason for the delay and the earliest date when the record can be made available.

Copies of records

Whenever an employee or designated representative requests a copy of a record, the employer shall assure that either

1. a copy of the record is provided without cost to the employee or representative;
2. the necessary mechanical copying facilities (e.g., photocopying) are made available without cost to the employee or representative for copying the record; or
3. the record is loaned to the employee or representative for a reasonable time to enable a copy to be made.

Written consent required

Each employer shall, upon request, assure the access of each employee to employee medical records of which the employee is the subject, except when the information contained in the records could be detrimental to the employee's health, such as a specific diagnosis of a terminal illness or a psychiatric condition. In such cases the information will be released to a designated representative by written consent only.

Each employer shall, upon request, assure the access of each employee and designated representative to each analysis using exposure or medical records concerning the employee's working conditions or workplace.

Upon an employee's first entering into employment, and at least annually thereafter, each employer shall inform current employees covered by this section of the following:

1. The existence, location, and availability of any records covered by this section.
2. The person responsible for maintaining and providing access to records.
3. Each employee's rights of access to these records.

Succession of records

Whenever an employer is ceasing to do business, the employer shall transfer all records subject to this section to the successor employer. The successor employer shall receive and maintain these records.

3.4: Means of Egress

Means of Egress

Exits shall be so arranged and maintained in every building or structure, as to provide free and unobstructed egress from all parts of the building or structure at all times when it is occupied. No lock or fastening to prevent free escape from the inside of any building shall be installed except in mental, penal, or corrective institutions where supervisory personnel are continually on duty and effective provisions are made to remove occupants in case of fire or other emergency.

Exits shall be marked by a readily visible sign. Access to exits shall be marked by readily visible signs in all cases where the exit or way to reach it is not immediately visible to the occupants. Means of egress shall be continually maintained free of all obstructions or impediments to full instant use in the case of fire or other emergency.

Emergency Actions Plans

Any emergency action plan required by a particular OSHA standard shall be in writing and shall cover those designated actions employers and employees must take to ensure employee safety from fire and other emergencies.

Elements of the plan

The following elements, at a minimum, shall be included in the plan:

1. Emergency escape procedures and emergency escape route assignments.
2. Procedures to be followed by employees who remain to operate critical plant operations before they evacuate.
3. Procedures to account for all employees after emergency evacuation have been completed.
4. Rescue and medical duties for those employees who are to perform them.
5. The preferred means of reporting fires and other emergencies.
6. Names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan.

Employee alarm system

The employer shall establish an employee alarm system and if the employee alarm system is used for alerting fire brigade members, or for other purposes, a distinctive signal for each purpose shall be used.

Planning

The employer shall establish in the emergency action plan the types of evacuation to be used in emergency circumstances.

Before implementing the emergency action plan, the employer shall designate and train a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees. The employer shall review the plan with each employee covered by the plan at the following times:

1. Initially when the plan is developed.
2. Whenever the employee s responsibilities or designated actions under the plan change.
3. Whenever the plan is changed.

Communication of plan

The employer shall review with each employee upon initial assignment those parts of the plan, which the employee must know to protect the employee in the event of an emergency. The written plan shall be kept at the workplace and made available for employee review. For those employers with 10 or fewer employees, the plan may be communicated orally to employees and the employer need not maintain a written plan.

Select Definitions

Act: Section 107 of the Contract Work Hours and Safety Standards Act, commonly known as the Construction Safety Act (86 Stat. 96; 40 U.S.C. 333).

ANSI: American National Standards Institute.

ASME: American Society of Mechanical Engineers

ASTM: American Society of Testing and Materials

Approved: Sanctioned, endorsed, accredited, certified, or accepted as satisfactory by a duly constituted and nationally recognized authority or agency.

Authorized person: A person approved or assigned by the employer to perform a specific type of duty or duties or to be at a specific location or locations at the jobsite.

Administration: The Occupational Safety and Health Administration.

Competent person: One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Construction work: For purposes of this section, "Construction work" means work for construction, alteration, and/or repair, including painting and decorating.

Defect: Any characteristic or condition, which tends to weaken or reduce the strength of the tool, object, or structure of which it is a part.

Designated person: "Authorized person" as defined in paragraph (d) of this section.

Employee: Every laborer or mechanic under the Act regardless of the contractual relationship which may be alleged to exist between the laborer and mechanic and the contractor or subcontractor who engaged him. "Laborer and mechanic" are not defined in the Act, but the identical terms are used in the Davis-Bacon Act (40 U.S.C. 276a), which provides for minimum wage protection on Federal and federally assisted construction contracts. The use of the same term in a statute which often applies concurrently with section 107 of the Act has considerable presidential value in ascertaining the meaning of "laborer and mechanic" as used in the Act. "Laborer" generally means one who performs manual labor or who labors at an occupation requiring physical strength; "mechanic" generally means a worker skilled with tools. See 18 Comp. Gen. 341.

Employer: Contractor or subcontractor within the meaning of the Act and of this part.

Hazardous substance: A substance which, by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful, is likely to cause death or injury.

NFPA: National Fire Protection Association

3.A: Review questions

Complete as directed.

Fill in the Blanks:

1. Under the provisions of Subpart C, every employer must ensure that each employee does not work under conditions which are _____ ,_____ or otherwise dangerous to their safety or health.

2. Employees required to handle or use poisons, caustics, and other harmful substances shall be_____regarding the safe handling and use, and be made aware of the potential hazards, personal hygiene, and personal protective measures required.

3. True or False...Employers who are only performing demolition work are not responsible for the development and maintenance of a fire protection and prevention program at the job site.

4. Combustible scrap and debris shall be removed at regular _____ during the course of construction.

5. Which of the following construction areas are required to be lit with either natural or artificial lighting during construction periods?

a. Aisles

b. Ramps

c. Runways

d. Storage areas

e. All of the above

6. In general, the medical record for each employee shall be preserved and maintained for at least the duration of employment plus_____years.

a. 5 b. 10 c. 20 d. 30

7. Means of_____shall be continually maintained free of all obstructions or impediments to full instant use in the case of fire or other emergency.

8. The employer shall establish in the emergency action plan the types of_____to be used in emergency circumstances.

9. For the purposes of Subpart C, Define a "confined space."

CHAPTER OVERVIEW

4: Occupational Health and Environmental Controls

> *"A prudent man foresees the difficulties ahead and prepares for them; the simpleton goes blindly on and suffers the consequences." Proverbs 22:3*

Overview

You have probably heard the euphemism "There is a method to the madness" used to describe when there is hidden or buried in a process, procedure, scheme or set of instructions a logical order to "how" an objective is achieved or a goal met. Sometimes there may even be a bit of chaos apparent when there are varied and diverse instructions or ways of interpreting those instructions. When discussing method there are always questions as to "why" or to "what extent" something must be done a certain way or even at all.

This chapter will begin with discussing a standard that is really the overarching theme of workplace safety, "Hazard Communication". Because at the end of the day keeping people safe through implementation of OSHA's core mission of identifying and eliminating workplace hazards is really about how well information is communicated and understood. This chapter will also connect elements of hazard communication to "Industrial Hygiene", the "science" and "method" of keeping workplaces safe. When we know the reason behind the "why" , "what", and "how", acceptance is easier.

Chapter Objective:

1. Review and understand the requirements of the Hazard Communication Standard.
2. Define the core elements of Industrial Hygiene.
3. Discuss the "science" of health and safety.
4. Identify health hazards associated with many types of chemicals.
5. Define and discuss PPE.

Learning Outcome:

1. Recognize and cite the five categories of occupational hazards.
2. Recognize and understand the Hierarchy of Controls.

Standards: 1910.1200 and 1926.59-Hazard Communication

Key Terms:

Communication, Industrial Hygiene, Hazards, Controls, PPE, SDS

Mini-Lecture: Industrial Hygiene, Hazard Communication

Topic Required Time: 2 hrs; Independent Study and reflection 1 3/4 hour.

4.1: Introduction to Occupational Health and Environmental Controls

Occupational Health and Environmental Controls

1926 Subpart D Occupational Health and Environmental Controls focuses on health hazards and our exposures. It addresses the physical environments in which we may work and establishes standards required for ensuring physical conditions such as sanitation, illumination, ventilation, and noise levels are acceptable for human occupants. It focuses on both physical hazards and chemical hazards. In this chapter we will focus on describing the basis for how chemical health hazards are measured, monitored, and controlled.

Construction workers are exposed daily to thousands of chemicals that are brought onto the jobsite for all types of uses. Workers in other industries such as refineries or power plants or manufacturing facilities are exposed to chemicals as part of processes that exceed threshold levels. Exposure to many of these chemicals can lead to serious health hazards for the exposed worker. The OSHA Hazard Communication Standard was written to ensure that the hazards of all chemicals produced or imported into this country are evaluated and that information regarding any health hazards be transmitted to employers and their employees.

The Hazard Communication Standard provides for three primary means to get information about health hazards into the hands of employers and their employees. The first means is through the use of appropriate labels and other forms of warning. The second is by the use of Safety Data Sheets (SDS). The third is by employee training.

General

The Hazard Communication standard requires that chemical manufacturers and importers evaluate their chemicals and determine if they are hazardous.

Elements of a Hazard Communication Program

Employers shall develop, implement and maintain, at each workplace, a written Hazard Communication Program consisting of at least the following elements:

1. Labels and other forms of warning.
2. Safety Data Sheets.
3. Employee training and information.
4. List of known hazardous chemicals at the workplace.
5. Methods used to inform employees of hazards.

Multi-employer workplaces

On multi-employer workplaces, employers who produce, use, or store hazardous chemicals at the workplace must ensure that the information about these chemicals, in the form of SDS, is available for their employees and any other employees who may be exposed to these chemicals.

Labels and Other Forms of Warning

Labels are required to follow the new globally harmonized system(GHS) and parties have the following responsibilities.

Chemical manufacturer, importer, or distributor responsibilities

The chemical manufacturer, importer, or distributor must ensure that each hazardous chemical is labeled, tagged, or marked with the following information before it enters the workplace:

1. Identity of the hazardous chemical.
2. Appropriate hazardous warnings.
3. Name and address of chemical manufacturer, importer or other responsible party.

Employer responsibility

Once the hazardous chemical enters the workplace it is the responsibility of the employer to ensure that each container is marked or labeled with the following information:

1. Identity of the hazardous chemical.
2. Appropriate hazardous warnings such as words, pictures, symbols, or a combination of all three.

Portable containers

For portable containers which are used to transfer hazardous chemicals from one labeled container to the point of use, the containers need not be labeled.

Label requirements

The employer must ensure that the labels, and any other forms of warning, are written in English and are prominently displayed on the container or readily available in the work area throughout each work shift.

4.2: Hazard Communication Safety Data Sheets

Hazard Communication Safety Data Sheets

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

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

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

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

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

Section 5, Fire-fighting measures lists suitable extinguishing techniques, equipment; chemical hazards from fire.

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

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

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

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

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

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

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

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

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

Employers must ensure that SDSs are readily accessible to employees.

See Appendix D of 1910.1200 for a detailed description of SDS contents.

Chemical manufacturers, importers and distributors must ensure that employers are provided copies of the SDS sheets with their initial shipment and with the first shipment after the SDS has been changed.

Maintaining SDS Sheets

The employer must maintain SDS sheets in the workplace for each of the hazardous chemicals on site. SDS sheets must be readily accessible, during each work shift, to employees when they are in their work area. Electronic access, such as computer databases, microfiche and other alternatives to maintaining paper copies of the SDS sheets are permitted, as long as no barriers to immediate employee access in each workplace are created by such options. In any event, SDS sheets must be readily accessible during each work shift to all employees.

If employees are required to travel between workplaces during a shift, SDS sheets are permitted to be kept at the primary workplace facility. SDS sheets may be kept in any form, provided they contain all of the required information as listed above.

Training

Employers provide employees with effective training on the hazardous chemicals in their workplaces at the time of their initial assignment, and whenever new hazardous chemicals are introduced into the workplace.

The required training shall cover at least the following topics:

1. The requirements of the Hazard Communication Standard.
2. Operations in the employee's area where hazardous chemicals are present.
3. The location of the written hazard communication program and SDS sheets.
4. Methods and operations to detect the presence of hazardous chemicals.
5. The physical & health hazards associated with the chemicals in their work areas.
6. PPE available to the employees and other control measures they can use to protect themselves.
7. Details of the employer's hazard communication program, including how to use SDS sheets and proper PPE.

4.3: Industrial Hygiene

Industrial Hygiene

Industrial hygiene is the science of anticipating, recognizing, evaluating, and controlling workplace conditions that may cause workers' injury or illness. Industrial hygienists use environmental monitoring and analytical methods to detect the extent of worker exposure and employ engineering, administrative/work practice controls, and other methods to control potential health hazards.

The operative word is “control”. Once hazards are identified, evaluated and assessed it is the employer’s responsibility to manage and control those hazards applying a control hierarchy. The Hierarchy of Control is the application of a logical and systematic process with a primary goal of eliminating the hazard altogether. In the image below it shows the control hierarchy demonstrated and depicted as a pyramid with divisions of control. The arrow running aside the pyramid denotes increasing effectiveness from the base of the pyramid to the top. The apex of the pyramid in dark green effects the most control through elimination/substitution of a hazard. The next level of control in light green is engineering which requires a physical change to the workplace. The third tier of control in yellow is administrative or work practice controls which requires a worker to do something. The last tier or base of the pyramid in red is personal protective equipment which requires the workers to wear something.

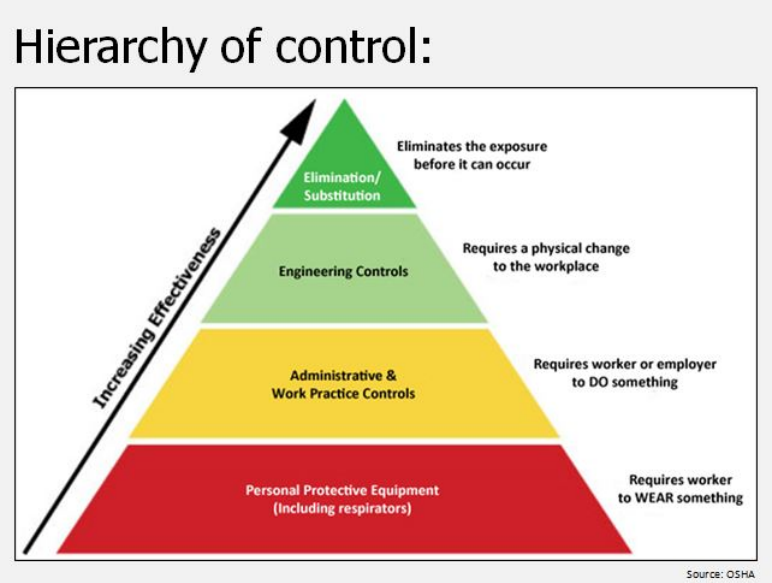

Figure 4.3.1: Hierarchy of Control. (Source; OSHA)

Hazards must be categorized to effectively apply the hierarchy of controls. The five primary categories of hazards are chemical, biological, physical, physiological (ergonomic), and psychological (psycho-social) hazards. Effective control of hazards especially when considering personal protective equipment must consider the category of the hazard, i.e. respirators for aerosolized blood will differ from respirators for pulverized silica. Some hazards can be placed in multiple categories such as gasoline. Gasoline is a chemical hazard and in confined spaces would require respiratory protection but is also a physical hazard in a confined space if fumes exceed lower explosive limits (LELs).

NIOSH along with the American Council of Governmental Industrial Hygienists (ACGIH) provide for the research and development of criteria that establish the safety standards promulgated by OSHA.

Industrial hygiene and the hygienists assisting with applying the science of protecting workers and keeping workplaces safe utilize the following terminology of the discipline to describe health characteristics, impacts and physical parameters. You will see many of the following terms in SDSs, labels on containers, PPE, and other engineering controls.

4.4: Industrial Hygiene Terminology

Useful Terminology

ACGIH: American Conference of Governmental Industrial Hygienists, which develops and publishes, recommended occupational exposure limits for hundreds of chemical substances and physical agents. See TLV.

Acid: Any chemical with a low pH that in water solution can burn the skin or eyes. Acids turn litmus paper red and have pH values of 0 to 6.

Action level: Term used by OSHA and NIOSH to express the level of toxicant, which requires medical surveillance, usually one half of the PEL.

Activated Charcoal: Charcoal is an amorphous form of carbon formed by burning wood, nutshells, animal bones, and other carbonaceous materials. Charcoal becomes activated by heating it with steam to 800-900°C. During this treatment, a porous, submicroscopic internal structure is formed which gives it an extensive internal surface area. Activated charcoal is commonly used as a gas or vapor adsorbent in air- purifying respirators and as a solid sorbent in air sampling.

Acute Effect: Adverse effect on a human or animal, which has severe symptoms developing rapidly and coming quickly to a crisis. Also see "chronic effect."

Adsorption: The condensation of gasses, liquids, or dissolved substances on the surfaces of solids.

AIHA: American Industrial Hygiene Association.

Air: The mixture of gasses that surrounds the earth; its major components are as follows: 78.08% nitrogen, 20.95% oxygen, 0.03% carbon dioxide, and 0.93% argon. Water vapor (humidity) varies.

Air-line respirator: A respirator that is connected to a compressed breathing air source by a hose of small inside diameter. The air is delivered continuously or intermittently in a sufficient volume to meet the wearer's breathing requirements.

Air-purifying respirator: A respirator that uses chemicals to remove specific gasses and vapors from the air or that uses a mechanical filter to remove particulate matter. An air-purifying respirator must only be used when there is sufficient oxygen to sustain life and the air contaminant level is below the concentration limits of the device.

Alkali: Any chemical with a high pH that in water solution is irritating or caustic to the skin.

Strong alkalis in solution are corrosive to the skin and mucous membranes. Example: sodium hydroxide, referred to as caustic soda or lye. Alkalis turn litmus paper blue and have pH values from 8 to 14. Another term for alkali is base.

Allergy: An abnormal response of a hypersensitive person to chemical and physical stimuli. Allergic manifestations of major importance occur in about 10 percent of the population.

ANSI: The American National Standards Institute is a voluntary membership organization (run with private funding) that develops consensus standards nationally for a wide variety of devices and procedures.

Asphyxiant: A vapor or gas, which can cause unconsciousness or death by suffocation (lack of oxygen). Asphyxiation is one of the principal potential hazards of working in confined spaces.

ASTM: American Society for Testing and Materials.

Atmosphere-supplying respirator: A respirator that provides breathing air from a source independent of the surrounding atmosphere. There are two types: air-line and self- contained breathing apparatus.

Atmospheric pressure: The pressure exerted in all directions by the atmosphere. At sea level, mean atmospheric pressure is 29.92 inches Hg, 14.7 psi, or 407 inches w.g.

Base: A compound that reacts with an acid to form a salt. It is another term for alkali.

Benign: Not malignant. A benign tumor is one, which does not metastasize or invade tissue.

Benign tumors may still be lethal, due to pressure on vital organs.

Biohazard: A combination of the words biological hazard. Organisms or products of organisms that present a risk to humans.

Boiling point: The temperature at which the vapor pressure of a liquid equals atmospheric pressure.

Carbon monoxide: A colorless, odorless toxic gas produced by any process that involves the incomplete combustion of carbon-containing substances. It is emitted through the exhaust of gasoline powered vehicles.

Carcinogen: A substance or agent capable of causing or producing cancer in mammals, including humans. A chemical is considered to be a carcinogen if: a) it has been evaluated by the International Agency for Research on Cancer (IARC) and found to be a carcinogen or potential carcinogen; or b) it is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or c) it is regulated by OSHA as a carcinogen.

CAS: Chemical Abstracts Service is an organization under the American Chemical Society. CAS abstracts and indexes chemical literature from all over the world in "Chemical Abstracts." "CAS Numbers" are used to identify specific chemicals or mixtures.

Ceiling limit (C): An airborne concentration of a toxic substance in the work environment, which should never be exceeded.

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act of 1980. Commonly known as "Superfund." (U.S.EPA)

Chemical cartridge respirator: A respirator that uses various chemical substances to purify inhaled air of certain gasses and vapors. This type respirator is effective for concentrations no more than ten times the TLV of the contaminant, if the contaminant has warning properties (odor or irritation) below the TLV.

CHEMTREC: Chemical Transportation Emergency Center. Public service of the Chemical Manufacturers Association that provides immediate advice for those at the scene of hazardous materials emergencies. CHEMTREC has a 24-hour toll- free telephone number (800-424-9300) to help respond to chemical transportation emergencies.

Chronic effect: An adverse effect on a human or animal body, with symptoms which develop slowly over a long period of time or which recur frequently. Also see "acute."

Combustible liquid: Combustible liquids are those having a flash point at or above 37.8°C, (100°F).

Concentration: The amount of a given substance in a stated unit of measure. Common methods of stating concentration are percent by weight, or by volume, weight per unit volume, normality, etc.

Corrosive: A substance that causes visible destruction or permanent changes in human skin tissue at the site of contact.

CFR: Code of Federal Regulations. A collection of the regulations that have been promulgated under United States law.

Cutaneous: Pertaining to or affecting the skin.

Degrees Celsius (Centigrade): The temperature on a scale in which the freezing point of water is 0°C and the boiling point is 100°C. To convert to Degrees Fahrenheit, use the following formula: °F = (°C x 1.8) + 32.

Degrees Fahrenheit: The temperature on a scale in which the boiling point of water is 212°F and the freezing point is 32°F.

Density: The mass per unit volume of a substance. For example, lead is much more dense than aluminum.

Dermatitis: Inflammation of the skin from any cause.

Dermatosis: A broader term than dermatitis; it includes any cutaneous abnormality, thus encompassing folliculitis, acne, pigmentary changes, and nodules and tumors.

Dose-response relationship: Correlation between the amount of exposure to an agent or toxic chemical and the resulting effect on the body.

DOL: U.S. Department of Labor. OSHA and MSHA are part of the DOL.

DOT: U.S. Department of Transportation.

Dusts: Solid particles generated by handling, crushing, grinding, rapid impact, detonation, and decrepitation of organic or inorganic materials, such as rock, ore, metal, coal, wood and grain. Dusts do not tend to flocculate or mass, except under electrostatic forces; they do not diffuse in air but settle under the influence of gravity.

Dyspnea: Shortness of breath, difficult or labored breathing.

EPA: U.S. Environmental Protection Agency.

Evaporation: The process by which a liquid is changed into the vapor state.

Evaporation rate: The ratio of the time required to evaporate a measured volume of a liquid to the time required to evaporate the same volume of a reference liquid (butyl acetate, ethyl ether) under ideal test conditions. The higher the ratio, the slower the evaporation rate. The evaporation rate can be useful in evaluating the health and fire hazards of a material.

Federal Register: Publication of U.S. government documents officially promulgated under the law, documents whose validity depends upon such publication. It is published on each day following a government working day. It is, in effect, the daily supplement to the Code of Federal Regulations, CFR.

Fire point: The lowest temperature at which a material can evolve vapors fast enough to support continuous combustion.

First Aid: Emergency measures to be taken when a person is suffering from overexposure to a hazardous material, before regular medical help can be obtained.

Flammable limits: Flammables have a minimum concentration below which propagation of flame does not occur on contact with a source of ignition. This is known as the lower flammable explosive limit (LEL). There is also a maximum concentration of vapor or gas in air above which propagation of flame does not occur. This is known as the upper flammable explosive limit (UEL). These units are expressed in percent of gas or vapor in air by volume.

Flammable liquid: Any liquid having a flashpoint below 37.8°C (100°F), except any mixture having components with flashpoints of 100°F or higher, the total of which make up 99 percent or more of the total volume of the mixture.

Flammable range: The difference between the lower and upper flammable limits, expressed in terms of percentage of vapor or gas in air by volume, and is also often referred to as the "explosive range."

Flashpoint: The minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid. Two tests are used - open cup and closed cup.

Fume: Airborne particulate formed by the evaporation of solid materials, e.g. metal fume emitted during welding. Usually particulates are less than one micron in diameter.

Gage pressure: Pressure measured with respect to atmospheric pressure.

Gas: A state of matter in which the material has very low density and viscosity; can expand and contract greatly in response to changes in temperature and pressure; easily diffuses into other gasses; readily and uniformly distributes itself throughout any container. A gas can be changed to the liquid or solid state only by the combined effect of increased pressure and decreased temperature. Examples include sulfur dioxide, ozone, and carbon monoxide.

Gram (g): A metric unit of weight. One ounce equals 28.4 grams.

HEPA filter: (High Efficiency Particulate Air Filter). A disposable, extended medium, dry type filter with a particle removal efficiency of no less than 99.97 percent for 0.3m particles.

IARC: International Agency for Research on Cancer.

IDLH: Immediately Dangerous to Life and Health. An atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere.

Ignition source: Anything that provides heat, spark or flame sufficient to cause combustion/explosion.

Ignition temperature: The minimum temperature to initiate or cause self-sustained combustion in the absence of any source of ignition.

Impervious: A material that does not allow another substance to pass through or penetrate it. Frequently used to describe gloves.

Inches of mercury column: A unit used in measuring pressures. One inch of mercury column equals a pressure of 1.66 kPa (0.491 psi).

Inches of water column: A unit used in measuring pressures. One inch of water column equals a pressure of 0.25 kPa (0.036 psi).

Incompatible: Materials which could cause dangerous reactions from direct contact with one another.

Ingestion: Taking in by the mouth.

Inhalation: Breathing of a substance in the form of a gas, vapor, fume, mist, or dust.

Insoluble: Incapable of being dissolved in a liquid.

Irritant: A chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact.

Latent period: The time that elapses between exposure and the first manifestation of damage.

LC_{50}: Lethal concentration that will kill 50 percent of the test animals within a specified time.

See LD50.

LD_{50}: The dose required to produce the death in 50 percent of the exposed species within a specified time.

Liter (L): A measure of capacity - one quart equals 0.9L.

Lower explosive limit (LEL): The lower limit of flammability of a gas or vapor at ordinary ambient temperatures expressed in percent of the gas or vapor in air by volume. This limit is assumed constant for temperatures up to 120°C (250°F). Above this, it should be decreased by a factor of 0.7 because explosibility increases with higher temperatures.

Malignant: As applied to a tumor. Cancerous and is capable of undergoing metastasis, or invasion of surrounding tissue.

Metastasis: Transfer of the causal agent (cell or microorganism) of a disease from a primary focus to a distant one through the blood or lymphatic vessels. Also, spread of malignancy from the site of primary cancer to secondary sites.

Meter: A metric unit of length, equal to about 39 inches.

Micron (micrometer, m): A unit of length equal to one millionth of a meter, approximately 1/25,000 of an inch.

Milligram (mg): A unit of weight in the metric system. One thousand milligrams equals one gram.

Milligrams per cubic meter (mg/m3): Unit used to measure air concentrations of dusts, gasses, mists, and fumes.

Milliliter (mL): A metric unit used to measure volume. One milliliter equals one cubic centimeter.

Millimeter of mercury (mmHg): The unit of pressure equal to the pressure exerted by a column of liquid mercury one millimeter high at a standard temperature.

Mists: Suspended liquid droplets generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state, such as by splashing, foaming, or atomizing. Mist is formed when a finely divided liquid is suspended in air.

SDS: Material Safety Data Sheet.

MSHA: Mine Safety and Health Administration, U.S. Department of Labor.

Mucous membranes: Lining of the hollow organs of the body, notably the nose, mouth, stomach, intestines, bronchial tubes, and urinary tract.

NFPA: The National Fire Protection Association is a voluntary membership organization whose aim is to promote and improve fire protection and prevention. The NFPA publishes 16 volumes of codes known as the National Fire Codes.

NIOSH: The National Institute for Occupational Safety and Health is a federal agency. It conducts research on health and safety concerns, tests and certifies respirators, and trains occupational health and safety professionals.

NTP: National Toxicology Program. The NTP publishes an Annual Report on carcinogens.

Nuisance dust: Have a long history of little adverse effect on the lungs and do not produce significant organic disease or toxic effect when exposures are kept under reasonable control.

OSHA: U.S. Occupational Safety and Health Administration, U.S. Department of Labor.

Oxidizer: A substance that gives up oxygen readily. Presence of an oxidizer increases the fire hazard.

Oxygen deficiency: That concentration of oxygen by volume below which atmosphere supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen.

Oxygen-enriched atmosphere: An atmosphere containing more than 23.5 percent oxygen by volume.

Particulate matter: A suspension of fine solid or liquid particles in air, such as dust, fog, fume, mist, smoke or sprays. Particulate matter suspended in air is commonly known as an aerosol.

PEL: Permissible Exposure Limit. An exposure limit that is published and enforced by OSHA as a legal standard.

Personal protective equipment (PPE): Devices worn by the worker to protect against hazards in the environment. Respirators, gloves, and hearing protectors are examples.

pH: Means used to express the degree of acidity or alkalinity of a solution with neutrality indicated as seven.

Polymerization: A chemical reaction in which two or more small molecules (monomers) combine to form larger molecules (polymers) that contain repeating structural units of the original molecules. A hazardous polymerization is the above reaction, with an uncontrolled release of energy.

Ppm: Parts per million parts of air by volume of vapor or gas or other contaminant. Unit used to measure air concentrations of vapors and gasses.

Psi: Pounds per square inch (for SDS purposes) is the pressure a material exerts on the walls of a confining vessel or enclosure. For technical accuracy, pressure must be expressed as psig (pounds per square inch gauge) or psia (pounds per square inch absolute; that is, gauge pressure plus sea level atmospheric pressure, or psig plus approximately 14.7 pounds per square inch).

RCRA: Resource Conservation and Recovery Act of 1976. (U.S.EPA)

Reactivity (chemical): A substance's susceptibility to undergo a chemical reaction or change that may result in dangerous side effects, such as an explosion, burning, and corrosive or toxic emissions.

Respirable size particulates: Particulates in the size range that permits them to penetrate deep into the lungs upon inhalation.

Respirator (approved): A device which has met the requirements of 30 CFR Part 11 and is designed to protect the wearer from inhalation of harmful atmospheres and has been approved by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA).

Respiratory system: Consists of (in descending order) - the nose, mouth, nasal passages, nasopharynx, pharynx, larynx, trachea, bronchi, bronchioles, air sacs (alveoli) of the lungs, and muscles of respiration.

Route of entry: The path by which chemicals can enter the body. There are three main routes of entry: inhalation, ingestion, and skin absorption.

SARA: Superfund Amendments and Reauthorization Act of 1986. (U.S.EPA) **SCBA.**

Self-contained breathing apparatus.

Sensitizer: A substance which on first exposure causes little or no reaction but which on repeated exposure may cause a marked response not necessarily limited to the contact site. Skin sensitization is the most common form of sensitization in the industrial setting.

Short-term exposure limit (STEL): ACGIH-recommended exposure limit. Maximum concentration to which workers can be exposed for a short period of time (15 minutes) for only four times throughout the day with at least one hour between exposures.

Skin: A notation (sometimes used with PEL or TLV exposure data) which indicates that the stated substance may be absorbed by the skin, mucous membranes, and eyes — either airborne or by direct contact - and that this additional exposure must be considered part of the total exposure to avoid exceeding the PEL or TLV for that substance.

Solubility in water: A term expressing the percentage of a material (by weight) that will dissolve in water at ambient temperature. Solubility information can be useful in determining spill cleanup methods and re-extinguishing agents and methods for a material.

Solvent: A substance, usually a liquid, in which other substances are dissolved. The most common solvent is water.

Sorbent: (1) A material that removes toxic gasses and vapors from air inhaled through a canister or cartridge. (2) Material used to collect gasses and vapors during air- sampling.

Specific gravity: The ratio of the mass of a unit volume of a substance to the mass of the same volume of a standard substance at a standard temperature. Water at 4°C (39.2°F) is the standard usually referred to for liquids; for gasses, dry air (at the same temperature and pressure as the gas) is often taken as the standard substance. See Density.

Stability: An expression of the ability of a material to remain unchanged. For SDS purposes, a material is stable if it remains in the same form under expected and reasonable conditions of storage or use. Conditions which may cause instability (dangerous change) are stated. Examples are temperatures above 150°F, shock from dropping.

Synergism: Cooperative action of substances whose total effect is greater than the sum of their separate effects.

Systemic: Spread throughout the body, affecting all body systems and organs, not localized in one spot or area.

Threshold: The lowest dose or exposure to a chemical at which a specific effect is observed.

Time-weighted average concentration (TWA): Refers to concentrations of airborne toxic materials which have been weighted for a certain time duration, usually 8 hours.

TLV Threshold Limit Value: A time-weighted average concentration under which most people can work consistently for 8 hours a day, day after day, with no harmful effects. The American Conference of Governmental Industrial Hygienists publishes a table of these values and accompanying precautions annually.

Toxicity: A relative property of a chemical agent and refers to a harmful effect on some biologic mechanism and the conditions under which this effect occurs.

Upper explosive limit (UEL): The highest concentration (expressed in percent vapor or gas in the air by volume) of a substance that will burn or explode when an ignition source is present.

Vapor pressure: Pressure (measured in pounds per square inch absolute - psia) exerted by a vapor. If a vapor is kept in confinement over its liquid so that the vapor can accumulate above the liquid (the temperature being held constant), the vapor pressure approaches a fixed limit called the maximum (or saturated) vapor pressure, dependent only on the temperature and the liquid.

Vapors: The gaseous form of substances that are normally in the solid or liquid state (at room temperature and pressure). The vapor can be changed back to the solid or liquid state either by increasing the pressure or decreasing the temperature alone. Vapors also diffuse. Evaporation is the process by which a liquid is changed into the vapor state and mixed with the surrounding air. Solvents with low boiling points will volatilize readily. Examples include benzene, methyl alcohol, mercury, and toluene.

Viscosity: The property of a fluid that resists internal flow by releasing counteracting forces.

Volatility: The tendency or ability of a liquid to vaporize. Such liquids as alcohol and gasoline, because of their well-known tendency to evaporate rapidly, are called volatile liquids.

Water column: A unit used in measuring pressure. See also Inches of water column.

4.A: Chapter 3 Review Questions-Occupational Health and Environmental Controls

Complete as directed.

Fill in the Blanks:

1. The purpose of the Hazard Communication Standard was to ensure that the hazards of all chemicals produced or imported into this country be evaluated and that information regarding any health hazards be transmitted to employers and their employees.

a. _____ True b._____False

2. Name the three means that the Hazard Communication standard uses to get information about health hazards into the hands of employers and their employees.

a. _____

b. _____

c. _____

3. Employers shall develop, implement and maintain at each workplace, a written Hazard Communication Program consisting of which of the following elements:

a. _____ Labels and other forms of warning.

b. _____ Safety Data Sheets.

c. _____ Employee training and information.

d. _____ List of known hazardous chemicals at the workplace.

e. _____ Methods used to inform employees of hazards.

f. _____ All of the above.

4. OSHA requires that employers provide employees with effective training on the hazardous chemicals in their workplaces within 6 months of their initial assignment, and whenever new hazardous materials are introduced into the workplace.

a. _____ True b._____False

5. The chemical manufacturer, importer, or distributor must ensure that each hazardous chemical is labeled, tagged or marked with which of the following before it enters the workplace:

a. _____ Identity of the hazardous chemical.

b. _____Appropriate hazardous warnings.

c. _____ Name and address of chemical manufacturer importer or other responsible party.

d. _____All of the above.

6. For portable containers which are used to transfer hazardous chemicals from one labeled container to the point of use, the containers need not be labeled.

a. _____ True b._____False

7. Chemical manufacturers and importers of hazardous chemicals must develop an SDS for each hazardous chemical they produce or import into this country.

a. _____ True b._____False

8. The employer must maintain in the workplace SDSs for each of the hazardous chemicals on site. SDSs must be_____ during each work shift, to employees when they are in their work area.

9. If employees are required to travel between workplaces during a shift, SDSs are permitted to be kept at the primary workplace facility.

a. _____ True b._____False

10. Among other items, the training for hazard communication requires that all employees be trained in the physical & health hazards associated with the chemicals in their work areas.

a._____True b._____False

11. List the primary elements and order the Hierarchy of Controls.

CHAPTER OVERVIEW

5: Health Hazards

> *"If you think in terms of a year, plant a seed; if in terms of ten years, plant trees; if in terms of 100 years, teach the people." - Confucious*

Overview

Our health is important, period. Humans no matter where they live have much better health outcomes from what was typical 500, 200, or even 100 years ago. We study and research natural elements in our physical world, our environment, and the health impacts resulting from immediate and long term exposures to those elements. This continuous study and education on health hazards is actually part of our educational infrastructure. This inclusion in the educational infrastructure is seen and felt. For example, "Over the last 200 years, U.S. life expectancy has more than doubled to almost 80 years (78.8 in 2015), with vast improvements in health and quality of life. However, while most people imagine medical advancements to be the reason for this increase, the largest gain in life expectancy occurred between 1880 and 1920 due to public health improvements such as control of infectious diseases, more abundant and safer foods, cleaner water, and other nonmedical social improvements."(Life Expectancy)

In this chapter you will connect some of what you learned about natural hazards in our physical world in both K-12 education, and the general education requirements of your secondary institutions to occupational health. Health hazards include those associated with biological and physical hazards. Take a moment to reflect on courses you may have taken in high school or college such as health science or life science, biology, physics, and chemistry as you review environmental health standards broadly, and specifically those encountered in general industry and construction work.

Chapter Objective

1. Determine the medical and first aid service required for construction sites in 1926 Subpart D.
2. Identify workplace sanitation requirements under 1926 Subpart D
3. Review requirements for occupational noise exposure, heat, non ionizing radiation, ventilation, and minimum illumination.
4. Review and understand the dangers of construction related health hazards such as silica, asbestos, cadmium, and lead.
5. Discuss typical PPE requirements for construction health hazards.
6. Decide if a construction site is covered by the Hazardous Waste Operations and Emergency Response Standard and what training is required to work on such sites.

Learning Outcome

1. Recognize and describe physical health hazards and methods for controlling those hazards.
2. Recognize and understand the requirements for preventing unsanitary, unhealthful, and unsafe and hazardous conditions on construction sites.
3. Identify provisions for the availability of medical facilities and HAZMAT Operations.

Standards: 1926 Subpart D, 1926.62 Lead, 1926.65(1910.120) HAZWOP, 1926.1101 Asbestos, 1926.1127 Cadmium, 1926.1153 Respirable Crystalline Silica, 1926 Subpart E and 1910 Subpart I Personal Protective Equipment

Key Terms

HAZMAT,Decibel, First Aid, Foot-Candle, Laser, Potable, Respirable, Vector

Mini-Lecture: Physical Health Hazards and PPE

Topic Required Time: 2 hrs; Independent Study and reflection 1 3/4 hour.

5.1: Introduction to Health Hazards

Subpart D

Subpart D, of the 1926 OSHA standards covers occupational health and environmental controls for construction sites. The subpart consists of 15 individual standards. Several of these, such as Hazard Communication and Process Safety Management, are discussed in chapter 3. This lesson will focus on eight of the individual construction standards that address workplace safety and health, and include a general discussion of PPE 1910 Subpart I.

Medical Services and First Aid

Employers must render first aid to an employee in medical distress as a result of an accident or other condition. The following are specific employer responsibilities for rendering aid.

Availability of medical personnel

The employer shall ensure the availability of medical personnel for advice and consultation on matters of occupational health. Provisions shall be made prior to commencement of the project for prompt medical attention in case of serious injury.

In the absence of an infirmary, clinic, hospital, or physician, that is reasonably accessible, in terms of time and distance to the worksite, and which is available for the treatment of injured employees, a person who has a valid certificate in first-aid training from the U. S. Bureau of Mines, the American Red Cross, or equivalent training that can be verified by documented evidence shall be available at the worksite to render first aid.

First aid supplies

First aid supplies approved by the consulting physician shall be easily accessible when required. The first-aid kit shall consist of materials approved by the consulting physician in a weatherproof container with individual sealed packages for each type of item. The contents of the first-aid kit shall be checked by the employer before being sent out on each job and at least weekly on each job to ensure that the expended items are replaced.

Corrosive materials

Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

5.2: Occupational Exposures

Occupational Noise Exposure

Sound levels

When employees are subjected to sound levels exceeding those listed in Table D-2, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels measure in decibels (dBA) within the levels of the table, personal protective equipment as required in Subpart E, shall be provided and used to reduce sound levels within the levels of the table.

Tabe D-2 - Permissible Noise Exposures

Permissible Noise Exposure

Duration per day(hours)	Sound Level dBA slow response
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115

In all cases where the sound levels exceed the values shown in Table D-2, a continuing effective hearing conservation program shall be administered.

When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

5.3: Lead and other Elements

General

Section 1926.62 applies to all construction work where an employee may be occupationally exposed to lead. All construction work excluded from coverage in the general industry standard for lead by 29 CFR 1910.1025(a)(2) is covered by this standard. Construction work is defined as work for construction, alteration and/or repair, including painting and decorating. It includes but is not limited to the following:

1. Demolition or salvage of structures where lead or materials containing lead are present;
2. Removal or encapsulation of materials containing lead;
3. New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;
4. Installation of products containing lead;
5. Lead contamination/emergency cleanup;
6. Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location, at which construction activities are performed, and
7. Maintenance operations associated with the construction activities described in this paragraph.

Exposure to lead

When lead is absorbed into the body in certain doses it becomes toxic. Lead can be absorbed into the body by inhalation and ingestion. Inhalation of airborne lead is the most common source of occupational lead absorption. For this reason employers shall assure that no employee is exposed to lead at concentrations greater than fifty micrograms per cubic meter of air (50 *ug/m3}* averaged over an 8-hour period.

Action level

The action level (AL) is the level at which an employer must begin certain compliance activities. For lead, the action level, without regard to the use of respirators, is an airborne concentration of lead of 30 micrograms per cubic meter of air (30 *ug/m3)* calculated as an 8- hour time-weighted average (TWA).

Respirator factor of exposure

When respirators are used to limit employee exposure, employee exposure may be considered to be at the level provided by the protection factor of the respirator for those periods the respirator is worn. Those periods may be averaged with exposure levels during periods when respirators are not worn to determine the employee's daily TWA exposure.

Employer responsibility

Each employer who has a workplace or operation covered by this standard shall initially determine if any employee may be exposed to lead at or above the action level.

Written record

Where a determination is made that no employee is exposed to airborne concentrations of lead at or above the action level, the employer shall make a written record of such determination.

Monitoring

If the initial determination or subsequent determination reveals employee exposure to be at or above the action level, but at or below the permissible exposure limit PEL, the employer shall perform monitoring in accordance with this paragraph at least every 6 months. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are below the action level at which time the employer may discontinue monitoring for that employee until there is a change of equipment, process, control, personnel or a new task has been initiated.

Changes in workplace

Whenever there has been a change of equipment, process, control personnel or a new task has been initiated that may result in additional employees being exposed to lead at or above the action level or may result in employees already exposed at or above the action level being exposed above the PEL, the employer shall conduct additional monitoring.

Employee notification

Within 5 working days after completion of the exposure assessment the employer shall notify each employee in writing of the results, which represent that employee's exposure level.

Whenever the results indicate that the representative employee exposure without regard to respirators, is at or above the PEL the employer shall include in the written notice a statement that the employees exposure was at or above that level and a description of the corrective action taken or to be taken to reduce exposure to below that level.

Respirator use requirements

Where the use of respirators is required under this section the employer shall provide, at no cost to the employee, and assure the use of respirators, which comply, with the requirements of this paragraph. Respirators shall be used in the following circumstances:

1. Whenever an employee s exposure to lead exceeds the PEL;
2. In work situations in which engineering controls and work practices are not sufficient to reduce exposures to or below the PEL;
3. Whenever an employee requests a respirator; and
4. An interim protection for employees performing lead assessments.

Employee exposure above the PEL

Where an employee is exposed to lead above the PEL without regard to the use of respirators, where employees are exposed to lead compounds which may cause skin or eye irritation (e.g. Lead arsenate, Lead oxide), and as interim protection for employees performing lead assessment tasks, the employer shall provide appropriate protective work clothing and equipment at no cost to the employee and assure that the employee uses them to prevent contamination of the employee and the employee's garments.

Medical surveillance

The employer shall make available initial medical surveillance to employees occupationally exposed on any day to lead at or above the action level. Initial medical surveillance consists of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels.

Employer communication

The employer shall communicate information concerning lead hazards according to the requirements of OSHA's Hazard Communication Standard for the construction industry, 29 CFR 1926.59, including but not limited to the requirements concerning warning signs and labels, material safety data sheets (SDS), and employee information and training.

Exposure to Asbestos

Asbestos is the name given to a group of naturally occurring minerals that are resistant to heat and corrosion. Asbestos has been used in products, such as insulation for pipes (steam lines for example), floor tiles, building materials, and in vehicle brakes and clutches. Asbestos includes the mineral fibers chrysotile, amosite, crocidolite, tremolite, anthophyllite, actinolite and any of these materials that have been chemically treated or altered. Heavy exposures tend to occur in the construction industry and in ship repair, particularly during the removal of asbestos materials due to renovation, repairs, or demolition. Workers are also likely to be exposed during the manufacture of asbestos products (such as textiles, friction products, insulation, and other building materials) and during automotive brake and clutch repair work.

Hazards and Health Effects

Asbestos is well recognized as a health hazard and its use is now highly regulated by both OSHA and EPA. Worker exposures to asbestos hazards are addressed in specific OSHA standards for the construction industry, general industry and shipyard employment sectors. These standards reduce the risk to workers by requiring that employers provide personal exposure monitoring to assess the risk and hazard awareness training for operations where there is any potential exposure to asbestos. Airborne levels of asbestos are never to exceed legal worker exposure limits. There is no "safe" level of asbestos exposure for any type of asbestos fiber.

Breathing asbestos fibers can cause a buildup of scar-like tissue in the lungs called asbestosis and result in loss of lung function that often progresses to disability and death. Asbestos also causes cancer of the lung and other diseases such as Mesothelioma of the pleura which is a fatal malignant tumor of the membrane lining the cavity of the lung or stomach.

Medical surveillance

Medical surveillance guidance is provided in the following appendix to the OSHA Standards:

29 CFR 1926.1101 - Appendix D, Medical questionnaires; Mandatory

29 CFR 1910.1001 - Appendix D. Medical questionnaires; Mandatory

Controlling Exposure

Controlling the exposure to asbestos can be done through engineering controls, administrative actions, and personal protective equipment (PPE). Engineering controls include such things as isolating the source and using ventilation systems. Administrative actions include limiting the workers exposure time and providing showers. Personal protective equipment includes wearing the proper respiratory protection and clothing.

Exposure to Crystalline Silica

Crystalline silica is a common mineral found in the earth's crust. Materials like sand, stone, concrete, and mortar contain crystalline silica. It is also used to make products such as glass, pottery, ceramics, bricks, and artificial stone.

Respirable crystalline silica – very small particles at least 100 times smaller than ordinary sand you might find on beaches and playgrounds – is created when cutting, sawing, grinding, drilling, and crushing stone, rock, concrete, brick, block, and mortar. Activities such as abrasive blasting with sand; sawing brick or concrete; sanding or drilling into concrete walls; grinding mortar; manufacturing brick, concrete blocks, stone countertops, or ceramic products; and cutting or crushing stone result in worker exposures to respirable crystalline silica dust. Industrial sand used in certain operations, such as foundry work and hydraulic fracturing (fracking), is also a source of respirable crystalline silica exposure. About 2.3 million people in the U.S. are exposed to silica at work.

Hazards and Health Effects

Workers who inhale these very small crystalline silica particles are at increased risk of developing serious silica-related diseases, including:

- Silicosis, an incurable lung disease that can lead to disability and death;
- Lung cancer;
- Chronic obstructive pulmonary disease (COPD); and
- Kidney disease.

To protect workers exposed to respirable crystalline silica, OSHA has issued two respirable crystalline silica standards: one for construction, and the other for general industry and maritime.

OSHA's Respirable Crystalline Silica standard for construction requires employers to limit worker exposures to respirable crystalline silica and to take other steps to protect workers.

Controlling Exposure

The standard provides flexible alternatives, which OSHA expects will be especially useful for small employers. Employers can either use the control methods laid out in Table 1 of the construction standard, or they can measure workers' exposure to silica and independently decide which dust controls work best to limit exposures to the PEL in their workplaces.

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

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

Construction employers must comply with all requirements of the standard by September 23, 2017, except requirements for laboratory evaluation of exposure samples, which begin on June 23, 2018.

Permissible Exposure Levels (PEL)

1910.1053(c) and 1926.1153 (d)(1) establish a PEL of 50 µg/m³ as an 8-hour TWA. Employers must ensure that no employee is exposed to an airborne concentration of respirable crystalline silica above that PEL.

• An action level of 25 µg/m³ is also established for both standards 1910.1053(b) and 1926.1153(b)

Employers that have fully and properly implemented the engineering controls, work practices, and respiratory protection for each employee performing a task listed in Table 1 of the construction standard 1926.1153(c) do not need to comply with the requirements of 1926.1153 (d), including the PEL.

Medical Surveillance

Employers must comply with the medical surveillance requirements in Appendix B of 1926.1153.

Exposure to Cadmium

Cadmium (Cd) is a soft, malleable, bluish white metal found in zinc ores, and to a much lesser extent, in the cadmium mineral greenockite. Most of the cadmium produced today is obtained from zinc byproducts and recovered from spent nickel-cadmium batteries. First discovered in Germany in 1817, cadmium found early use as a pigment because of its ability to produce brilliant yellow, orange, and red colors. Cadmium became an important metal in the production of nickel-cadmium (Ni-Cd) rechargeable batteries and as a sacrificial corrosion-protection coating for iron and steel. Common industrial uses for cadmium today are in batteries, alloys, coatings (electroplating), solar cells, plastic stabilizers, and pigments.

Worker exposure to cadmium can occur in all industry sectors but mostly in manufacturing and construction. Workers may be exposed during smelting and refining of metals, and manufacturing batteries, plastics, coatings, and solar panels.

Hazards and Health Effects

Occupational exposure to cadmium can lead to a variety of adverse health effects including cancer. Acute inhalation exposure (high levels over a short period of time) to cadmium can result in flu-like symptoms (chills, fever, and muscle pain) and can damage the lungs. Chronic exposure (low level over an extended period of time) can result in kidney, bone and lung disease.

Controlling Exposure

Workers can be exposed to cadmium by breathing in dusts, fumes, or mists containing cadmium. Cadmium or cadmium compounds can also get on the skin, contaminate clothing or food, and be ingested (which is also one of the routes of exposure). The most effective way to prevent exposure to a hazardous metal such as cadmium is through elimination or substitution.

Permissible Exposure Level

The employer shall assure that no employee is exposed to an airborne concentration of cadmium in excess of five micrograms per cubic meter of air (5 µg/m3), calculated as an eight-hour time-weighted average exposure (TWA)

Action level (AL) is defined as an airborne concentration of cadmium of 2.5 micrograms per cubic meter of air (2.5 µg/m3), calculated as an 8-hour time-weighted average (TWA)

Medical Surveillance

The employer shall institute a medical surveillance program for all employees who are or may be exposed at or above the action level and all employees who perform the following tasks, operations or jobs: Electrical grounding with cadmium welding; cutting, brazing, burning, grinding or welding on surfaces that were painted with cadmium-containing paints; electrical work using cadmium-coated conduit; use of cadmium containing paints; cutting and welding cadmium-plated steel; brazing or welding with cadmium alloys; fusing of reinforced steel by cadmium welding; maintaining or retrofitting cadmium-coated equipment; and, wrecking and demolition where cadmium is present. A medical surveillance program may not be required provided the employer meets certain conditions of limiting employee exposure.

5.4: Environment

Ventilation

General

Whenever hazardous substances such as dusts, fumes, mists, vapors, or gases exist or are produced in the course of construction work, their concentrations shall not exceed the Threshold Limit Values (TLVs) of airborne contaminants for construction specified in 1926.55(a).

When ventilation is used as an engineering control method, the system shall be installed and operated according to the requirements of this section.

System design

Local exhaust ventilation shall be designed to prevent dispersion into the air of dusts, fumes, mists, vapors, and gases in concentrations causing harmful exposure. Such exhaust systems shall be designed so that dusts fumes, mists, vapors, or gases are not drawn through the work area of employees.

System requirements

Exhaust fans, jets, ducts, hoods, separators, and all necessary appurtenances, including refuse receptacles, shall be so designed, constructed, maintained and operated as to ensure the required protection by maintaining a volume and velocity of exhaust air sufficient to gather dusts, fumes, vapors, or gases from said equipment or process, and to convey them to suitable points of safe disposal, thereby preventing their dispersion in harmful quantities into the atmosphere where employees work.

System operation

The exhaust system shall be in operation continually during all operations, which it is designed to serve. If the employee remains in the contaminated zone, the system shall continue to operate after the cessation of said operations, the length of time to depend upon the individual circumstances and effectiveness of the general ventilation system. According to the best medical opinion, dust capable of causing disability is of microscopic size, tending to remain for hours in suspension in still air, so it is essential that the exhaust system be continued in operation for a time after the work process or equipment served by the same shall have ceased, in order to ensure the removal of the harmful elements to the required extent. For the same reason, employees wearing respiratory equipment should not remove same immediately until the atmosphere clear.

Other environments

The 1926.57 Ventilation Standard also contains specific provisions for ventilation in and around abrasive blasting locations, grinding, polishing and buffing operations and spray finishing operations. These requirements should be reviewed if these types of operations are to be performed on the construction site.

Heat

Every year, dozens of workers die and thousands more become ill while working in extreme heat or humid conditions. There are a range of heat illnesses and they can affect anyone, regardless of age or physical condition. Employers are responsible for providing workplaces free of known safety hazards. This includes protecting workers from extreme heat. An employer with workers exposed to high temperatures should establish a complete heat illness prevention program to include:

- Providing workers with water, rest, shade if outdoors, cooling areas indoors.
- Allowing new or returning workers to gradually increase workloads and take more frequent breaks as they acclimatize, or build a tolerance for working in the heat.
- Planning for emergencies and training workers on heat illness prevention.
- Monitoring workers for signs of heat illness.

NIOSH has also introduced an Heat Safety Tool App that can be downloaded on smart devices which provides immediate guidance based on environmental conditions.

Illumination

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

Table D-3 – Minimum Illumination Intensities in Foot-Candles

Minimum Illumination Intensities

Foot-Candles	Area of Operation
5	General construction area lighting.
3	General construction areas, concrete placement, excavation and waste areas, access ways, active storage areas, loading platforms, refueling, and field maintenance areas.
5	Indoors: warehouses, corridors, hallways, and exit ways.
5	Tunnels, shafts, and general underground work areas: (Exception: minimum of 10 foot-candies is required at tunnel and shaft heading during drilling, mucking, and scaling. Bureau of Mines approved cap lights shall be acceptable for use in the tunnel heading)
10	General construction plant and shops (e.g., batch plants, screening plants, mechanical and electrical equipment rooms, carpenter shops, rigging lofts and active storerooms, mess halls, and indoor toilets and workrooms.)
30	First aid stations, infirmaries, and offices.

Other areas or operations not covered in the table above, refer to the American National Standard All. 1965, R1970, Practice for Industrial Lighting, for recommended values of illumination.

5.5: Personal Protective Equipment

What is Personal Protective Equipment (PPE)?

PPE is the last line of defense in the hierarchy of controls. As previously discussed there are some hazards, physical and chemical, that workers are exposed to despite efforts to either eliminate, substitute, engineer, or work practice control the danger away. The correct application, design, and issuance of the PPE are the employer's responsibility. The correct wear, care, and use of the required PPE is the employee responsibility.

PPE is a generic term. There are types of PPE designed to protect parts of the human body exposed to hazards and hazardous environments. The typical areas needing protection and the type of PPE are shown below:

Table of Typical PPE

Table of PPE

Body Part	Protection	Image
Head	Hard Hat, Helmet	
Hands	Gloves	
Feet	Steel Toe Boots	

Body Part	Protection	Image
Eyes-Sight	Goggles, Glasses	
Ears-Hearing	Ear Plugs, Earmuffs	
Nose, Mouth	Respirator, face mask	
Face	Face Shield	
Body	Coveralls, High Visibility Vest	

PPE shall only be specified for use after a job hazard analysis(JHA) or job safety analysis(JSA) has been completed. The PPE shown above are “typical” and not specific for any task. The JHA and site assessment will determine what PPE is necessary, when it is necessary, and why it is necessary.

5.A: Chapter 4 Review Questions

Complete as directed.

1. When an infirmary, clinic, hospital, or physician, is not reasonably accessible in terms of time and distance to the worksite, for the treatment of injured employees, what other option is permitted?

2. Common drinking cups are permitted for jobsite water coolers provided a means to rinse the cup after each use is provided.

a. _____ True b._____ False

3. When employees are subjected to sound levels exceeding_____dBA for 8 hours, feasible administrative or engineering controls shall be utilized to protect against hearing loss.

4. Only _____and trained employees shall be assigned to install, adjust, and operate laser equipment.

5. Whenever hazardous substances such as dusts, fumes, mists, vapors, or gases exist or are produced in the course of construction work their concentrations shall not exceed the_____of airborne contaminants for construction.

6. New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain Lead, or materials containing Lead are not covered by the Lead in construction standard.

a. _____ True b._____False

7. The Lead standard protects workers from the hazards associated with Lead by assuring that no employee is exposed to lead at concentrations greater than _____ micrograms per cubic meter of air, averaged over an_____ -hour period.

8. Toilets shall be provided at construction sites according to the number of employees on the site. For 20 or less employees _____ toilet is required.

a._____1 b._____2 c._____3 d._____4

9. The requirements of part 1910 and part 1926 of Title 29 of the Code of Federal Regulations apply pursuant to their terms to Hazardous Waste and Emergency Response Operations only if they are specifically mentioned in the Hazwopper Standard.

a. _____ True b._____False

General site workers engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum ofhours of instruction off the site, and a minimum of_ days actual field experience under the direct supervision of a trained, experienced supervisor.

CHAPTER OVERVIEW

6: Fire Protection and Prevention

> *"Anyone who believes they have common sense has simply forgotten who taught them what they know." -Allen D. Quilley*

Overview

Fires fall in the category of both natural and man induced hazards and have therefore been considered as a natural catastrophe or emergency. Fire is perhaps the most frightening and dangerous hazard humans have historically encountered, so much so that fire prevention and protection is embedded in our public and workplace safety infrastructure.

The devastation that an all consuming out of control fire can produce is why there is the discipline of Fire Science. Fire science is the study of all aspects of fire, from fire behavior to fire investigation. Many of those seeking to become a firefighter or obtain a career in fire prevention, protection, or safety might pursue a degree in fire science.

Fires are workplace emergencies and require specific fire prevention controls in the workplace. They are standalone hazards with specific safety standards but must also be considered in emergency planning. Every employer must consider all potential workplace emergencies and have in place either an oral or written plan to address those emergencies.

Chapter Objective:

1. Review the science of fire and the different classes of fire.
2. Identify the need for and the proper selection of portable fire fighting equipment.
3. Identify the primary elements for fire prevention and control measures.
4. Identify the primary elements of an emergency action plan (EAP).
5. Describe the natural and human induced workplace emergencies.
6. Describe the purpose and objective of an emergency plan.

Learning Outcome:

1. Select the proper type of containers for storage and handling of combustible and flammable liquids on the job.
2. List the necessary steps for effective fire prevention on construction jobsites.
3. Draft a simple EAP.

Standards: 1926 Subpart F-Fire Protection and Prevention, 1910 Subpart E-Exit Routes and Emergency Planning, 1910 Subpart L-Fire Protection

Key Terms:

Combustible, flammable, emergency, explosive, extinguisher, tetrahedron

Mini-Lecture: Emergency Planning

Topic Required Time: 2 hrs; Independent Study and reflection 1 3/4 hour.

6.1: Introduction to Fire Protection and Prevention

Fire

Each year approximately 5,000 people lose their lives as the result of fire. OSHA estimates that nearly 10% of those deaths can be attributed to workplace fires. Subpart F of the 1926 Construction Standards is designed to protect workers from the hazards associated with fires in the workplace, but specifically for construction sites and construction work. Subpart F contains requirements for workplace firefighting equipment, fire exits, workplace fire emergency and prevention plans, employee training and the proper handling and storage of flammable and combustible liquids.

Subpart E and Subpart L of the General Industry Standard focus on emergency egress and emergency planning while also providing National Fire Protection Association(NFPA) requirements embedded in building and safety code. As a result construction, maritime, and agriculture are excluded from the requirements of this standard.

The Science of Fire - Fire Types

General

The classic fire triangle has been used for years to represent the three elements necessary for the occurrence of a fire: Heat, Fuel and Oxygen. Recently, a fire tetrahedron, a four-sided figure, has replaced the triangle (see Figure 5.1.1). The fourth side is chemical reaction and represents a chemical chain reaction that occurs in the burning of flammable or combustible liquids and flammable gases. Each of the sides represents one of four ways to extinguish a fire.

Removing the heat from the fire, such as by adding water or other chemicals can extinguish the fire. Somewhat more difficult is removing the fuel from the fire, such as for liquid storage tank fires. The oxygen can be removed from the fire by smothering the fire and the chemical reaction of the fire can be interrupted, stopping the growth of the fire.

The Fire Tetrahedron

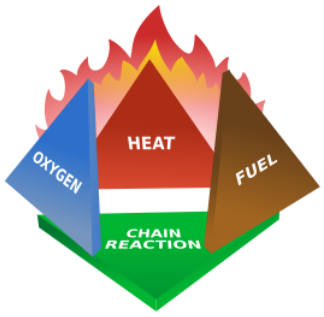

Figure 6.1.1: The Fire Tetrahedron demonstrating elements of a fire, oxygen, heat, fuel, chain reaction. (Source; public domain)

Fire classification

Fires are classified as Class A, B, C, D and K fires.

Class A Fires

Class A fires occur in ordinary materials, such as, wood, paper and rags. The use of water or water-based solutions is most successful in extinguishing these types of fires.

Class B Fires

Class B fires occur in the vapor-air mixture over the surface of flammable liquids, such as, gasoline, oil, grease and paint thinners. The most successful way to extinguish these fires is by limiting the oxygen or interrupting the chemical chain reaction. Solid streams of water are likely to spread the fire, but in some cases a water fog nozzle with a fine mist may prove effective. Generally, dry, multi-purpose chemicals or foams are used to extinguish these fires.

Class C Fires

Class C fires occur in or near electrical equipment. Non-conducting agents, such as dry- chemical, carbon dioxide and halogenated extinguishing agents are commonly used to extinguish Class C fires. Foam or streams of water should not be used because they are good conductors.

Class D Fires

There is also a Class D fire, but these fires are not frequently encountered in construction. These fires occur in combustible metals, such as magnesium, titanium, sodium, etc.

Specialized techniques and equipment must be used to control and extinguish these types of fires. Normal extinguishing agents should not be used because they may increase the intensity of the fire.

Class K Fires

Class K fires involve vegetable oils, animal oils, or fats in cooking appliances. Extinguishers with a K rating are designed to extinguish fires involving vegetable oils, animal oils, or fats utilized in commercial cooking appliances.

Portable fire extinguishers

Firefighting equipment, such as portable fire extinguishers, shall be suitable for the Class of fire in which it is to be used. Class A fire extinguishers are identifiable by a triangle which contains the letter "A" and if colored, by the color green. Class B fire extinguishers are identifiable by a square which contains the letter "B" and if colored, by the color red. Class C fire extinguishers are identifiable by a circle which contains the letter "C" and if colored, by the color blue.

Fire Protection

Employer responsibility

The employer shall be responsible for the development of a fire protection program to be followed throughout all phases of the construction and demolition work. In addition, the employer shall provide for the firefighting equipment as specified in this subpart. As fire hazards occur, there shall be no delay in providing the necessary equipment.

As warranted by the project, the employer shall provide a trained and equipped firefighting organization (Fire Brigade) to assure adequate protection to life.

Firefighting equipment accessibility

Access to all available firefighting equipment shall be maintained at all times. All firefighting equipment, provided by the employer, shall be conspicuously located. All firefighting equipment shall be periodically inspected and maintained in operating condition. Defective equipment shall be immediately replaced.

Water supply

A temporary or permanent water supply, of sufficient volume, duration, and pressure, required to properly operate the firefighting equipment shall be made available as soon as combustible materials accumulate. Where underground water mains are to be provided, they shall be installed, completed, and made available for use as soon as practicable.

Site fire extinguisher requirements

A fire extinguisher, rated not less than 2A, shall be provided for each 3,000 square feet of the protected building area, or major fraction thereof. Travel distance from any point of the protected area to the nearest fire extinguisher shall not exceed 100 feet. One 55-gallon open drum of water with two fire pails may be substituted for a fire extinguisher having a 2A rating.

One or more fire extinguishers, rated not less than 2A, shall be provided on each floor. In multistory buildings, at least one fire extinguisher shall be located adjacent to the stairway. Extinguishers and water drums, subject to freezing, shall be protected from freezing.

Fire extinguisher ratings

Fire extinguisher ratings refer to the relative effectiveness of the fire extinguisher to one gallon of water. A 2A fire extinguisher is therefore twice as effective as one gallon of water or as effective as two gallons of water on an ordinary combustible materials fire (Class A fire). A 1/2-inch diameter garden-type hose line, not to exceed 100 feet in length and equipped with a nozzle, may be substituted for a 2A-rated fire extinguisher, provided it is capable of discharging a minimum of five gallons per minute with a minimum hose stream range of 30 feet horizontally. The garden-type hose lines shall be mounted on conventional racks or reels. The number and location of hose racks or reels shall be such that at least one hose stream can be applied to all points in the area. Capacity of extinguishers shall be in accordance with ANSI/UL711,”Rating and Fire Testing of Extinguishers”.

Flammable or combustible liquids

A fire extinguisher, rated not less than 10B, shall be provided within 50 feet of wherever more than 5 gallons of flammable or combustible liquids or 5 pounds of flammable gas are being used on the jobsite. This requirement does not apply to the integral fuel tanks of motor vehicles.

Inspection and maintenance

Portable fire extinguishers shall be inspected periodically and maintained in good working condition. The employer shall assure that portable fire extinguishers are maintained in a fully charged and operable condition and kept in their designated places at all times except during use.

The employer shall assure that portable fire extinguishers are subjected to an annual maintenance check. Stored pressure extinguishers do not require an internal examination. The employer shall record the annual maintenance date and retain this record for one year after the last entry or the life of the shell, whichever is less.

Fire extinguishers equipment approval

Fire extinguishers, which have been listed or approved by a nationally recognized testing laboratory, shall be used to meet the requirements of Subpart F.

Training

Where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage firefighting. Training shall occur upon initial employment and at least annually thereafter.

Demolition or alterations

During demolition or alterations, existing automatic sprinkler installations shall be retained in service as long as reasonable. The operation of sprinkler control valves shall be permitted only by properly authorized persons. Modification of sprinkler systems to permit alterations or additional demolition should be expedited so that the automatic protection may be returned to service as quickly as possible. Sprinkler control valves shall be checked daily at close of work to ascertain that the protection is in service.

Emergency notification

An alarm system, e.g., telephone system, siren, etc., shall be established by the employer whereby employees on the site and the local fire department can be alerted for an emergency. The alarm code and reporting instructions shall be conspicuously posted at phones and at employee entrances.

Fire Prevention

General

Smoking shall be prohibited at, or in, the vicinity of operations, which constitute a fire hazard, and shall be conspicuously posted: "No Smoking or Open Flame."

Portable fire extinguishing equipment

Portable fire extinguishing equipment, suitable for the fire hazard involved shall be provided at convenient, conspicuously accessible locations in the yard area. Portable fire extinguishers, rated not less than 2A, shall be placed so that maximum travel distance to the nearest unit shall not exceed 100 feet.

Materials stored outdoors

Combustible materials installed in open yard storage areas shall be piled with due regard to the stability of piles and in no case higher than 20 feet. Method of piling shall be solid wherever possible and in orderly and regular piles. No combustible material shall be stored outdoors within 10 feet of a building or structure.

Materials stored indoors

Storage in indoor areas shall not obstruct, or adversely affect, means of exit. All materials shall be stored, handled, and piled with due regard to their fire characteristics. Incompatible materials, which may create a fire hazard, shall be segregated by a barrier having a fire resistance of at least one hour.

Material stored indoors shall be piled to minimize the spread of fire internally and to permit convenient access for firefighting. Stable piling shall be maintained at all times. Aisle space shall be maintained to safely accommodate the widest vehicle that may be used within the building for firefighting purposes.

A clearance of 24 inches shall be maintained around the path of travel of fire doors unless a barricade is provided, in which case no clearance is needed. Material shall not be stored within 36 inches of a fire door opening.

Clearance shall be maintained around lights and heating units to prevent ignition of combustible materials. Clearance of at least 36 inches shall be maintained between the top level of the stored material and the sprinkler deflectors.

Flammable and Combustible Liquids

General

Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids. Approved metal safety cans shall be used for the handling and use of flammable liquids in quantities greater than one gallon, except that this shall not apply to those flammable liquid materials, which are highly viscous (extremely hard to pour), which may be used and handled in original shipping containers. For quantities of one gallon or less, only the original container or approved metal safety cans shall be used for storage, use, and handling of flammable liquids.

Storage

No more than 25 gallons of flammable or combustible liquids shall be stored in a room outside of an approved storage cabinet. Electrical wiring and equipment located in inside storage rooms shall be approved for Class 1, Division 1, Hazardous Locations.

Flammable or combustible liquids shall not be stored in areas used for exits, stairways, or normally used for the safe passage of people. Materials which will react with water and create a fire hazard shall not be stored in the same room with flammable or combustible liquids.

In locations where flammable vapors may be present, precautions shall be taken to prevent ignition by eliminating or controlling sources of ignition. Sources of ignition may include open flames, lightning, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical, and mechanical), spontaneous ignition, chemical and physical-chemical reactions, and radiant heat.

Equipment in classified (Class I, Class II, Class III) hazardous locations must also be suitable for those locations and not permit the ignition of vapors, gases, or combustible dusts.

Fire Protection and Prevention – Definitions

Approved for the purpose of this subpart: Equipment that has been listed or approved by a nationally recognized testing laboratory (NRTL) such as Factory Mutual Engineering Corp., or Underwriters' Laboratories, Inc. or Federal agencies such as Bureau of Mines, or U.S. Coast Guard, which issues approvals for such equipment.

Combustible liquids: Any liquid having a flash point at or above 140° F (60°C), and below 200° F (93.4°C).

Flammable liquids: Any liquid having a flash point below 140° F. and having a vapor pressure not exceeding 40 pounds per square inch (absolute) at 100° F.

Flash point: The temperature at which it gives off vapor sufficient to form an ignitable mixture with the air near the surface of the liquid or within the vessel used as determined by appropriate test procedure and apparatus.

Ignition temperature: The minimum temperature required to initiate or cause self-sustained combustion. The ignition temperature of some common materials is listed below:

Ignition temperatures for some materials

Material	Ignition Temperature
Newspaper	446°F
Cotton Batton	450°F
Gasoline	500° - 850°F
Sawdust	400° - 500°F

Lower explosive limit (LEL): The minimum concentration of vapor in air or oxygen below which propagation of flame does not occur on contact with a source of ignition.

Safety can: An approved closed container, of not more than 5 gallons capacity, having a flash-arresting screen, spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure. Plastic containers can be used provided they are "approved."

Upper explosive limit (UEL): The maximum concentration in air or oxygen below which propagation of flame does not occur on contact with a source of ignition.

Electrical Bonding: The practice of intentionally electrically connecting all exposed metal items not designed to carry electricity in a room or building as protection from electric shock and to protect against static charge build up.

Electrical Grounding: To ensure that persons in the area are not exposed to dangerous, electric-shock voltage. To provide current-carrying capability that can accept ground-fault current without creating a fire or explosive hazard.

6.2: Emergency Action Plans

Emergency Action Plans

An emergency action plan (EAP) is a written document(may be communicated orally if less than 10 employees) required by OSHA standards. [29 CFR 1910.38(a)] The purpose of an EAP is to facilitate and organize employer and employee actions during workplace emergencies. The primary goal of the plan is to get employees away (evacuate or isolate) from the emergency event or condition. Well developed emergency plans and proper employee training (such that employees understand their roles and responsibilities within the plan) will result in fewer and less severe employee injuries and less structural damage to the facility during emergencies. A poorly prepared plan, likely will lead to a disorganized evacuation or emergency response, resulting in confusion, injury, and property damage.

Fight or Flee

A fire is the most common type of emergency for which small businesses must plan. Evacuation plans that designate or require some or all of the employees to fight fires with portable fire extinguishers increase the level of complexity of the plan and the level of training that must be provided employees.

Fire, Rescue, or Medical Services

In an emergency most of us are quickly moved away from the hazardous environments created during emergency situations. However there usually remains a group of dedicated and well-trained professional emergency responders and medical service personnel which may be tasked with containing and mitigating these incidents, rescuing individuals at-risk, and providing medical assistance to the injured.

Sheltering in Place

There are some emergencies where evacuation is not the safest action for employees. When chemical, biological, or radiological contaminants are released into the environment in such a quantity and/or proximity to a place of business it is usually safer to remain indoors rather than to evacuate employees.

Sheltering in place may also be the safest action when the emergency involves criminal activity, domestic violence or terrorist activity.

Primary Elements of the Plan

An emergency plan must contain at a minimum the following elements:

1. Procedures for reporting a fire or other emergency;
2. Procedures for emergency evacuation, including type of evacuation and exit route assignments
3. Procedures to be followed by employees who remain to operate critical plant operations before they evacuate;
4. Procedures to account for all employees after evacuation;
5. Procedures to be followed by employees performing rescue or medical duties;
6. The name or job title of every employee who may be contacted by employees who need more information about the plan or an explanation of their duties under the plan.

The EAP must describe the covered emergencies and include external contact and resource information. The plan must also discuss the requirements of any emergency alert or alarm system, frequency of system testing, training requirements, and is subject to annual review.

Typical emergencies include Fire, Earthquake, Severe Weather, Chemical and Biological Releases, Explosions, Violence, Civil Disturbance, Medical.

6.A: Chapter 5 Review Questions

Complete as directed.

Fill in the Blanks:

1. Which of the following fire classifications would best describe a fire which occurs in the vapor-air mixture over the surface of flammable liquids, such as, gasoline, oil grease and paint thinners?

a. _____ Class A b._____ Class B c._____ Class C d._____Class D

2. Which of the following colors would be used to identify a Class C portable fire extinguisher?

a. _____ black b._____ red c._____ blue d._____ green

3. Travel distance from any point of the protected area to the nearest fire extinguisher shall not exceed?

a._____ 25ft b._____50ft c._____ 75ft d._____100ft

4. One or more fire extinguishers, rated not less than_____shall be provided on each floor. In multistory buildings, at least_____fire extinguisher shall be located adjacent to stairway.

5. Combustible materials installed in open yard storage areas shall be piled with due regard to the stability of piles and in no case higher than_____feet.

a._____ 7 b._____ 10 c._____ 20 d._____ 25

6. No combustible material shall be stored outdoors withinfeet of a building or structure.

a._____ 5 b._____ 10 c._____ 15 d._____ 20

7. Clearance of at least_____ inches shall be maintained between the top level of the stored material and the sprinkler deflectors.

a._____12 b._____ 24 c._____ 36 d._____48

8. No more than_____gallons of flammable or combustible liquids shall be stored in a room unless it is contained in an approved storage cabinet.

a._____ 5 b._____ 10 c._____ 20 d._____ 25

9. "Flammable liquids" means any liquid having a flash point below_____°F and having a vapor pressure not exceeding 40 pounds per square inch (absolute) at 100° F.

a._____ 100 b._____ 140 c._____ 150 d._____ 200

10. The_____of the liquid means the temperature at which it gives off vapor sufficient to form an ignitable mixture with the air near the surface of the liquid or within the vessel used as determined by appropriate test procedure and apparatus.

11.List typical emergencies that shall be covered under an EAP.

CHAPTER OVERVIEW

7: Materials Handling, Storage, Use, and Disposal

> *"Working safely may get old, but so do those who practice it." – Author Unknown*

Overview

Handling materials (material, supplies, stock) is perhaps one activity that all workers will do at some point in a day's work. No matter the industry, workers are required to access, move, transport, and store items necessary for accomplishing a task. Most workers with the exception of those who may have a physical impairment are expected to lift or carry at least 20 lbs. In the construction trades many workers are expected to manually lift or manage more than 50 lbs.

When materials are too large, heavy, or bulky to manage then material handling equipment is used to assist workers with moving and managing those materials. Equipment such as forklifts, pallet jacks, hoists, and cranes provide additional lifting power. When mechanical equipment is used to handle materials there are additional considerations. Safe work practices and procedures are added to the requirements for safe operation of the handling equipment, and for ensuring the equipment is operable.

When materials are handled, moved, and stored it is not only important to make sure they are delivered in tact but also to ensure the area or environment where materials are stored is maintained in a clean and orderly condition. This chapter will focus on the equipment necessary for safely handling materials and connect materials handling to storage and housekeeping practices at any worksite.

Chapter Objective:

1. Understand the Importance of Proper Material Storage and Good Housekeeping Practices on Work Sites.
2. Apply the Requirements for Using and Inspecting Rigging Equipment for Material Handling on Work Sites.
3. Understand the Requirements of 1926 Subpart H Materials Handling, Storage, Use & Disposal and 1910 Subpart N Materials Handling and Storage.

Learning Outcome:

1. Correctly apply the hierarchy of controls to rigging hazards.
2. Explain the common practices in material handling storage and fire prevention methods.

Standards: 1926 Subpart H-Materials Handling Storage, Use, and Disposal, 1910 Subpart N-Materials Handling and Storage, 1926 Subpart F Fire Protection and Prevention

Key Terms:

Rigging, Slings, Splice,Synthetic

Mini-Lecture: Forklift Safety, Rigging Safety

Topic Required Time: 2 hrs; Independent Study and reflection 1 3/4 hour.

7.1: Introduction to Materials Handling, Storage, Use, and Disposal

Handling Materials

Handling of jobsite materials is a core function on all construction sites as well as in fulfillment centers, warehouse and distribution facilities. Yet, improper procedures and unsafe practices which often lead to accidents and injury are quite common. Good housekeeping practices frequently ignored are just as important to materials handling safety as using the right PPE. The following standards for materials handling contain practices and procedures that not only reduce the risk of accident and injury, but also damaged materials and exposure to financial loss.

General requirements for storage

OSHA requires that all materials used on the jobsite shall be properly stored. Materials stored in tiers shall be stacked, racked, blocked, interlocked or otherwise secured to prevent sliding, falling or collapse.

Great care must be used in storage areas to ensure that maximum safe loads are not exceeded. Maximum safe load limits for floors must be posted in all buildings and structures in the appropriate storage areas. The safe limits must be listed in pounds per square foot, for all floors except those located on grade.

Material Storage

Location

Material stored inside of buildings under construction shall not be placed within six ft. of any hoist way or inside floor opening. Such material shall also be kept at least 10 ft. from an exterior wall, which does not extend above the top of the material stored.

Fall Protection

Fall protection must be provided for all employees required to work in silos, hoppers, tanks, and similar locations where materials are stored. Materials that are not compatible shall be segregated in storage.

Bagged Material

Bagged materials shall be stored so that the bags are stacked by stepping back the layers and cross-keying the bags at least every 10 bags high.

Scaffolds and Runways

Unless the materials are for immediate use, they shall not be stored on scaffolds or runways.

Bricks and Masonry

Brick stacks shall not be more than seven feet in height. Where loose brick stacks exceed four feet, they must be tapered back two inches for every foot of height above four ft. When masonry blocks are stored in stacks higher than six feet, the stacks shall be tapered back one-half block per tier above the six ft. level.

Lumber

When lumber is stored all of the following conditions shall be followed:

1. All nails shall first be removed.
2. It must be stacked on level and solidly supported sills.
3. It must be stable and self-supporting.
4. The piles must not exceed 20 ft., provided the lumber to be handled manually, does not exceed 16 ft.

Steel materials

Structural steel, poles, pipe, bar stock, and other cylindrical materials shall be stacked and blocked so as to prevent spilling or tilting. Such items are permitted to be stored by means of racks.

Housekeeping

Storage areas must be kept clear. Accumulation of materials that may cause tripping, fire, explosion or pest harborage hazard in the storage area is not permitted. Aisles and passageways must be kept clear to provide for ready access and safe movement of material

handling equipment or employees.

Fire Prevention

General

Smoking shall be prohibited at, or in, the vicinity of operations, which constitute a fire hazard, and shall be conspicuously posted: "No Smoking or Open Flame."

Portable fire extinguishing equipment

Portable fire extinguishing equipment, suitable for the fire hazard involved shall be provided at convenient, conspicuously accessible locations in the yard area. Portable fire extinguishers, rated not less than 2A, shall be placed so that maximum travel distance to the nearest unit shall not exceed 100 feet.

Materials stored outdoors

Combustible materials installed in open yard storage areas shall be piled with due regard to the stability of piles and in no case higher than 20 feet. Method of piling shall be solid wherever possible and in orderly and regular piles. No combustible material shall be stored outdoors within 10 feet of a building or structure.

Materials stored indoors

Storage in indoor areas shall not obstruct, or adversely affect, means of exit. All materials shall be stored, handled, and piled with due regard to their fire characteristics. Incompatible materials, which may create a fire hazard, shall be segregated by a barrier having a fire resistance of at least one hour.

Material stored indoors shall be piled to minimize the spread of fire internally and to permit convenient access for firefighting. Stable piling shall be maintained at all times. Aisle space shall be maintained to safely accommodate the widest vehicle that may be used within the building for firefighting purposes.

A clearance of 24 inches shall be maintained around the path of travel of fire doors unless a barricade is provided, in which case no clearance is needed. Material shall not be stored within 36 inches of a fire door opening.

Clearance shall be maintained around lights and heating units to prevent ignition of combustible materials. Clearance of at least 36 inches shall be maintained between the top level of the stored material and the sprinkler deflectors.

Flammable and Combustible Liquids

General

Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids. Approved metal safety cans shall be used for the handling and use of flammable liquids in quantities greater than one gallon, except that this shall not apply to those flammable liquid materials, which are highly viscous (extremely hard to pour), which may be used and handled in original shipping containers. For quantities of one gallon or less, only the original container or approved metal safety cans shall be used for storage, use, and handling of flammable liquids.

Storage

No more than 25 gallons of flammable or combustible liquids shall be stored in a room outside of an approved storage cabinet. Electrical wiring and equipment located in inside storage rooms shall be approved for Class 1, Division 1, Hazardous Locations.

Flammable or combustible liquids shall not be stored in areas used for exits, stairways, or normally used for the safe passage of people. Materials which will react with water and create a fire hazard shall not be stored in the same room with flammable or combustible liquids.

In locations where flammable vapors may be present, precautions shall be taken to prevent ignition by eliminating or controlling sources of ignition. Sources of ignition may include open flames, lightning, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical, and mechanical), spontaneous ignition, chemical and physical-chemical reactions, and radiant heat.

Equipment in classified (Class I, Class II, Class III) hazardous locations must also be suitable for those locations and not permit the ignition of vapors, gases, or combustible dusts.

7.2: Rigging Equipment for Material Handling

Rigging Equipment for Material Handling

General

The requirements contained in Subpart H apply to rigging equipment used in conjunction with other material handling equipment for the movement of material by hoisting.

Inspection

Rigging equipment for material handling shall be inspected prior to use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment shall not be used.

Load considerations

Rigging equipment shall not be used for loads rated in excess of the equipment's safe working load. Safe working loads are listed in Tables H-l through H-20 in Subpart H.

If the type of installation requires that special hooks, grabs, clamps, etc. must be used, they shall be marked to indicate their maximum safe working loads and they shall be proof-tested prior to their use to 125% of their rated load.

Types of slings

Slings used for hoisting shall be made from alloy steel chain, wire rope metal mesh, natural or synthetic fiber rope, and synthetic web. Each day before use, the slings shall be inspected for damage or defects by a competent person.

Alloy Steel Chains

Marking

Welded alloy steel chains must be marked with a permanent identifiable tag stating size, grade, rated capacity and manufacturer.

Capacity

Hooks, rings, links and other attachments used with alloy steel chains shall have a rated capacity at least equal to that of the chain.

Types not permitted

Shop or job made hooks, links, fasteners, etc., formed from bolts, rods etc., shall not be used.

Inspection

Alloy steel chains shall be inspected on a regular basis. The frequency of the inspection is determined by the frequency of the use, severity of the conditions of use, the nature of the lifts being made, and previous experience with the use of the chains.

Wire Ropes

Rated capacity

The safe working loads of wire ropes shall be determined from Tables H-3 through H-14 of Subpart H. For sizes, classifications, and grades which are not included in the Tables, the safe working load recommended by the manufacturer shall be followed provided a safety factor of not less than five is maintained.

Work techniques

Protruding ends of strands in wire rope shall be covered or blunted. Wire rope shall not be secured by knots, except on haul back lines and scrapers. Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load. A sling shall not be pulled from under a load when the load is resting on the sling.

Natural Rope and Synthetic Fiber

Eye splices

Eye splices in manila rope shall contain at least three full tucks, and short splices shall contain at least six full tucks, three on each side of the centerline of the splice.

Eye splices in synthetic fiber rope shall contain at least four full tucks and short splices shall contain at least eight full tucks, four on each side of the centerline of the splice.

For all eye splices, the eye shall be large enough to provide for an angle not greater than 60 degrees at the splice when the eye is placed over the load or support.

Work conditions

Natural and synthetic fiber rope slings shall be permitted when used in a temperature range of minus 20 degrees F to plus 180 degrees F, without decreasing the working load limit, unless the sling is wet and frozen. Wet and frozen slings must be used in accordance with manufacturer's recommendations.

Splicing

Knots shall not be used in lieu of splices. Clamps for splicing fiber ropes shall not be used unless the clamps are designed specifically for such use.

Removal from service

Natural and synthetic rope slings shall be immediately removed from service if any of the following conditions exist:

1. Abnormal wear.
2. Powdered fiber between strands.
3. Broken or cut fibers.
4. Variations in the size or roundness of strands.
5. Discoloration or rotting.
6. Distortion of hardware in the sling.

Synthetic Webbing

Marking

When synthetic web slings are used, the employer must mark or code each sling to show all of the following:

1. Name or trademark of manufacturer.
2. Rated capacities for the type of hitch.
3. Type of material.

Rated capacity

The rated capacity of synthetic web slings shall not be exceeded. Synthetic webbing shall be of uniform thickness and width and selvage edges shall not be split from the webbings width.

Fittings

Fittings for synthetic web slings shall have a minimum breaking strength equal to that of the sling.-Fittings shall be free of all sharp edges that might damage the webbing.

Attachment

Stitching is the only permissible method for attaching end fittings to the webbing and to form eyes in the webbing.

Work environments

Nylon web slings shall not be used where fumes, vapors, sprays, mists or liquids of acids or phenolics are present. Polyester and polypropylene web slings shall not be used where fumes vapors, sprays, mists, or liquids of caustics are present.

Removal from Service

Synthetic web slings shall be immediately removed from service if any of the following conditions exist:

1. Acid or caustic burns.
2. Melting or charring of any part of the sling surface.

3. Broken or worn stitches.
4. Snags, punctures, tears or cuts.
5. Distortion of fittings.

Shackles and Hooks

Loading considerations

Table H-19 of Subpart H is used to determine the safe working loads of the various sizes of shackles. Higher safe working loads may be permitted where recommended by the manufacturer for specific use provided that a safety factor of not less than five is maintained.

Manufacturer's recommendations

The manufacturer's recommendations shall be followed in determining the safe working loads of the various sizes and types of hooks. Hooks for which no manufacturer's data is available, shall be tested to twice the intended safe working load before they are first put into use.

Disposal of Waste Material

Chute requirement

Whenever materials are dropped more than 20 ft. to any point lying outside the exterior walls of the building, a chute constructed of wood or equivalent materials shall be used.

Dropped through holes in floors

When debris is dropped through holes in the floor without the use of chutes, the area onto which the material is dropped shall be completely protected with barricades not less than 42 inches high and not less than six ft. back from the projected edge of the opening above.

Signs warning of the hazard of falling materials shall be posted at each level.

Combustible materials

All scrap lumber, waste material, and rubbish shall be removed from the immediate work area as work progresses. Solvent waste and oily rags etc., shall be stored in fire resistant containers until removed from the job.

7.A: Chapter 6 Review Questions

Complete as directed.

Fill in the Blanks:

1. Maximum safe load limit for floors must be posted in all buildings and structures and in the appropriate storage areas. The safe limits must be listed in_____ for all floors except those located on grade.

2. Materials stored inside of buildings under construction shall not be placed within_____ feet of any hoist way or inside floor openings. Such materials shall also be kept at least_____ feet from an exterior wall which does not extend above the top of the material stored.

3. Unless materials are for immediate use, materials shall not be stored on_____ or_____.

4. When masonry blocks are stored in stacks higher than_____ feet, the stacks shall be tapered back one-half tier above this level.

5._____ and_____must be kept clear to provide for ready access and safe movement of material handling equipment or employees.

6. Rigging equipment for material handling shall be_____ prior to use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment shall not be used.

7. If the type of installation requires that special hooks, grabs, clamps, etc. must be used, they shall be marked to indicate their maximum safe working loads and they shall be proof-tested prior to their use to_____ of their rated load.

8. _____ is the only permissible method for attaching end fittings to synthetic webbing and to form eyes in the webbing.

Multiple Choice:

9. When lumber is stored, which of the following conditions shall be followed:

a. _____ All nails shall first be removed.

b. _____ It must be stacked on level and solidly supported sills.

c. _____ It must be stable and self-supporting.

d. _____ The piles must not exceed 20 feet provided the lumber to be handled manually, does not exceed 16 feet.

e. _____ All of the above.

True or False:

10. T or F

Materials stored in tiers shall be stacked, racked, blocked, interlocked or otherwise secured to prevent sliding, falling or collapse.

CHAPTER OVERVIEW

8: Hand and Power Tools

> *"Safety is something that happens between your ears, not something you hold in your hands." – Jeff Cooper*

Overview

In Chapter 0 Valuing Work we explored the history of work highlighting how work was done throughout history, some of the tools, equipment and materials used. Tools and equipment allow us to increase our efficiency and output. They help us protect our limbs and even vital organs. However tools and equipment used incorrectly, can quickly become a hazard and reverse any efficiency gained from their use.

Most of us have used hand tools of some sort; a pair of scissors, a box cutter, a screwdriver. It is important to note however that any physical device that we operate or handle in the course of performing a task can be considered a tool or piece of equipment requiring special consideration for safe use. In this chapter we will discuss the standards for hand and power tool safety but also address how we extend the substance of these standards to equipment in general.

Chapter Objective:

1. Recognize the hazards associated with the use of hand and power tools.
2. Determine what personal protective equipment (PPE) is required when using hand and power tools.
3. Understand the machine guarding methods used to protect employees from the hazards associated with the use of machinery.
4. Identify OSHA requirements for proper and improper use of hand and power tools.

Learning Outcome:

1. Correctly apply the hierarchy of controls to standards for tool and equipment safety.
2. Identify which tier of the hierarchy of controls machine guards represent.

Standards: 1926 Subpart I-Hand and Power Tools, 1910 Subpart O-Machinery and Machine Guarding, 1926 Subpart K Electrical

Key Terms:

Guards, hydraulic, machines, pneumatic, powder actuated

Mini-Lecture: Tool and Equipment Safety

Topic Required Time: 2 hrs; Independent Study and reflection 1 3/4 hour.

8.1: Introduction to Hand and Power Tools

Tools and Equipment

Hand and power tools are an integral part of work performance in the construction industry. Because workers who use hand and power tools are exposed to hazards, they must be trained in the safe use of each tool they are required to use. They also must be trained to understand the associated hazards and how to take necessary precautions.

> **Note**
>
> A significant requirement of working with tools is that workers must maintain all hand tools, power tools, and similar equipment in a safe condition, whether such equipment is furnished by the employer or the employee.

Hazards Associated with the Use of Hand and Power Tools

Understanding the hazards

Hazards are the conditions related to tools or equipment that could cause a worker to be injured. Hazards are associated with such factors as energy sources, including the rotating or reciprocating elements of tools and equipment, electric or pneumatic energy, and user's misuse of equipment. Hazards are not related to the user's business, such as the construction business. Hazards are present in any business.

Minimizing exposure to hazards

Thinking about the hazard and how the worker can be exposed, and then modifying the mechanism by which the exposure occurs can minimize exposure to hazards. For example, flying parts and pieces can result from using grinders and side grinders. Wearing appropriately rated face shields and appropriate clothing provides some protection from the momentum of flying parts and pieces. Insuring that tools are appropriately selected by the ratings of specific parts (such as grinding wheel and saw blade ratings), performing physical inspections, using and maintaining necessary guards, and making sure the operator has been appropriately trained to help minimize exposure to hazards.

Personal Protective Equipment (PPE)

PPE should always be selected based on the hazard. For instance, face shields and eye protection that are used to protect from possible flying parts and pieces must be rated to provide the necessary protection from impact. In some instances, wearing PPE might *not* be appropriate, such as wearing gloves when using a drill press. However, in other instances, wearing gloves can protect from abrasions and cuts. Understanding how to select appropriate PPE for the task is important and part of the job hazard analysis.

OSHA Requirements

Subpart I of OSHA 29 CFR 1926, Construction Standards, contains safety requirements for hand tools, power-operated tools, abrasive wheels and tools, and some other specialized tools, such as jacks, air receivers, woodworking tools, and power transmission apparatus.

To provide a higher degree of safety, OSHA 29 CFR 1926.300 incorporates some of the general requirements of 29 CFR 1910, Subpart 0, Machinery and Machine Guarding, to help protect workers from hazards. The hazards arise from use of the equipment, not from the classification of work.

Requirements for tools and machines that require guarding

When working with tools, employers must make sure that the tools are appropriately guarded, as follows:

- Ensure that power-operated tools that are designed to accommodate guards are equipped with such guards before use.
- Ensure that all belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or moving parts of equipment are guarded if such parts are exposed to contact by employees, or if they otherwise create a hazard.

"Point of operation" refers to the area on a machine where work actually is performed upon the material being processed. The following are examples of machines and tools that usually require point of operation guarding:

- Guillotine cutters
- Shears

- Alligator shears
- Powered presses
- Milling machines
- Power saws
- Jointers
- Portable power tools
- Forming rolls and calendars
- Provide one or more methods of machine guarding to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips, or sparks.

> **Note**
>
> Examples of guarding methods are barrier guards, two-hand tripping devices, and electronic safety devices.

- · Guard all points of operation of machines whose operation exposes an employee to injury.

> **Note**
>
> The guarding device shall conform with all applicable standards or in the absence of specific applicable standards, shall be designed and constructed to prevent the operator from having any part of his or her body in the danger zone during the operating cycle.

- Ensure that special hand tools used to place and remove material permit easy handling of material without the operator placing a hand in the danger zone. Ensure that such tools are not used in lieu of other guarding required by this section and that they can be used only to supplement protection provided.
- Guard the blades of fans when the periphery of the blades is less than 7ft. (2.128m) above the floor or working level. Ensure that the fan guard does not have openings larger than 0.5 inch (1.27 cm).

General requirements

The following requirements are general rules that must be followed for safe operation of tools and equipment:

- Ensure that machines designed for a fixed location are anchored securely to prevent them from walking or moving.
- Provide specific PPE necessary to protect employees using hand and power tools from the hazards of falling, flying, abrasive, and splashing objects and also from harmful dusts, fumes, mists, vapors, or gases. All PPE shall meet the requirements and be maintained according to OSHA 29 CFR 1926 Subparts D and E.
- Use the following tools only with a positive "on-off' control: hand-held powered platen sanders, grinders with wheels 2-inch diameter or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws, and jigsaws with blade shanks ¼-inch wide or less.
- Ensure that all of the following tools are equipped with a momentary contact "on- off control: all hand-held powered drills; tappers; fastener drivers; horizontal, vertical, and angle grinders with wheels greater than 2 inches in diameter; disc sanders; belt sanders; reciprocating saws; saber saws; and other similar operating powered tools. Such equipment also may have a lock-on control, provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.
- Ensure that all other hand-held powered tools, such as circular saws, chain saws, and percussion tools without positive accessory holding means are equipped with a constant pressure switch that will shut off the power when the pressure is released.

Hand tools

The greatest hazards posed by hand tools result from misuse and improper maintenance. Employers must not issue or permit the use of unsafe hand tools. The employer is responsible for the safe condition of the tools and equipment used by the employees, but the employees are responsible for using and maintaining the tools properly. These requirements must be followed for use of hand tools:

- Do not use wrenches, including adjustable, pipe, end and socket wrenches, when the jaws are sprung to the point that slippage occurs.
- Keep impact tools, such as drift pins, wedges, and chisels, free of mushroomed heads.

- Keep the wooden handles of tools free of splinters or cracks and ensure that they are kept tight in the tool.
- Wear appropriate PPE, such as safety goggles and gloves, due to the hazards that might be encountered while using portable tools.
- Keep knives and scissors sharp. Dull tools can be more hazardous than sharp ones.

8.2: Power-Operated Hand Tools

Power-Operated Hand Tools

Electric power-operated tools must be either of the approved double-insulated type or grounded in accordance with OSHA 29 CFR 1926, Subpart K. "Approved" means accepted, certified, listed, labeled, or otherwise determined to be safe by a qualified testing laboratory. In addition, these requirements must be followed for use of power-operated hand tools:

- Do not permit the use of electric cords for hoisting or lowering tools.
- Remove all damaged portable electric tools from use and tag them "Do Not Use."
- Secure hose or whip pneumatic power tools by some positive means to prevent the tool from becoming accidentally disconnected.
- Securely install and maintain safety clips or retainers on pneumatic impact (percussion) tools to keep attachments from being accidentally expelled.
- Ensure that all pneumatically driven nailers, staplers, and other similar equipment that are provided with automatic fastener feeds (that operate at more than 100 psi pressure at the tool) have safety devices on the muzzle to prevent the tool from ejecting fasteners unless the muzzle is in contact with the work surface.
- Do not allow compressed air to be used for cleaning purposes except where reduced to less than 30 psi and then only with effective chip guarding and PPE that meets the requirements of 29 CFR 1926 Subpart E. The 30 psi requirement does not apply for concrete form, mill scale, and similar cleaning purposes.
- Do not exceed the manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings.
- Do not permit the use of hoses for hoisting or lowering tools.
- Ensure that all hoses exceeding ½-inch inside diameter have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.
- Equip airless spray guns of the type that atomize paints and fluids at high pressures (1,000lbs or more per sq. in.) with automatic or visible manual safety devices to prevent pulling of the trigger and releasing paint or fluid until the safety
- device is manually released, or, provide a diffuser nut that will prevent high pressure, high velocity release while the nozzle tip is removed as well as a nozzle tip guard, or other equivalent protection, that will prevent the tip from corning into contact with the operator.
- Equip abrasive blast cleaning nozzles with an operating valve that must be held open manually. Provide a support on which the nozzle can be mounted when it is not in use.
- turn off all fuel-powered tools while refueling, servicing, or maintaining them. Transport, handle, and store fuel in accordance with 29 CFR 1926, Subpart F.
- Apply applicable requirements, as outlined in 29 CFR 1926, Subparts D and E, for concentrations of toxic gases and use of PPE when using fuel-powered tools in enclosed spaces.

Powder-actuated tools

These requirements must be followed for use of powder-actuated tools:

- Allow only workers who have been trained in the operation of the particular tool in use to operate a powder-operated tool.
- Test the tool daily before loading, in accordance with the manufacturer's recommendations, to ensure that safety devices are in proper working condition.
- Remove from service immediately any tool not in proper working order or that develops a defect during use, and do not use it again until it is repaired.
- Ensure that all PPE is in accordance with 29 CFR 1926, Subpart E.
- Do not load tools until just prior to the intended firing time. Never point either loaded or empty tools at any person. Keep hands clear of the open barrel end. Never leave loaded tools unattended.
- Do not drive fasteners into hard or brittle materials including, but not limited to, the following:
  - cast iron
  - glazed tile
  - surface-hardened steel
  - glass block
  - live rock
  - face brick

- hollow tile

- Avoid driving pins or fasteners into materials that are easily penetrated unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side. Never drive a fastener into a spalled area caused by an unsatisfactory fastening.
- Do not use tools in an explosive or flammable atmosphere. Always use tools with the correct shield, guard, or attachment recommended by the manufacturer.

Abrasive wheels and tools

These requirements must be followed for use of abrasive wheels and tools:

- Ensure that all grinding machines are supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation.
- Ensure that all grinding machines are equipped with safety guards that cover the spindle end, nut, and flange projections, that the safety guard is mounted to maintain proper alignment with the wheel, and that the strength of the fastenings exceeds the strength of the guard.
- Provide safety guards (protection hoods) for floor-stand and bench-mounted abrasive wheels used for external grinding. Ensure that the maximum angular exposure of the grinding wheel periphery and sides is not more than 90 degrees, except that when work requires contact with the wheel below the horizontal plane of the spindle where the angular exposure must not exceed 125 degrees. In either case, ensure that the exposure does not begin more than 65 degrees above the horizontal plane of the spindle. The safety guards must be strong enough to withstand the effect of a bursting wheel, and work rests that are rigidly supported and readily adjustable must be provided for floor- and bench-mounted grinders. Work rests must be kept at a distance not more than 1/8 inch from the surface of the wheel.
- Inspect closely and ring-test all abrasive wheels before mounting to ensure that they are free from cracks and defects.
- Ensure that grinding wheels fit freely and are not forced on the spindle. Tighten the spindle nut only enough to hold the wheel in place. Protect all workers using abrasive wheels with eye protection equipment in accordance with the requirements of 29 CFR 1926, Subpart E, unless adequate eye protection is afforded by eye shields that are permanently attached to the bench or floor stand.

Jacks and Hydraulic Tools

These requirements must be followed for use of jacks and hydraulic tools:

- Mark the manufacturers rated capacity legibly on all jacks and ensure that the capacity is not exceeded.
- Make sure that all jacks have a positive stop to prevent over travel.
- Make sure that the base of the jack is blocked or cribbed when it needs a firm foundation. Place a wood block between the cap and the load if a possibility of slippage of the metal cap of the jack exists.
- Crib, block, or otherwise secure the load immediately after it has been raised.
- Supply hydraulic jacks exposed to freezing temperatures with adequate antifreeze liquid.
- Lubricate all jacks at regular intervals.
- Inspect each jack thoroughly at times depending upon the service conditions. Inspect no less frequently that the following intervals:
- For constant or intermittent use at one locality, once every six months
- For jacks sent out of shop for special work, when sent out and when returned
- For a jack subjected to abnormal load or shock, immediately before and immediately thereafter
- Tag jacks that are out of order and ensure that they are not used until rep

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8.A: Chapter 7 Review Questions

Complete as directed.

Fill in the Blanks:

1. When_____ -_____tools are designed to accommodate guards, they shall be equipped with such guards when in use.

2. The point of operation of machines whose operation exposes a worker to injury shall be_____.

3. One or more methods of machine guarding shall be provided to protect the operator and other workers in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips, and sparks.

Name three methods of providing machine guarding.

a. _____

b. _____

c. _____

4. Only employees who have been_____in the operation of the particular tool in use shall be allowed to operate a powder-actuated tool.

5. All abrasive wheels must be closely inspected and_____before mounting to ensure that they are free from cracks or defects.

Multiple Choice:

6. What kind of power tools must be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected?

a. Electric b. Pneumatic c. Power-actuated d. Abrasive

7. Pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed that operate at more than_____psi pressure at the tool must have a safety device on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in contact with the work surface.

a. 50 b. 100 c. 150 d. 200

8. Compressed air shall not be used for cleaning purposes except where reduced to less than_____and then only with effective chip guarding and PPE that meets the requirements of 29 CFR 1926 Subpart E.

a. 10 psi b. 15 psi c. 20 psi d. 30 psi

9. Jacks shall be thoroughly inspected at intervals depending upon the service conditions. For constant or intermittent use at one locality, the inspection interval is every_____.

a. 1 month b. 3 months c. 6 months d. 12 months

True or False:

10. T or F

All employees using abrasive wheels must be protected by eye protection equipment in accordance with the requirements of 29 CFR 1926 Subpart E, except when adequate eye protection is afforded by eye shields that are permanently attached to the bench or floor stand.

CHAPTER OVERVIEW

9: Welding and Cutting

> *"The real enemy of safety is not non-compliance but non-thinking" - Dr. Rob Long*

Overview

Welding is a specialized and skilled trade. Welders learn metallurgy, the science of the properties of metals, production and purification, as well as learning about the intense heat combining/forging metals for many purposes. When you combine intense heat with the chemical and physical properties of metals you produce not only health hazards from vaporized metals but also physical hazards of heat and radiation.

Many of you reading this resource are not planning on becoming welders and the safety protocols presented here are focused on hazard awareness. Those who will ultimately choose welding as a career will have much more safety training than presented in this chapter. It is important to pay close attention to the supporting activities associated with welding, primarily focused on hazardous materials, fuel and energy, fire protection and prevention, shielding and ventilation as the focus in these areas protect workers in a welding environment.

Chapter Objective:

1. Determine the proper manner to transport, move, place and store compressed gas cylinders.
2. Identify the components of gas welding and cutting units and the proper use and maintenance of these components.
3. Review the requirements for arc welding and cutting on construction sites.
4. Understand the safety concerns and health hazards when welding and cutting on the job.

Learning Outcome:

1. Correctly apply the hierarchy of controls to welding and cutting activities.
2. Identify hazardous materials associated with welding and cutting.

Standards: 1926 Subpart J Welding and Cutting, 1926 Subpart CC Confined Spaces in Construction, 1910 Subpart H Hazardous Materials, 1910 Subpart M Compressed Gas and Compressed Air Equipment, 1910 Subpart Z Toxic and Hazardous Substances

Key Terms:

Arc, Compressed Gas, confined space, coupling, fuel gas, manifold, torch

Mini-Lecture: Welding Safety, Hazardous Materials

Topic Required Time: 1 hr; Independent Study and reflection 3/4 hour.

9.1: Introduction to Welding and Cutting

Welding in Construction

Welding and cutting on construction sites is a common task which is often performed by several different trades. OSHA investigations into accidents related to welding and cutting discovered that the most frequent accidents resulted from the ignition of fumes/vapors or other explosive materials in the vicinity of the welding or cutting operation. These types of fire related accidents may be attributed to improper material handling and storage.

Another hazard that workers encounter is the long-term effects of welding and cutting. These effects include damage to the eyes, lungs, and skin. Other hazards include falls from elevations, electrocutions, caught between, and explosions as welding activity can occur during all phases of construction.

To address these safety issues Subpart J of the 1926 OSHA standards covers welding and cutting requirements for construction sites. This subpart includes requirements for gas welding and cutting, Arc welding and cutting, fire prevention, ventilation and health concerns when heating treated metals.

Welding produces toxic vapors and fumes such as beryllium, chromium, and fuel gases for welding are considered hazardous materials. Because the production of toxic vapors during welding may create confined space conditions or if the welding activity is occurring in a confined space it is important to ensure proper ventilation and when appropriate air supplied respirators.

Gas Welding and Cutting

General

When transporting, moving, and storing compressed gas cylinders, valve protection caps shall be in place and secured. When cylinders are hoisted, they shall be secured on a cradle, sling board or pallet. They shall not be hoisted or transported by means of magnets or choker slings. A suitable cylinder truck, chain, or other steadying device shall be used to keep cylinders from being knocked over while in use.

Transporting

When cylinders are transported by powered vehicles, they shall be secured in a vertical position.

Moving

Unless cylinders are firmly secured on a special carrier intended for this purpose, regulators shall be removed and valve protection caps put in place before cylinders are moved.

Compressed gas cylinders shall be secured in an upright position at all times except, if necessary, for short periods of time while cylinders are actually being hoisted or carried. This is the most frequently cited welding and cutting violation.

Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dropped, struck, or permitted to strike each other violently. Valve protection caps shall not be used for lifting cylinders from one vertical position to another. Bars shall not be used under valves or valve protection caps to pry cylinders loose when frozen. Warm, not boiling, water shall be used to thaw cylinders loose.

Storage

When work is finished, when cylinders are empty, or when cylinders are moved at any time, the cylinder valve shall be closed. Oxygen cylinders in storage shall be separated from fuel- gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet (6.1 m) or by a noncombustible barrier at least 5 feet (1.5 m) high having a fire- resistance rating of at least one-half hour.

Inside of buildings, cylinders shall be stored in a well-protected well-ventilated, dry location, at least 20 feet (6.1 m) from highly combustible materials such as oil or excelsior. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways.

Assigned storage places shall be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons. Cylinders shall not be kept in unventilated enclosures such as lockers and cupboards.

Cylinder Placement

Cylinders shall be kept far enough away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them. When this is impractical, fire resistant shields shall be provided. Cylinders shall be placed where they cannot become part of an electrical circuit. Electrodes shall not be struck against a cylinder to strike an arc.

Fuel gas cylinders shall be placed with valve end up whenever they are in use. They shall not be placed in a location where they would be subject to open flame, hot metal, or other sources of artificial heat. Cylinders containing oxygen or acetylene or other fuel gas shall not be taken into confined spaces.

Cylinders, whether full or empty, shall not be used as rollers or supports. No damaged or defective cylinder shall be used.

Use of Fuel Gas

Training

Employers shall instruct employees in the safe use of fuel gas, as follows:

1. Before a regulator is connected to a cylinder valve, the valve shall be opened slightly and closed immediately. (This action is generally termed "cracking" and is intended to clear the valve of dust or dirt that might otherwise enter the regulator.) The person cracking the valve shall stand to one side of the outlet, not in front of it. The valve of a fuel gas cylinder shall not be cracked where the gas would reach welding work, sparks, flame, or other possible sources of ignition.
2. The cylinder valve shall always be opened slowly to prevent damage to the regulator. For quick closing, valves on fuel gas cylinders shall not be opened more than 1 ½ turns. When a special wrench is required, it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel gas flow can be shut off quickly in case of an emergency. In the case of manifolded or coupled cylinders, at least one such wrench shall always be available for immediate use. Nothing shall be placed on top of a fuel gas cylinder when in use, which may damage the safety device or interfere with the quick closing of the valve.
3. Fuel gas shall not be released from cylinders through torches or other devices, which are equipped with shutoff valves without reducing the pressure through a suitable regulator, attached to the cylinder valve or manifold.
4. Before a regulator is removed from a cylinder valve, the cylinder valve shall always be closed and the gas released from the regulator.
5. If, when the valve on a fuel gas cylinder is opened, and a leak is found around the valve stem, the valve shall be closed and the gland nut tightened. If this action does not stop the leak, the use of the cylinder shall be discontinued, and it shall be properly tagged and removed from the work area. In the event that fuel gas should leak from the cylinder valve, rather than from the valve stem, and the gas cannot be shut off, the cylinder shall be properly tagged and removed from the work area. If a regulator attached to a cylinder valve will effectively stop a leak through the valve seat, the cylinder need not be removed from the work area.
6. If a leak should develop at a fuse plug or other safety device, the cylinder shall be removed from the work area.

Fuel Gas and Oxygen Manifold

Marking

Fuel gas and oxygen manifolds shall bear the name of the substance they contain in letters at least 1-inch high which shall be either painted on the manifold or on a sign permanently attached to it.

Location

Fuel gas and oxygen manifolds shall be placed in safe, well ventilated, and accessible locations. They shall not be located within enclosed spaces.

Connections

Manifold hose connections, including both ends of the supply hose that lead to the manifold, shall be such that the hose cannot be interchanged between fuel gas and oxygen manifolds and supply header connections. Adapters shall not be used to permit the interchange of hose. Hose connections shall be kept free of grease and oil.

Storage

When not in use, manifold and header hose connections shall be capped. Nothing shall be placed on top of a manifold, when in use, which will damage the manifold or interfere with the quick closing of the valves.

Fuel Hoses

Identification

Fuel gas hoses and oxygen hoses shall be easily distinguishable from each other. The contrast may be made by different colors or by surface characteristics readily distinguishable by the sense of touch. Oxygen and fuel gas hoses shall not be interchangeable. A single hose having more than one gas passage shall not be used.

Maintenance, inspection, and testing

All hoses in use, carrying acetylene, oxygen, natural or manufactured fuel gas, or any gas or substance which may ignite or enter into combustion or be in any way harmful to employees, shall be inspected at the beginning of each working shift. Defective hoses shall be removed from service.

Hose which has been subject to flashback, or which shows evidence of severe wear or damage, shall be tested to twice the normal pressure to which it is subject, but in no case less than 300 psi. Defective hose, or hose in doubtful condition, shall not be used.

When parallel sections of oxygen and fuel gas hose are taped together, not more than 4 inches out of 12 inches shall be covered by tape.

Couplings

Hose couplings shall be of the type that cannot be unlocked or disconnected by means of a straight pull without rotary motion. Boxes used for the storage of gas hose shall be ventilated. Hoses, cables, and other equipment shall be kept clear of passageways, ladders and stairs.

Torches

Clogged torch tip openings shall be cleaned with suitable cleaning wires drills, or other devices designed for such purpose. Torches in use shall be inspected at the beginning of each working shift for leaking shutoff valves, hose couplings, and tip connections. Defective torches shall not be used. Torches shall be lighted by friction lighters or other approved devices, and not by matches or from hot work.

Oil and grease hazards

Oxygen cylinders and fittings shall be kept away from oil or grease. Cylinders, cylinder caps and valves, couplings, regulators, hose, and apparatus shall be kept free from oil or greasy substances and shall not be handled with oily hands or gloves. Oxygen shall not be directed at oily surfaces, greasy clothes, or within a fuel oil or other storage tank or vessel.

Arc Welding and Cutting

Manual Electrode Holders

Only manual electrode holders which are specifically designed for arc welding and cutting, and are of a capacity capable of safely handling the maximum rated current required by the electrodes, shall be used.

Any current-carrying parts passing through the portion of the holder, which the arc welder or cutter grips in his hand, and the outer surfaces of the jaws of the holder, shall be fully insulated against the maximum voltage, encountered to ground.

Welding cables and connectors

All arc welding and cutting cables shall be of the completely insulated flexible type, capable of handling the maximum current requirements of the work in progress, taking into account the duty cycle under which the arc welder or cutter is working.

Use cable free from repair or splices for a minimum distance of 10 feet from the cable end to which the electrode holder is connected, except that cables with standard insulated connectors or with splices whose insulating quality is equal to that of the cable are permitted.

When it becomes necessary to connect or splice lengths of cable one to another, substantial insulated connectors of a capacity at least equivalent to that of the cable shall be used. If connections are effected by means of cable lugs, they shall be securely fastened together to give good electrical contact and the exposed metal parts of the lugs shall be completely insulated.

Cables in need of repair shall not be used. When a cable, other than those with acceptable splices, becomes worn to the extent of exposing bare conductors, the portion thus exposed shall be protected by means of rubber and friction tape or other equivalent

insulation.

Ground returns and machine grounding

A ground return cable shall have a safe current carrying capacity equal to or exceeding the specified maximum output capacity of the arc welding or cutting unit, which it services. When a single ground return cable services more than one unit, it's safe current-carrying capacity shall equal or exceed the total specified maximum output capacities of all the units, which it services. Pipelines containing gases or flammable liquids, or conduits containing electrical circuits, shall not be used as a ground return.

When a structure or pipeline is employed as a ground return circuit, it shall be determined that the required electrical contact exists at all joints. The generation of an arc, sparks, or heat at any point shall cause rejection of the structures as a ground circuit.

When a structure or pipeline is continuously employed as a ground return circuit, all joints shall be bonded, and periodic inspections shall be conducted to ensure that no condition of electrolysis or fire hazard exists by virtue of such use.

The frames of all arc welding and cutting machines shall be grounded either through a third wire in the cable containing the circuit conductor or through a separate wire which is grounded at the source of the current. Grounding circuits, other than by means of the structure, shall be checked to ensure that the circuit between the ground and the grounded power conductor has resistance low enough to permit sufficient current to flow to cause the fuse or circuit breaker to interrupt the current.

All ground connections shall be inspected to ensure that they are mechanically strong and electrically adequate for the required current.

Training

Employers shall instruct employees in the safe means of arc welding and cutting as follows:

1. When electrode holders are to be left unattended, the electrodes shall be removed and the holders shall be so placed or protected that they cannot make electrical contact with employees or conducting objects.
2. Hot electrode holders shall not be dipped in water; to do so may expose the arc welder or cutter to electric shock.
3. When the arc welder or cutter has occasion to leave his work or to stop work for any appreciable length of time, or when the arc welding or cutting machine is to be moved, the power supply switch to the equipment shall be opened.
4. Any faulty or defective equipment shall be reported to the supervisor.

Shielding

Whenever practicable, all arc welding and cutting operations shall be shielded by noncombustible or flameproof screens which will protect employees and other persons working in the vicinity from the direct rays of the arc.

9.2: Fire Prevention

Fire hazards

When practical, objects to be welded, cut, or heated shall be moved to a designated safe location or, if the objects to be welded, cut, or heated cannot be readily moved, all movable fire hazards in the vicinity shall be taken to a safe place, or otherwise protected.

If the object to be welded, cut, or heated cannot be moved and if all the fire hazards cannot be removed, positive means shall be taken to confine the heat, sparks, and slag, and to protect the immovable fire hazards from them.

No welding, cutting, or heating shall be done where the application of flammable paints or the presence of other flammable compounds, or heavy dust concentrations creates a hazard.

Fire extinguishing equipment

Suitable fire extinguishing equipment shall be immediately available in the work area and shall be maintained in a state of readiness for instant use. When the welding, cutting, or heating operation is such that normal fire prevention precautions are not sufficient, additional personnel shall be assigned to guard against fire while the actual welding, cutting, or heating

operation is being performed, and for a sufficient period of time after completion of the work to ensure that no possibility of fire exists. Such personnel shall be instructed as to the specific anticipated fire hazards and how the firefighting equipment provided is to be used.

When welding, cutting, or heating is performed on walls, floors, and ceilings, since direct penetration of sparks or heat transfer may introduce a fire hazard to an adjacent area, the same precautions shall be taken on the opposite side as are taken on the side on which the welding is being performed.

Confined Space

For the elimination of possible fire in enclosed spaces as a result of gas escaping through leaking or improperly closed torch valves, the gas supply to the torch shall be positively shut off at some point outside the enclosed space whenever the torch is not to be used or whenever the torch is left unattended for a substantial period of time, such as during the lunch period. Overnight and at the change of shifts, the torch and hose shall be removed from the confined space. Open-end fuel gas and oxygen hoses shall be immediately removed from enclosed spaces when they are disconnected from the torch or other gas- consuming device.

Containers

Except when the contents are being removed or transferred, drums, pails and other containers, which contain or have contained flammable liquids, shall be kept closed. Empty containers shall be removed to a safe area separate from hot work operations or open flames.

Drums, containers, or hollow structures which have contained toxic or flammable substances shall, before welding, cutting, or heating is undertaken on them, either be filled with water or thoroughly cleaned of such substances and ventilated and tested.

Before heat is applied to a drum, container, or hollow structure, a vent or opening shall be provided for the release of any built-up pressure during the application of heat.

Ventilation and Protection in Welding, Cutting and Heating

Mechanical ventilation

Either general mechanical or local exhaust ventilation shall be provided whenever welding, cutting, or heating is performed in a confined space.

Mechanical ventilation shall meet the following requirements:

1. Mechanical ventilation shall consist of either general mechanical ventilation systems or local exhaust systems.
2. General mechanical ventilation shall be of sufficient capacity and so arranged as to produce the number of air changes necessary to maintain welding fumes and smoke within safe limits, as defined in Subpart D.
3. Local exhaust ventilation shall consist of freely movable hoods intended to be placed by the welder or burner as close as practicable to the work. This system shall be of sufficient capacity and so arranged as to remove fumes and smoke at the source

and keep the concentration of them in the breathing zone within safe limits as defined in Subpart D.
4. Contaminated air exhausted from a working space shall be discharged into the open air or otherwise clear of the source of intake air.
5. All air replacing that withdrawn shall be clean and breathable.
6. Oxygen shall not be used for ventilation purposes, comfort cooling, blowing dust from clothing, or for cleaning the work area.

Confined Spaces

General or local exhaust ventilation is not required when sufficient ventilation cannot be obtained without blocking the means of access to the confined space. In these cases, employees in the confined space shall be protected by air line respirators in accordance with the requirements of Subpart E, and an employee on the outside of such a confined space shall be assigned to maintain communication with those working within it and to aid them in an emergency.

When a welder must enter a confined space through a manhole or other small opening, means shall be provided for quickly removing him in case of emergency. When safety belts and lifelines are used for this purpose they shall be attached to the welder's body so that his body cannot be jammed in a small exit opening. An attendant with a pre-planned rescue procedure shall be stationed outside to observe the welder at all times and be capable of putting rescue operations into effect.

Materials of toxic significance

Welding, cutting, or heating in any enclosed spaces involving the following metals shall be performed with either general mechanical or local exhaust ventilation:

1. Zinc-bearing base or filler metals or metals coated with zinc-bearing materials.
2. Lead base metals.
3. Cadmium-bearing filler materials.
4. Chromium-bearing metals or metals coated with chromium-bearing materials.

Welding, cutting, or heating in any enclosed spaces involving the following metals shall be performed with local exhaust ventilation or employees shall be protected by air line respirators in accordance with the requirements of Subpart E of this part:

1. Metals containing Lead or metals coated with Lead-bearing materials.
2. Cadmium-bearing or cadmium-coated base metals.
3. Metals coated with mercury-bearing metals.
4. Beryllium-containing base or filler metals. Because of its high toxicity, work involving beryllium shall be done with both local exhaust ventilation and air line respirators.

Employees performing such operations in the open air shall be protected by filter-type respirators in accordance with the requirements of Subpart E except that employees performing such operations on beryllium-containing base or filler metals shall be protected by air line respirators in accordance with the requirements of Subpart E.

Other employees exposed to the same atmosphere as the welders or burners shall be protected in the same manner as the welder or burner.

General Provisions for Welding, Cutting and Heating

Welding, cutting, and heating, which does not involve confined spaces, or materials which might present a toxic hazard, may normally be done without mechanical ventilation or respiratory protective equipment, but where, because of unusual physical or atmospheric conditions, an unsafe accumulation of contaminants exists, suitable mechanical ventilation or respiratory protective equipment shall be provided.

Employees performing any type of welding, cutting, or heating shall be protected by suitable eye protective equipment in accordance with the requirements of Subpart E.

Welding, Cutting and Heating of Preservative Coatings

Before welding, cutting, or heating is commenced on any surface covered by a preservative coating whose flammability is not known, a test shall be made by a competent person to determine its flammability. Preservative coatings shall be considered to be highly flammable when scrapings burn with extreme rapidity.

Precautions shall be taken to prevent ignition of highly flammable hardened preservative coatings. When coatings are determined to be highly flammable, they shall be stripped from the area to be heated to prevent ignition.

In enclosed spaces, all surfaces covered with toxic preservatives shall be stripped of all toxic coatings for a distance of at least 4 inches from the area of heat application, or the employees shall be protected by air line respirators, meeting the requirements of Subpart E of this part.

In the open air, employees shall be protected by a respirator, in accordance with requirements of Subpart E.

The preservative coatings shall be removed a sufficient distance from the area to be heated to ensure that the temperature of the unstripped metal will not be appreciably raised. Artificial cooling of the metal surrounding the heating area may be used to limit the size of the area required to be cleaned.

9.A: Chapter 8 Review Questions

Complete as directed.

Fill in the Blanks:

1. Compressed gas cylinders shall be secured in an_____position at all times except, if necessary, for short periods of time while cylinders are actually being hoisted or carried.

2. Cylinders containing oxygen or acetylene or other fuel gas shall not be taken into_____ _____.

3. What is the correct procedure to follow if the valve on a fuel gas cylinder is opened and a leak around the valve stem is discovered?

4. Whenever practicable, all arc welding and cutting operations shall be_____ by noncombustible or flameproof screens which will protect employees and other persons working in the vicinity from the direct rays of the arc.

5. When the welding, cutting, or heating operation is such that normal fire prevention precautions are not sufficient, additional_____ shall be assigned to guard against fire while the actual welding, cutting, or heating operation is being performed and for a sufficient period of time after completion of the work to ensure that no possibility of fire exists.

6. Before welding, cutting, or heating is commenced on any surface covered by a preservative coating whose flammability is not known, a test shall be made by a_____ _____ to determine its flammability.

Multiple Choice:

7. Which of the following is or are an acceptable means for hoisting compressed gas cylinders:

a. magnets b. cradles c. sling board d. pallet e. choker slings

8. Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of_____feet (6.1 m) or by a noncombustible barrier at least 5 feet (1.5m) high having a fire-resistance rating of at least one-half hour.

a. 5 b. 10 c. 15 d. 20

True or False: (Circle the Correct Answer)

9. T or F

Welding, cutting, and heating, which does not involve confined spaces, or materials, which might present a toxic hazard, may normally be done without mechanical ventilation or respiratory protective equipment.

General:

10. What precautions must be followed when a welder must enter a confined space through a manhole or other small opening?

CHAPTER OVERVIEW

10: Electrical Safety

> *"For safety is not a gadget but a state of mind." – Eleanor Everet*

Overview

Electrical safety is perhaps one of the areas in which engineering controls, work practice controls, and PPE together establish the sole objective of separating people from electricity. Electrical workers develop the knowledge and skills to ensure safe installation of electrical components and equipment, maintain electrical equipment, and even to operate electrical equipment. That same knowledge and skill is responsibly applied for the protection of themselves, other workers and the public at large.

The electrician or qualified electrical worker serves as an engineering control. The correct application of skill based training, while adhering to national electric code requirements and safe work practices effectively eliminate electrical hazards.

Chapter Objective:

1. Review the installation requirements for electrical systems as covered by Subpart K and the NEC.
2. Identify Safe Work Practices Required by OSHA.
3. Understand the Requirements for GFCI Protection.
4. Understand the Requirements for Electrical Lockout/Tagout.

Learning Outcome:

1. Correlate the functions of machine guarding and electrical safeguarding.
2. Identify the engineering controls in electrical safety standards and equipment.

Standards: 1926 Subpart K-Electrical, 1910 Subpart S-Electrical, 1926 Subpart K Electrical

Key Terms:

Approved, AEGCP, Approach distance, listed, gfci, qualified, safety related

Mini-Lecture: Electrical Hazards, Electrical Safety

Topic Required Time: 2 hrs; Independent Study and reflection 1 3/4 hour.

10.1: Introduction to Electrical Safety

Working Safely with Electricity

As a worker, you have a vested interest in working safely around electricity. It has a direct effect on how you perform your job tasks. The safe installation, maintenance, and operation of electrical equipment are essential for a safe workplace. Studies by OSHA have consistently shown that electrical accidents are a leading contributor to worker injuries and fatalities.

Electrical shock is one of the four leading causes of death in construction with electrocutions accounting on average for 3% of the worker fatalities annually.

Subpart K of the Construction Standards and Subpart S of the General Industry standards contain the requirements for electrical safety. Subpart K for construction is broken down into four major areas: Installation Safety Requirements, Safety-related Work Practices, Safety related Maintenance and Environmental Considerations and Safety requirements for Special Equipment.

Subpart S of the general industry standards contains requirements for electric utilization systems, wiring design and protection, wiring methods, components, and equipment for general use, specific purpose equipment and installations, hazardous (classified) locations, and special systems.

Applicable Regulations

OSHA Subpart K contains the installation requirements, safety-related work practices, safety- related maintenance and environmental considerations, and safety requirements for special equipment. In addition, Section 1926.499 contains the definitions that are applicable to this part. There are also other related requirements for users, such as the National Electrical Code for installation requirements.

Subpart K of the construction standard does not cover installations used for the generation, transmission, and distribution of electrical energy, including related communications, metering, control, and transformation installations.

Installation Safety Requirements

The scope of installation safety requirements applies to both electrical equipment and installations used to provide electrical power and light at the jobsite. The requirements apply to both temporary and permanent installations used on the jobsite, but not to pre-existing permanent installations.

Equipment approval

Subpart K of the Construction Standard requires, as does the National Electrical Code, that all electrical conductors and equipment be approved. The difference between the two is the way in which they define "approved". The NEC defines approved as being "acceptable to the authority having jurisdiction.” OSHA defines approved as being listed by a national recognized testing laboratory. This is an important distinction.

Installation provisions

Installations provisions include: Identification of Disconnecting Means, Working Clearances, Entrance and Access to Workspace, Wiring Design and Protection, Wiring Methods and Equipment, Special Equipment Hazardous Locations, and Special systems.

GFCI and Assured grounding program

One area in which OSHA requirements differ from the NEC is ground-fault protection for personnel. OSHA standards still permit the use of an Assured Equipment Grounding Conductor Program to protect personnel on jobsites. Since 1996, the NEC has strictly limited the use of the AEGCP to receptacles other than 15 or 20-amp, 125-volt. Even though both strategies are approved, GFCI protection has an excellent performance record with less monitoring requirements. GFCI protection is required for all 125, 15 or 20-amp receptacles on construction jobsites, no matter where the power is taken from.

GFCI protection protects employees against electrical shocks by continually monitoring the amount of current going to equipment and the amount that returns. When there is a difference of approximately 5mA the GFCI opens the circuit in as little as 1/40 of a second.

GFCI protection, where so required, can be provided by individual GFCI protected receptacles, receptacles fed through other GFCI type receptacles, receptacles protected by a GFCI circuit breaker, or cord sets incorporating listed GFCI protection.

10.2: Safety-Related Work Practices

Safety-Related Work Practices

Working on live parts

Only qualified persons may work on electrical circuits or parts of equipment that have not been de-energized. Such persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special equipment PPE and insulating tools and materials.

Guarding

Barriers or other means of guarding shall be provided to ensure that workspace for electrical equipment is not used for passageways during the time energized parts are exposed.

Fuses

Where fuses are installed or removed with one or both terminals energized, only special tools insulated for the voltage shall be used.

Approach distances

Approach distances are the minimum distance that a person and the longest conductive object he or she may contact cannot come in contact with. Approach distances for overhead electrical lines are determined by the voltage of the lines and the qualifications of the persons working near the lines. Approach distances for unqualified persons are:

- For voltages to ground of 50 kV and below - 10 feet
- For voltages to ground over 50 kV - 10 feet plus 4 inches for every 10 kV over 50 kV.
- For qualified persons the following approach distances are required:

Overhead Power line Clearances

Voltage Level	Clearance Distance
For voltages 300V and less	Avoid Contact
For Voltages over 300V but not over 750V	1 ft. 0 in.
For Voltages over 750V but not over 2 kV	1 ft. 6 in.
For Voltages over 2 kV but not over 15 kV	2 ft. 0 in.
For Voltages over 15 kV but not over 37 kV	3 ft. 0 in.
For Voltages over 37 kV but not over 87. 5 kV	3 ft. 6 in.
For Voltages over 87. 5 kV but not over 121 kV	4 ft. 0 in
For Voltages over 121 kV but not over 140 kV	4 ft. 6 in.

Working near overhead lines

Any vehicle or mechanical equipment capable of having parts of its structure elevated near overhead lines shall maintain a minimum working clearance of 10 feet. If the lines operate at a voltage to ground above 50 kV, the distance shall be increased 4 inches for every 10 kV over that voltage. If insulating barriers are installed to prevent contact with the lines, the clearances may be reduced to a distance which is within the working dimensions of the barrier, if the barriers are rated for voltage of the line and the barriers are not part of or an attachment to the vehicle or raised structure.

Flexible cords

Flexible cords connected to equipment shall not be used for raising or lowering the equipment. Extension cords shall not be fastened with staples, hung from nails, or suspended by wire.

Re-energizing circuits

After a circuit is de-energized by a circuit protective device, the circuit may not be manually re-energized until it has been determined that the equipment and circuit can be safely energized.

Illumination

Employees may not enter spaces containing exposed energized parts unless illumination is provided, which permits the employee to work safely.

Confined or enclosed space

Where employees work in a confined or enclosed space, such as a manhole that contains exposed energized parts, the employer shall provide and the employee shall use protective shields, protective barriers, or insulating material as necessary to avoid inadvertent contact with these parts.

Portable ladders

Portable ladders shall have non conductive side rails if they are used where the employee or the ladder could contact exposed energized parts.

Conductive articles

Conductive articles, such as jewelry and clothing, shall not be worn if they might contact exposed energized parts. Such articles may be worn if they are rendered nonconductive by covering, wrapping or other insulating means. This practice is not recommended.

Lockout Tagout

General

When employees are exposed to contact with parts of fixed electric equipment or circuits which have been de-energized, the circuits shall be locked or tagged.

Tagging

Controls that are to be deactivated during the course of work on energized equipment or circuits shall be tagged.

Disconnecting circuits

The circuits and equipment to be worked on shall be disconnected from all electric energy sources. Control circuit devices, such as pushbuttons selector switches, and interlocks may not be used as the sole means for de-energizing circuits or equipment.

Stored energy

Stored electrical energy which might endanger personnel shall be released. Capacitors shall be discharged and high-capacitance elements shall be short-circuited and grounded if the energy might endanger personnel.

Rendered inoperative

Circuits shall be rendered inoperative and a tag placed at each point where the equipment or circuit could be energized. The best way to accomplish this is to use a lock and tag on each disconnecting means used to de-energize the equipment and circuits to be worked on. The lock shall prevent the operation of the disconnecting means unless undue force or tools are used. The tags shall contain a statement prohibiting operation of the disconnecting means and removal of the tag.

Tags only

Tags can only be applied if the equipment is not capable of being locked out or if the employer can demonstrate that the tagging procedure will be at least as effective as the use of a lock. When tags are used without locks, at least one additional safety measure, such as opening an extra disconnecting switch, must be taken to assure a level of safety, which is equivalent to that of the locks.

Operating equipment

Prior to beginning work on circuits or equipment that have been tagged or locked out; a qualified person shall operate the equipment operating controls to verify that the equipment is definitely de-energized. In addition a qualified person shall use test

equipment to test the circuit elements and electrical parts to which the employees will be exposed to verify that the equipment is definitely de-energized.

Re-energizing equipment

When equipment that has been locked or tagged out is ready to be reenergized, a qualified person shall conduct tests and visual inspections to verify that all tools, equipment, electrical jumpers or grounds have been removed and the equipment or circuits can be safely re-energized.

Removal of a lock or tag

Tag or lock removal shall only be done by the employee who applied it. If that employee is absent from the workplace, the tag or lock can be removed only after the employer ensures that the employee who applied the tag or lock is not at the jobsite. The employee is aware that the lock or tag has been removed before he or she resumes work, and there is a visual determination that all employees are clear of the circuits and equipment.

Safety-Related Maintenance and Environmental Considerations

Equipment considerations

The employer shall ensure that all wiring and equipment in hazardous locations shall be maintained in a dust-tight, dust-ignition proof, or explosion-proof condition, as appropriate.

Environmental considerations

Unless identified for the use in the operating environment, no conductors or equipment shall be installed in damp or wet locations that are exposed to gases, fumes, vapors, which may have a deteriorating effect or excessive temperature.

Metal raceways, cable armor, boxes, cable sheathing, cabinets, elbows couplings, fittings, supports and support hardware shall be constructed of materials that are appropriate for the environment in which they are to be installed.

Safety Requirements for Special Equipment

Unsealed batteries shall be located in enclosures with outside vents or in well ventilated rooms and shall be arranged so as to prevent the escape of fumes, gases, or electrolyte spray into other areas.

10.A: Chapter 9 Review Questions

Complete as directed.

Fill in the Blanks:

1. The approach distance, for unqualified persons, for circuits operating at 50 kV and below is_____ft.

2. _____ or other means of guarding shall be provided to ensure that workspace for electrical equipment is not used for passageways during the time energized parts are exposed.

3. The requirements for electrical safety are contained in Subpart_____ of the Construction Standards and Subpart _____of the General Industry Standards.

4. Portable ladders shall have_____ side rails if they are used where the employee or the ladder could contact exposed energized parts.

5. No conductors or equipment shall be installed in a wet or damp location, where exposed to gases, fumes, or vapors that may have deteriorating effect, or where exposed to excessive temperature unless it is_____for such conditions.

Multiple Choice:

6. When GFCI protection is used, it can be accomplished by the use of which of the following:

a. _____ Individual GFCI type receptacles.

b. _____ Receptacles fed through other GFCI type receptacles.

c. _____ Receptacles protected with a GFCI type circuit breakers.

d. _____ Cords sets incorporating listed GFCI protection.

e. _____ Any of the above.

True or False: (Circle the Correct Answer)

7. T or F

Electrical shock is one of the four leading causes of death in the construction industry with electrocutions accounting for 17% of the worker fatalities.

8. T or F

Flexible cords connected to equipment shall not be used for raising or lowering the equipment.

9. T or F

Tags are permitted in lieu of lockout, only if the equipment is not capable of being locked out or if the employer can demonstrate that the tagging procedure will be as effective as the use of the lock.

10. T or F

Control circuit devices, such as pushbutton selector switches, may be used as the sole means for de-energizing circuits or equipment.

CHAPTER OVERVIEW

11: Scaffold Safety

> *"At the end of the day, the goals are simple: safety and security." – Jodi Rell*

Overview

Scaffolds are temporary structures used to support a work crew and materials to aid in the construction, maintenance and repair of buildings, bridges and all other man-made structures. Scaffolds are widely used on site to get access to heights and areas that would be otherwise difficult to reach. One of the primary differences between a scaffold system and ladders is that the scaffold allows for focused (performance work) attention to a task with both hands on the task, with materials readily accessible. Ladders typically used for access restrict a workers ability to work with some fall risk with both hands on the task.

There are many types of scaffolds and there is archeological evidence showing scaffolds were used in antiquity i.e. Great Wall of China. There are five main types of scaffolding used worldwide today. These are tube and coupler (fitting) components, prefabricated modular systems, H-frame / facade modular system scaffolds, timber scaffolds and bamboo scaffolds (particularly in China and India).

No matter the type of scaffold, proper construction by competent and trained individuals is paramount. Scaffolds are engineered structures and safety equipment and must meet safety standards for construction and use.

Chapter Objective:

1. Determine the Proper Type of Scaffolding for the Job.
2. Identify the purpose of Guardrails, Toeboards, Braces, Planks Platforms and Cleats.
3. Understand the Requirements of Subpart L- Scaffolding.
4. Understand the Application of OSHA Requirements for Scaffolding on Construction Sites.

Learning Outcome:

1. Identify safety protocols for accessing a scaffold.
2. Describe the role of the scaffold competent person.

Standards: 1926 Subpart l-Scaffolds, 1910 Subpart D Walking-Working Surfaces, 1910 Subpart F Powered Platforms, Man lifts, Vehicle-Mounted Work Platforms

Key Terms:

banding, cross-bracing, competent person, platform, registered professional engineer, suspension

Mini-Lecture: Scaffold Safety

Topic Required Time: 1 hrs; Independent Study and reflection 3/4 hour.

11.1: Introduction to Scaffold Safety

Introduction

Construction workers are often required to climb and work on scaffolding. Many times, workers are required to construct the scaffolding they are going to work on while in other areas the scaffolding will be constructed for them. Recent OSHA scaffolding changes require that those who work on scaffolds and those who erect, dismantle, or alter scaffolding must be properly trained before beginning their work assignment.

General Requirements

Applicability

Subpart L applies to all scaffolds used in workplaces. It does not apply to crane or derrick suspended personnel platforms, which are covered by 1926.550(g). In addition, the criteria for aerial lifts are set out exclusively in 1926.453.

Load requirements

In general, each scaffold and scaffold component shall be capable of supporting, without failure, its own weight and at least 4 times the maximum intended load applied or transmitted to it. Scaffolds shall be designed by a qualified person and shall be constructed and loaded in accordance with that design.

Planking or Decking

Each platform on all working levels of scaffolds shall be fully planked or decked between the front uprights and the guardrail supports as follows:

1. Each platform unit (e.g., scaffold plank, fabricated plank, fabricated deck, or fabricated platform) shall be installed so that the space between adjacent units and the space between the platform and the uprights is no more than one inch wide, except where the employer can demonstrate that a wider space is necessary (for example, to fit around uprights when side brackets are used to extend the width of the platform).Where the employer makes such a demonstration, the platform shall be planked or decked as fully as possible and the remaining open space between the platform and the uprights shall not exceed nine inches.
2. The requirement to provide full planking or decking does not apply to platforms used solely as walkways or solely by employees performing scaffold erection or dismantling. In these situations, only the planking that the employer establishes is necessary to provide safe working conditions is required.

Platform and Walkway Width

In general, each scaffold platform and walkway shall be at least 18 inches wide. However, ladder jack scaffold, top plate bracket scaffold roof bracket scaffold, and pump jack scaffold shall be at least 12 inches wide. Where scaffolds must be used in areas that the employer can demonstrate are so narrow that platforms and walkways cannot be at least 18 inches wide, such platforms and walkways shall be as wide as feasible, and employees on those platforms and walkways shall be protected from fall hazards by the use of guardrails and/or personal fall arrest systems.

Platform requirements

The front edge of all platforms shall not be more than 14 inches from the face of the work, unless guardrail systems are erected along the front edge and/or personal fall arrest systems are used. Each end of a platform, unless cleated or otherwise restrained by hooks or equivalent means, shall extend over the centerline of its support at least 6 inches.

Each end of a platform 10 feet or less in length shall not extend over its support more than 12 inches unless the platform is designed and installed so that the cantilevered portion of the platform is able to support employees and/or materials without tipping, or has guardrails which block employee access to the cantilevered end.

Each platform greater than 10 feet in length shall not extend over its support more than 18 inches unless it is designed and installed so that the cantilevered portion of the platform is able to support employees without tipping, or has guardrails which block employee access to the cantilevered end.

On scaffolds where scaffold planks are abutted to create a long platform, each abutted end shall rest on a separate support surface. This provision does not preclude the use of common support members such as "T" sections, to support abutting planks, or hook on platforms designed to rest on common supports. On scaffolds where platforms are overlapped to create a long platform, the overlap

shall occur only over supports, and shall not be less than 12 inches unless the platforms are nailed together or otherwise restrained to prevent movement.

At all points of a scaffold where the platform changes direction, such as turning a corner, any platform that rests on a bearer at an angle other than a right angle shall be laid first, and platforms which rest at right angles over the same bearer shall be laid second, on top of the first platform.

Platform finishes

Wood platforms shall not be covered with opaque finishes, except that platform edges may be covered or marked for identification. Platforms may be coated periodically with wood preservatives, fire-retardant finishes, and slip-resistant finishes; however, the coating may not obscure the top or bottom wood.

Component compatibility

Scaffold components manufactured by different manufacturers shall not be intermixed unless the components fit together without force and the scaffold's structural integrity is maintained by the user.

Scaffold Access for all Employees

Means of Access

When scaffold platforms are more than 2 feet above or below a point of access, portable ladders, hook-on ladders, attachable ladders, stair towers (scaffold stairways/towers), stairway-type ladders (such as ladder stands), ramps, walkways, integral prefabricated scaffold access or direct access from another scaffold, structure, personnel hoist, or similar surface shall be used. Cross braces shall not be used as a means of access.

Positioning

Hook-on and attachable ladders shall be positioned so that their bottom rung is not more than 24 inches above the scaffold supporting level. When hook-on and attachable ladders are used on a supported scaffold more than 35 feet high, they shall have rest platforms at 35 foot maximum vertical intervals.

Effective Date

Effective September 1997, employees erecting or dismantling supported scaffolds shall be provided with a safe means of access where the provision of safe access is feasible and does not create a greater hazard. The employer shall have a competent person determine whether it is feasible or would pose a greater hazard to provide, and have employees use a safe means of access. This determination shall be based on site conditions and the type of scaffold being erected or dismantled. Hook-on or attachable ladders shall be installed as soon as scaffold erection has progressed to a point that permits safe installation and use.

End Frames

When erecting or dismantling tubular welded frame scaffolds, (end) frames, with horizontal members that are parallel, level and are not more than 22 inches apart vertically may be used as climbing devices for access, provided they are erected in a manner that creates a usable ladder and provides good handhold and foot space. Cross braces on tubular welded frame scaffolds shall not be used as a means of access or egress.

Visible Defects

Scaffolds and scaffold components shall be inspected for visible defects by a competent person before each work shift, and after any occurrence, which could affect a scaffold's structural integrity. Any part of a scaffold damaged or weakened such that its strength is significantly weakened shall be immediately repaired or replaced, braced, or removed from service until repaired.

Moving

Scaffolds shall not be moved horizontally while employees are on them unless they have been designed by a registered professional engineer specifically for such movement or, for mobile scaffolds, where the provisions of 1926.452(w) are followed.

Clearance

Scaffolds shall not be erected, used, dismantled, altered, or moved such that they or any conductive material handled on them might come closer to exposed and energized power lines as follows:

Insulated Lines

Overhead Power line Clearances

Voltage	Minimum Distance	Alternatives
Less than 300V	3 ft (0.9m)	**********
*300 Volts to 50kV	10 ft (3.1m)	**********
More than 50kV	10 ft (3.1m) plus 0.4 inches (1.0cm) for each 1kv over 50kV	2 times the length of the line insulator, but never less than 10ft (3.1 m)

Uninsulated Lines

Overhead Power line Clearances

Voltage	Minimum Distance	Alternatives
Less than 50kV	10 ft (3.1 m)	**********
More than 50kV	10 ft (3.1 m) plus 0.4 inches (1.0 cm) for each 1kv over 50kV	2 times the length of the line insulator, but never less than 10ft (3.1 m)

Note

Scaffolds and materials may be closer to power lines than specified above where such clearance is necessary for performance of work, and only after the utility company, or electrical system operator, has been notified of the need to work closer and the utility company, or electrical system operator has **de-energized** the lines, **relocated** the lines, or **installed protective coverings** to prevent accidental contact with the lines.

Moving, dismantling, or altering

Scaffolds shall be erected, moved, dismantled, or altered only under the supervision and direction of a competent person qualified in scaffold erection, moving, dismantling or alteration. Such activities shall be performed only by experienced and trained employees selected for such work by the competent person.

Slipping hazards

Employees shall be prohibited from working on scaffolds covered with snow, ice, or other slippery material except as necessary for removal of such materials.

Inclement Weather

Work on or from scaffolds is prohibited during storms or high winds unless a competent person has determined that it is safe for employees to be on the scaffold and those employees are protected by a personal fall arrest system or wind screens. Wind screens shall not be used unless the scaffold is secured against the anticipated wind forces imposed.

Work level height

Makeshift devices, such as, but not limited to, boxes and barrels, shall not be used on top of scaffold platforms to increase the working level height of employees. Ladders shall not be used on scaffolds to increase the working level height of employees, except on large area scaffolds.

Note

"Large area scaffold" means a pole scaffold, tube and coupler scaffold, systems scaffold, or fabricated frame scaffold erected over substantially the entire work area.

For example: a scaffold erected over the entire floor area of a room.

11.2: Scaffold Fall Protection

Scaffold Fall Protection

General

In general, each employee on a scaffold more than 10 feet above a lower level shall be protected from falling to the lower level. The types of fall protection to be provided to the employees depend on the type of scaffold used. The fall protection requirements for employees installing suspension scaffold support systems on floors, roofs, and other elevated surfaces are set forth in Subpart M.

Effective Date

Effective September 1997, the employer shall have a competent person determine the feasibility and safety of providing fall protection for employees erecting or dismantling supported scaffolds. Employers are required to provide fall protection for employees erecting or dismantling supported scaffolds where the installation and use of such protection is feasible and does not create a greater hazard.

Personal Fall Arrest Systems

In addition to meeting the requirements of 1926.502(d), personal fall arrest systems used on scaffolds shall be attached by lanyard to a vertical lifeline, horizontal lifeline, or scaffold structural member. Vertical lifelines shall not be used when overhead components, such as overhead protection or additional platform levels, are part of a single-point or two-point adjustable suspension scaffold.

Guardrail Systems

Guardrail systems installed to meet the requirements of this section shall comply with the following provisions:

1. Guardrail systems shall be installed along all open sides and ends of platforms. Guardrail systems shall be installed before the scaffold is released for use by employees other than erection/dismantling crews.
2. The top edge height of Toprails or equivalent member on supported scaffolds manufactured or placed in service after January, 2000 shall be installed between 38 inches and 45 inches above the platform surface. The top edge height on supported scaffolds manufactured and placed in service before January 2000, and on all suspended scaffolds where both a guardrail and a personal fall arrest system are required shall be between 36 inches and 45 inches. When conditions warrant, the height of the top edge may exceed the 45 inch height, provided the guardrail system meets all other criteria.
3. When Midrails, screens, mesh, intermediate vertical members solid panels, or equivalent structural members are used, they shall be installed between the top edge of the guardrail system and the scaffold platform.
4. When Midrails are used, they shall be installed at a height approximately midway between the top edge of the guardrail system and the platform surface.
5. When screens and mesh are used, they shall extend from the top edge of the guardrail system to the scaffold platform, and along the entire opening between the supports.
6. When intermediate members (such as balusters or additional rails) are used, they shall not be more than 19 inches apart.
7. Each top rail or equivalent member of a guardrail system shall be capable of withstanding, without failure, a force applied in any downward or horizontal direction at any point along its top edge of at least 100 pounds for guardrail systems installed on single-point adjustable suspension scaffolds or two-point adjustable suspension scaffolds, and at least 200 pounds for guardrail systems installed on all other scaffolds.
8. Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members of a guardrail system shall be capable of withstanding, without failure, a force applied in any downward or horizontal direction at any point along the mid rail or other member of at least 75 pounds for guardrail systems with a minimum 100 pound Toprail capacity, and at least 150 pounds for guardrail systems with a minimum 200 pound Toprail capacity.
9. Guardrails shall be surfaced to prevent injury to an employee from punctures or lacerations, and to prevent snagging of clothing.
10. The ends of all rails shall not overhang the terminal posts except when such overhang does not constitute a projection hazard to employees.
11. Steel or plastic banding shall not be used as a Toprail or Midrail.

12. Manila or plastic (or other synthetic) rope being used for Toprails or Midrails shall be inspected by a competent person as frequently as necessary to ensure that it continues to meet the necessary strength requirements.
13. Crossbracing is acceptable in place of a Midrail when the crossing point of two braces is between 20 inches and 30 inches above the work platform or as a Toprail when the crossing point of two braces is between 38 inches and 48 inches above the work platform. The end points at each upright shall be no more than 48 inches apart.

Falling object protection

In addition to wearing hard hats each employee on a scaffold shall be provided with additional protection from falling hand tools, debris, and other small objects through the installation of toeboards, screens, or guardrail systems, or through the erection of debris nets, catch platforms, or canopy structures that contain or deflect the falling objects. When the falling objects are too large, heavy or massive to be contained or deflected by any of the above-listed measures, the employer shall place such potential falling objects away from the edge of the surface from which they could fall and shall secure those materials as necessary to prevent their falling.

Falling object provisions

Where there is a danger of tools, materials, or equipment falling from a scaffold and striking employees below, the following provisions apply:

1. The area below the scaffold to which objects can fall shall be barricaded, and employees shall not be permitted to enter the hazard area; or
2. A toeboard shall be erected along the edge of platforms more than 10 feet above lower levels for a distance sufficient to protect employees below, except on float (ship) scaffolds where an edging of 3/4 x 1-1/2 inch wood or equivalent may be used in lieu of toeboards;
3. Where tools, materials, or equipment are piled to a height higher than the top edge of the toeboard, paneling or screening extending from the toeboard or platform to the top of the guardrail shall be erected for a distance sufficient to protect employees below; or
4. A guardrail system shall be installed with openings small enough to prevent passage of potential falling objects; or
5. A canopy structure, debris net, or catch platform strong enough to withstand the impact forces of the potential falling objects shall be erected over the employees below.

Toeboards

Where used, toeboards shall be:

1. Capable of withstanding, without failure, a force of at least 50 pounds applied in any downward or horizontal direction at any point along the toeboard; and
2. At least three and one-half inches high from the top edge of the toeboard to the level of the walking/working surface. Toeboards shall be securely fastened in place at the outermost edge of the platform and have not more than 1/4 inch clearance above the walking/working surface. Toeboards shall be solid or with openings not over one inch in the greatest dimension.

Fabricated Frame Scaffolds (Tubular Welded Frame Scaffolds)

Moving Platforms

When moving platforms to the next level, the existing platform shall be left undisturbed until the new end frames have been set in place and braced, prior to receiving the new platforms.

Securing

Frames and panels shall be braced by cross, horizontal, or diagonal braces, or combination thereof, which secure vertical members together laterally. The cross braces shall be of such length as will automatically square and align vertical members so that the erected scaffold is always plumb, level, and square. All brace connections shall be secured. Frames and panels shall be joined together vertically by coupling or stacking pins or equivalent means.

Where uplift can occur which would displace scaffold end frames or panels, the frames or panels shall be locked together vertically by pins or equivalent means. Scaffolds over 125 feet (38. 0 m) in height above their base plates shall be designed by a registered professional engineer, and shall be constructed and loaded in accordance with such design.

11.3: Aerial Lifts

Aerial Lifts

Types

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

- Extendable boom platforms
- Aerial ladders
- Articulating boom platforms
- Vertical towers
- A combination of any such devices.

Employee positioning

Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position.

Restraint Systems

Belting off to an adjacent pole, structure, or equipment while working from an aerial lift shall not be permitted. A body belt shall be worn and a lanyard attached to the boom or basket when working from an aerial lift. Note: As of January, 1998, subpart M of this part (1926.502(d)) provides that body belts are not acceptable as part of a personal fall arrest system. The use of a body belt in a tethering system or in a restraint system is acceptable and is regulated under 1926.502(e).

Load Capacity

Boom and basket load limits specified by the manufacturer shall not be exceeded. An aerial lift truck shall not be moved when the boom is elevated in a working position with men in the basket, except for equipment which is specifically designed for this type of operation.

Controls

Articulating boom and extensible boom platforms, primarily designed as personnel carriers, shall have both platform (upper) and lower controls. Upper controls shall be in or beside the platform within easy reach of the operator. Lower controls shall provide for overriding the upper controls. Controls shall be plainly marked as to their function. Lower level controls shall not be operated unless permission has been obtained from the employee in the lift, except in case of emergency.

Training Requirements

Hazard training

The employer shall have each employee who performs work while on a scaffold trained by a person qualified in the subject matter to recognize the hazards associated with the type of scaffold being used and to understand the procedures to control or minimize those hazards.

The training shall include the following areas, as applicable:

1. The nature of any electrical hazards, fall hazards and falling object hazards in the work area;
2. The correct procedures for dealing with electrical hazards and for erecting, maintaining, and disassembling the fall protection systems and falling object protection systems being used;
3. The proper use of the scaffold, and the proper handling of materials on the scaffold;
4. The maximum intended load and the load-carrying capacities of the scaffolds used; and
5. Any other pertinent requirements of this subpart.

Training Topics

The employer shall have each employee who is involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold trained by a competent person to recognize any hazards associated with the work in question. The training shall include the following topics, as applicable:

1. The nature of scaffold hazards;

2. The correct procedures for erecting, disassembling, moving, operating, repairing, inspecting, and maintaining the type of scaffold in question;
3. The design criteria, maximum intended load-carrying capacity and intended use of the scaffold;
4. Any other pertinent requirements of this subpart.

Retraining

When the employer has reason to believe that an employee lacks the skill or understanding needed for safe work involving the erection, use or dismantling of scaffolds, the employer shall retrain each such employee so that the requisite proficiency is regained.

11.A: Review Questions

Complete as directed.

Fill in the Blanks:

1. In general, each scaffold and scaffold component shall be capable supporting, without failure, its own weight and at least times the maximum intended load applied or transmitted to it.
2. In general, each platform on all working levels of scaffolds shall be or decked between the front uprights in the guardrail supports.
3. The front edge of all platforms shall not be more than _____ inches from the face of the work, unless guardrail systems are erected along the front edge and/or personal fall arrest systems are used.
4. Each platform greater than 10 feet in length shall not extend over its support more than _____inches, unless it is designed and installed so that the cantilevered portion of the platform is able to support employees without tipping, or has guardrails which block employee access to the cantilevered end.
5. Scaffold components manufactured by different manufactures shall not be_____ unless the components fit together without force and the scaffold's structural integrity is maintained by the user.
6. Guardrail systems shall be capable of withstanding, without failure, a force of at least_____ pounds (890 N) applied within_____inches (5.1 cm) of the top edge, in any outward or downward direction, at any point along the top edge.
7. Cross braces on tubular Weldon frame scaffold_____ be used as a means of access or egress.
8. Only _____person(s) shall operate an aerial lift.
9. In addition to wearing_____ each employee on a scaffold shall be provided with additional protection from falling hand tools, debris, and other small objects through the installation of toeboards, screens, or guardrail systems, or through the erection of debris nets, catch platforms, or canopy structures that contain or deflect the falling objects.
10. Scaffolds shall be erected, moved, dismantled, or altered only under the supervision and direction of a_____ qualified in scaffold erection, moving, dismantling or alteration. Such activity shall be performed only by experienced and trained employees selected for such work by the competent person.

CHAPTER OVERVIEW

12: Fall Protection

> *"Do not think because an accident hasn't happened to you that it can't happen." – Safety saying, early 1900's*

Overview

Slips, trips, and Falls account for 20% of all accidents, injuries, and fatalities in the workplace and up to 37% in construction environments. There is probably no one who has escaped a stumble, slip, or trip whether at work or play. Walking and working surfaces must be in conditions that do not contribute to falls. Elevated working surfaces which include rooftops, scaffolds, elevated platforms, and even ladders must meet the same standards for cleanliness, evenness, and capacity.

The first duty is to prevent a fall from occurring at all. The discussion that follows focuses on protecting workers if a fall should occur and describing the options for managing fall hazards.

Chapter Objective:

1. Understand the Purpose of Fall Protection.
2. Determine the Proper use of Floor Coverings to Prevent Falls.
3. Be Aware of when Fall Protection is required.
4. Apply the Provisions of the Fall Protection Standard.
5. Discuss the Various Systems and Practices for Meeting the Fall Protection Standard.

Learning Outcome:

1. Apply the hierarchy of controls to fall prevention methods.
2. Describe the requirements for training and certification under Subpart M.

Standards: 1926 Subpart M-Fall Protection, 1910 Subpart D Walking-Working Surfaces, 1910 Subpart F Powered Platforms, Man lifts, Vehicle-Mounted Work Platforms

Key Terms:

Anchorage, Controlled Access Zones, Fall positioning device, Leading Edge, PFA

Mini-Lecture: Fall Hazards, Fall Protection

Topic Required Time: 2 hrs; Independent Study and reflection 1 3/4 hour.

12.1: Introduction to Fall Protection

Introduction

Falls are the leading cause of worker fatalities in all industries but especially in the construction industry. OSHA's Fall Protection standard became effective on February 1995. The major parts of the Fall Protection standard are; Scope & Application, Duty to have Fall Protection, Fall Protection System Criteria and Practices, and Training Requirements.

An employer’s responsibility is to first prevent falls from occurring at all, Maintaining work surfaces in good condition and providing physical supports for access to higher elevations and physical barriers along drop offs and leading edges is the primary method for controlling falls and preventing deaths.

Applicable Regulations

The requirements of Subpart M, Fall Protection, apply to the construction industry. The provisions of Subpart M do not apply to employees who are making an inspection, investigation, or assessment of workplace conditions either before work begins or after work has been completed. However if these efforts are focused and laborious then fall protection should be considered.

Fall Protection requirements for employees working on scaffolds are included in Subpart L. Employees working on stairways and ladders are covered by Subpart X. Requirements for employees engaged in the construction of electric transmission and distribution lines are contained in Subpart V.

Duty to Have Fall Protection

The Fall Protection standard sets up a uniform threshold height of six feet for determining when fall protection is required. The following activities require fall protection:

1. Leading Edges - Where employees are constructing a leading edge six feet or more above lower levels.
2. Walking/Working surfaces - Locations six feet or more above a lower level where the leading edge is under construction but the employee is not engaged in the leading edge work.
3. Hoist Areas - Employees working in a hoist area six feet or more above a lower level.
4. Holes - Employees shall be protected against falls through holes, including skylights, more than six feet above a lower level.
5. Form work and Reinforcing Steel - Employees on the face of formwork or reinforcing steel where the height is six feet or more above lower levels.
6. Ramps & Runways - Employees working on ramps or runways more than six feet above a lower level.
7. Excavations - Employees on the edge of an excavation six feet or more in depth.
8. Dangerous Equipment - Employees working less than six feet above dangerous equipment.
9. Overhead Bricklaying - Employees performing overhand bricklaying work more than six feet above lower levels.
10. Roofing work on low-slope roofs.
11. Steep Roofs.
12. Precast Concrete Erection.
13. Residential Construction.
14. Wall openings - Employees working on, at, above, or near wall openings where the outside bottom edge of the wall openings is six feet or more above lower levels.
15. Other walking/working surfaces not covered above.
16. Several of the activities contain an exception that permits the employees to work without fall protection when the employer can demonstrate that fall protection is infeasible or creates a greater hazard by its use.

Falling Objects

Employers must also provide protection for employees who are exposed to falling objects, Exposed employees must wear a hard hat and one of the following three measures must be implemented:

1. Use toe boards, screen, or guardrail systems to prevent the objects from falling.
2. Use a canopy structure and keep objects far enough from the edge so they cannot accidentally be pushed over the edge.
3. Use a barricade system to prevent employees from entering areas where objects may fall.

Covers

When covers are used to provide protection against holes in floors, roofs, and other working/walking surfaces, they shall meet the following criteria:

1. Covers must be secured when installed so as to prevent displacement by the wind, equipment or employees.
2. All covers shall be marked with the word "HOLE" or “COVER" or they shall be color coded to provide warning of the hazard.
3. Covers installed in roadways or aisles shall be capable of supporting, without failure, at least twice the maximum axle load of the largest vehicle expected to cross over the cover.
4. All other covers shall be capable of supporting, without failure, at least twice the weight of employees, equipment and materials that may be imposed upon the cover at any one time.

Fall Protection System Criteria and Practices Guardrail Systems

Definition

A barrier erected to prevent employees from falling to lower levels.

Requirements

Where guardrail systems are used to meet the requirement of fall protection the guardrail system shall comply with all of the following provisions:

1. The top edge of the rail height shall be 42", plus or minus three inches.
2. Midrails, screens, mesh, vertical members or equivalent shall be installed between the top edge of the rail and the working surface unless a parapet wall of at least 21" is present. If vertical members are used they must not exceed 19" center to center spacing. If mesh is used it shall extend from the top rail to the working surface.
3. Guardrails must be capable of withstanding a 200Ib. downward & outward force applied within two inches from the top rail at any point along the top edge.
4. When the 200Ib. force is applied the top rail shall not be deflected to a height of less than 39" above the working surface.
5. Midrails, screen mesh, vertical members, panels, etc., shall be capable of withstanding a 150Ib. force applied in any downward or outward direction.
6. Guardrail surfaces shall be free from any materials or rough edges that may cause punctures or lacerations or snagging of clothing.
7. The ends of the top rails and Midrails shall not overhang the terminal posts, unless the projection does not create a hazard.
8. Top rails shall not be constructed of steel or plastic banding.
9. The minimum diameter or thickness for top rails and Midrails is 1/4". If wire rope is used for the top rail it must be flagged at intervals not exceeding six feet with a high- visibility material.
10. Guardrail systems at holes shall be erected on all unprotected sides or edges of the hole.

Safety Net Systems

Definition

A system which utilizes a drop-tested net placed below the working surface to provide fall protection for employees.

Requirements

Where safety net systems are used to meet the requirement of fall protection the safety net system shall comply with all of the following provisions:

1. Safety systems must be installed as close as practicable to the working surface. In no case shall the net be installed more than 30' below such level.
2. Safety nets must be installed so that they have sufficient clearance to prevent contact with structures below.
3. Safety nets shall be drop tested at the jobsite after the initial installation and before being used as a fall protection system. Safety nets must be retested after being relocated after major repair and at six-month intervals, if in one place.
4. Drop tests shall consist of a 400Ib, bag of sand being dropped into the net from the highest surface at which employees will be working but in no case less than 42" above that level.
5. Defective nets shall not be used. Safety nets shall be inspected at least once a week for wear, damage, or other deterioration.

6. Materials, scrap pieces, equipment and tools which have fallen into the net must be removed as soon as possible and at least before the next work shift.

The maximum size of safety net openings shall not exceed 36sq. inches. Individual openings shall not exceed six inches on any side.

12.2: Personal Fall Arrest Systems

Personal Fall Arrest Systems

Definition

A system which consists of an anchorage connectors, body belt, or body harness, and may include a lanyard deceleration device, lifeline, or combination of the above, used by an employee to arrest falls.

Requirements

Where personal fall arrest systems are used to meet the requirement of fall protection the personal fall arrest system shall comply with all of the following provisions:

1. Effective January, 1998, body belts are not permitted as part of a personal fall arrest system. Body belts will be permitted for the purpose of a positioning device only.
2. Personal fall arrest systems must be inspected prior to each use for damage and wear. Defective components must be replaced.
3. D-rings and snaphooks must have a minimum tensile strength of 5,000Ibs.
4. Effective January, 1998, only locking type snaphooks shall be used. Snaphooks must be compatible with the member to which they are connected unless they are of the locking type.
5. Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000Ibs. Ropes and straps or webbing used in lanyards shall be made of synthetic fibers.
6. Anchorages used for personal fall arrest systems shall be independent of those used to support platforms. Anchorage points shall be capable of supporting at least 5,000Ibs.
7. The attachment point of the body belt must be located in the center of the wearer's back. The attachment point for a body harness shall be located in the center of the wearer's back near shoulder level or above the wearer's head.
8. Body belts, harnesses and other components of a personal fall arrest system shall not be used to hoist materials.
9. Personal fall arrest systems shall not be attached to guardrail systems.

Positioning Device System

Definition

A system which utilize a body belt or body harness rigged in a manner which permits the employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free.

Requirements

If positioning device systems are used they shall comply with all of the following provisions:

1. The total length of a worker's free fall cannot exceed two feet.
2. Position device anchorage points must be capable of supporting twice the potential impact load of an employee's fall or 3,000Ibs, whichever is greater.
3. All of the components for positioning device systems, such as, snaphooks, D-rings, etc., must meet the same criteria as those for personal fall arrest systems.
4. Positioning device systems must be inspected prior to each use for wear, damage or other deterioration.

Warning Line System

Definition

A form of 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 guardrails, safety nets, or fall arrest systems.

Requirements

If warning line systems are used, they shall comply with all of the following provisions:

1. The warning line system must be erected around all sides of the roof work area.
2. The warning lines shall be erected at least six feet from the roof edge when no mechanical equipment is being used. If mechanical equipment is being used, the warning lines must be erected at least six feet from the parallel roof edge and 10' from

the perpendicular roof edge to the direction in which the mechanical equipment operates.

3. Warning lines shall consist of ropes, wires or chains. The lines shall be installed so that its lowest point is at least 34" from the working surface and no greater than 39" from the working surface.
4. Warning lines shall be flagged at intervals not exceeding six feet with a high- visibility material.
5. Warning lines shall be supported by stanchions and attached in such a manner so 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.

Safety Monitoring Systems

Definition

A Safety Monitoring System is a safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.

Requirements

If safety monitoring systems are used they shall comply with all of the following provisions:

1. If no other fall protection system has been implemented, the employer must use a safety monitoring system. The employer shall appoint a competent person to monitor the safety of the workers.
2. The competent person must have knowledge in fall hazard recognition, and must be capable of warning workers of fall hazard dangers and in detecting unsafe work practices.
3. The competent person must operate from the same working surface on which the employees work so he/she can be seen.
4. The competent person has to be close enough to the workers that he/she can communicate orally with the workers. The competent person can have no other duties which distract from the monitoring function.
5. Mechanical equipment shall not be used or stored in areas where safety monitor systems are being used to monitor employees engaged in roofing operations.

12.3: Controlling access

Controlled Access Zones

Definition

A Controlled Access Zone is an area in which certain work, such as overhead bricklaying, may take place without the use of a guardrail system, personal fall arrest system or safety net system. The access to the area where the work is performed is strictly controlled.

Requirements

If controlled access zones are used they must meet all of the following conditions:

1. When a controlled access zone is in place the area must be defined by control lines or any other means to restrict access.
2. Control lines shall consist of ropes, wires, tapes, or the equivalent.
3. Each control line must be marked at six feet intervals with a high visibility material.

Training

Requirements

Employers must provide fall protection training for every employee who might be exposed to fall hazards. The training must include recognition of fall hazards and steps to minimize the hazards. The following areas must be covered in the fall protection training:

1. The nature of fall hazards in the work area.
2. The correct procedures for installing, maintaining, disassembling and inspecting fall protection systems.
3. The use and operation of controlled access zones and guardrail, personal fall arrest, safety net, warning line and safety monitoring systems.
4. The role of each employee in a safety monitoring system.
5. The limitations of mechanical equipment used during the performance of roofing work.
6. The correct procedures for equipment and material handling and storage and the erection of overhead protection.
7. The employee's role in fall protection plans.

12.A: Review Questions

Complete as directed.

Fill in the Blanks:

1. Employees working along, at, above or near wall openings where the outside bottom edge of the wall openings is feet or more above lower levels must have fall protection provided.
2. The Fall Protection Standard sets up a uniform threshold of _____ feet for determining when fall protection is required.
3. The top height of the guardrail shall be_____inches, plus or as a minus 3 inches.
4. Safety net systems must be installed as close as practical to the working surface and in no case more than _____ feet below such level.
5. Where no mechanical equipment is being used, warning lines must be located at least_____ feet from the roof edge.
6. Guardrails must be capable the standing a _____ pound downward force applied within _____inches of the top rail at any point along the top edge.
7. Covers for floor openings must be marked with the word _____or _____or shall be color-coded to provide warning of the hazard.
8. The attachment point for a body harness, used for fall protection, shall be located where?

True or False: (Circle the Correct Answer)

1. Several types of activities covered by the standard can be performed without fall protection provided the employer can demonstrate the fall protection is infeasible or creates a great hazard by its use. T or F
2. If no other fall protection system has been implemented the employer must have a safety monitoring system. T of F

CHAPTER OVERVIEW

13: Crane and Hoists Safety

> *"You don't need to know the whole alphabet of Safety. The A, B, C of it will save you if you follow it: Always Be Careful." – Colorado School of Mines Magazine*

Overview

Cranes and hoists continue the discussion on materials handling. As equipment goes, they are the heavy lifters and very versatile. Cranes are typically used to lift loads that are critical for some important application, expensive, and needing to be placed in unique or hard to reach locations. Hoists like cranes can be mobile or fixed. There are hoists that lift people although mostly today they are often referred to as aerial or man lifts.

Much of the focus on crane safety targets equipment inspection and maintenance. Crane operators must also be qualified having received extensive training and certification of competency. Crane operators are competent persons. Together the material rigger and crane operator bear the ultimate responsibility for a safe lift.

Lastly, a special type of crane, the derrick, is often associated with oil drilling on land and in the ocean. They typically resemble a tripod with the lift or hoist mechanism in the center of the equipment. Many of the standards discussed in this chapter apply to both crane and derrick although the focus will be on cranes in construction environments.

Chapter Objective:

1. Identify the acceptable approach distances for cranes and derricks working in the vicinity of electrical transmission and distribution.
2. Review the requirements for the hoisting of personnel platforms from cranes or derricks.
3. Discuss the various systems and practices that ensure crane, hoist, and aerial lift safety.

Learning Outcome:

1. Describe the proper implementation of safety requirements for cranes and derricks under 1926.550
2. Describe conformance requirements of Subpart N for aerial lifts used to elevate personnel to jobsites above-ground.
3. Summarize the major safety concerns for material and personnel hoists and jobsite elevators.

Standards: 1926 Subpart CC-Cranes and Derricks in Construction, 1926 Subpart N Helicopters, Hoists, Elevators, and Conveyors, 1910 Subpart F Powered Platforms, Man lifts, Vehicle-Mounted Work Platforms, 1910 Subpart N Materials Handling and Storage

Key Terms:

Clearance, gauge, proof test, sling, tag line

Mini-Lecture: Crane Safety

Topic Required Time: 2 hrs; Independent Study and reflection 1 3/4 hour.

13.1: Introduction to Cranes and Hoists

Cranes in Construction

The use of cranes on construction sites is becoming more and more prevalent. All types and sizes of cranes are constructed today to meet the many different needs of the construction industry. Overall, these cranes have an excellent safety record on the job. Unfortunately, due to the nature of the work they perform, when there is an accident, fatalities often occur and the extent and cost of the damage to the equipment and the construction site can be extensive. The purpose of this discussion will be to review some basics of crane safety that can help personnel at construction sites determine what hazards could exist as a result of the use of the crane. It is not the intent of this review to prepare anyone to perform inspections of cranes to determine their working condition. That task can take years of experience and should only be performed by competent persons who have been properly trained.

Applicable Regulations

Subpart N, contains seven separate standards related to the use of cranes, derricks, hoists, elevators and conveyors. The standards which are most closely related to construction work will be covered in this lesson.

Cranes and Derricks - General Provisions

Specifications and limitations

The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded. Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer.

Rated capacities

Rated load capacities, and recommended operating speeds, special hazard warnings or instructions, shall be conspicuously posted on all equipment. Instructions or warnings shall be visible to the operator while he is at his control station.

Hand Signals

Hand signals to crane and derrick operators shall be those prescribed by the applicable ANSI standard for the type of crane in use. An illustration of the signals shall be posted at the job site.

Inspection of machinery

The employer shall designate a competent person who shall inspect all machinery and equipment prior to each use, and during use, to make sure it is in safe operating condition. Any deficiencies shall be repaired, or defective parts replaced, before continued use. A thorough annual inspection of the hoisting machinery shall be made by a competent person, or by a government or private agency recognized by the U. S. Department of Labor. The employer shall maintain a record of the dates and results of inspections for each hoisting machine and piece of equipment.

Guarding

Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or other moving parts or equipment shall be guarded if such parts are exposed to contact by employees, or otherwise create a hazard.

Swing Radius

Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted shall be barricaded in such a manner as to prevent an employee from being struck or crushed by the crane.

Equipment exhaust

Whenever internal combustion engine powered equipment emits exhausts in enclosed spaces, tests shall be made and recorded to see that employees are not exposed to unsafe concentrations of toxic gases or oxygen deficient atmospheres.

Fire Protection

An accessible fire extinguisher of 5BC rating, or higher, shall be available at all operator stations or cabs of equipment. All employees shall be kept clear of loads about to be lifted and of suspended loads.

Cranes and Derricks - Working Clearances

Working in proximity to energized electrical lines

Except where electrical distribution and transmission lines have been de-energized and visibly grounded at point of work or where insulating barriers, and are not a part of or an attachment to the equipment or machinery, and have been erected to prevent physical contact with the lines, equipment or machines shall be operated proximate to power lines only in accordance with the following:

1. For lines rated 50kV or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet.
2. For lines rated over 50kV, minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1kV over 50kV, or twice the length of the line insulator, but never less than 10 feet.
3. In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50kV, and 10 feet for voltages over 50kV, up to and including 345kV, and 16 feet for voltages up to and including 750kV.

Designated person

A person shall be designated to observe clearance of the equipment and give timely warning for all operations when it is difficult for the operator to maintain the desired clearance by visual means. Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not alter the requirements of any other regulation of this part even if such device is required by law or regulation.

Overhead Wire

Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.

Transmitter Towers

Prior to work near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter shall be de-energized or tests shall be made to determine if electrical charge is induced on the crane. The following precautions shall be taken when necessary to dissipate induced voltages:

1. The equipment shall be provided with an electrical ground directly to the upper rotating structure supporting the boom; and
2. Ground jumper cables shall be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Crews shall be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load.
3. Combustible and flammable materials shall be removed from the immediate area prior to operations.

Equipment modifications

No modifications or additions, which affect the capacity or safe operation of the equipment, shall be made by the employer without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags or decals, shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

Crane or Derrick Suspended Personnel Platforms

General requirements

The use of a crane or derrick to hoist employees on a personnel platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous, or is not possible because of structural design or worksite conditions.

Hoisting of personnel

Hoisting of the personnel platform shall be performed in a slow, controlled cautious manner with no sudden movements of the crane or derrick, or the platform.

Load lines

Load lines shall be capable of supporting, without failure, at least seven times the maximum intended load, except that where rotation resistant rope is used, the lines shall be capable of supporting without failure, at least ten times the maximum intended load.

Brakes and locking devices

Load and boom hoist drum brakes, swing brakes, and locking devices such as pawls or dogs shall be engaged when the occupied personnel platform is in a stationary position.

Crane leveling

The crane shall be uniformly level within one percent of level grade and located on firm footing. Cranes equipped with outriggers shall have them all fully deployed following manufacturer's specifications, insofar as applicable, when hoisting employees.

Load capacity

The total weight of the loaded personnel platform and related rigging shall not exceed 50 percent of the rated capacity for the radius and configuration of the crane or derrick.

Live Booms

The use of machines having live booms (booms in which lowering is controlled by a brake without aid from other devices which slow the lowering speeds) is prohibited.

Positive acting device

A positive acting device shall be used which prevents contact between the load block or overhaul ball and the boom tip (anti-two-blocking device), or a system shall be used which deactivates the hoisting action before damage occurs in the event of a two-blocking situation (two-block damage prevention feature).

Lowering of hoist

The load line hoist drum shall have a system or device on the power train other than the load hoist brake, which regulates the lowering rate of speed of the hoist mechanism (controlled load lowering). Free fall is prohibited.

13.2: Personnel Platforms

Personnel Platforms

Design criteria

The personnel platform and suspension system shall be designed by a qualified engineer or a qualified person competent in structural design.

The suspension system shall be designed to minimize tipping of the platform due to movement of employees occupying the platform.

The personnel platform itself, except the guardrail system and personnel fall arrest system anchorages, shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load. Criteria for guardrail systems and personal fall arrest system anchorages are contained in Subpart M, Fall Protection.

Platform specifications

Guardrails

Each personnel platform shall be equipped with a guardrail system which meets the requirements of Subpart M, and shall be enclosed at least from the toeboard to mid-rail with either solid construction or expanded metal having openings no greater than ½ inch. A grab rail shall be installed inside the entire perimeter of the personnel platform.

Access gates

Access gates, if installed, shall not swing outward during hoisting. Access gates, including sliding or folding gates, shall be equipped with a restraining device to prevent accidental opening. Headroom shall be provided which allows employees to stand upright in the platform.

Protection from falling objects

In addition to the use of hard hats, employees shall be protected by overhead protection on the personnel platform when employees are exposed to falling objects.

Rough edges

All rough edges exposed to contact by employees shall be surfaced or smoothed in order to prevent injury to employees from punctures or lacerations.

Welding

All welding of the personnel platform and its components shall be performed by a qualified welder familiar with the weld grades, types, and material specified in the platform design.

Platform marking

The personnel platform shall be conspicuously posted with a plate or other permanent marking which indicates the weight of the platform, and its rated load capacity or maximum intended load.

Load capacity

The personnel platform shall not be loaded in excess of its rated load capacity. When a personnel platform does not have a rated load capacity, then the personnel platform shall not be loaded in excess of its maximum intended load.

Number of employees

The number of employees occupying the personnel platform shall not exceed the number required for the work being performed.

Platform use

Personnel platforms shall be used only for employees, their tools and the materials necessary to do their work, and shall not be used to hoist only materials or tools when not hoisting personnel.

Securing of materials and tools

Materials and tools for use during a personnel lift shall be secured to prevent displacement. Materials and tools for use during a personnel lift shall be evenly distributed within the confines of the platform while the platform is suspended.

Personnel Platforms - Rigging

Wire Rope

When a wire rope bridle is used to connect the personnel platform to the load line, each bridle leg shall be connected to a master link or shackle in such a manner to ensure that the load is evenly divided among the bridle legs.

Hooks

Hooks on overhaul ball assemblies, lower load blocks, or other attachment assemblies shall be of a type that can be closed and locked, eliminating the hook throat opening. Alternatively, an alloy anchor type shackle with a bolt, nut and retaining pin may be used.

Component rating

Wire rope, shackles, rings, master links, and other rigging hardware must be capable of supporting, without failure, at least five times the maximum intended load applied or transmitted to that component. Where rotation resistant rope is used, the slings shall be capable of supporting without failure at least ten times the maximum intended load. All eyes in wire rope slings shall be fabricated with thimbles.

Bridles

Bridles and associated rigging for attaching the personnel platform to the hoist line shall be used only for the platform and the necessary employees, their tools and the materials necessary to do their work and shall not be used for any other purpose when not hoisting personnel.

Trial Lift

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

This trial lift shall be performed immediately prior to placing personnel on the platform. The operator shall determine that all systems, controls and safety devices are activated and functioning properly; that no interferences exist, and that all configurations necessary to reach those work locations will allow the operator to remain under the 50 percent limit of the hoist's rated capacity. Materials and tools to be used during the actual lift can be loaded in the platform for the trial lift. A single trial lift may be performed at one time for all locations that are to be reached from a single set up position.

The trial lift shall be repeated prior to hoisting employees whenever the crane or derrick is moved and set up in a new location or returned to a previously used location. Additionally, the trial lift shall be repeated when the lift route is changed unless the operator determines that the route change is not significant (i.e. the route change would not affect the safety of hoisted employees.

After the trial lift, and just prior to hoisting personnel, the platform shall be hoisted a few inches and inspected to ensure that it is secure and properly balanced. Employees shall not be hoisted unless the following conditions are determined to exist:

1. Hoist ropes shall be free of kinks.
2. Multiple part lines shall not be twisted around each other.
3. The primary attachment shall be centered over the platform.
4. The hoisting system shall be inspected if the load rope is slack to ensure all ropes are properly stated on drums and in sheaves.

Visual inspection

A visual inspection of the crane or derrick, rigging, personnel platform, and the crane or derrick base support, or ground, shall be conducted by a competent person immediately after the trial lift to determine whether the testing has exposed any defect or produced any adverse effect upon any component or structure. Any defects found during inspections which create a safety hazard shall be corrected before hoisting personnel.

Proof tested

At each job site, prior to hoisting employees on the personnel platform, and after any repair or modification, the platform and rigging shall be **proof tested to 125 percent** of the platform's rated capacity by holding it in a suspended position for five minutes with the test load evenly distributed on the platform (this may be done concurrently with the trial lift). After proof testing, a competent person shall inspect the platform and rigging. Any deficiencies found shall be corrected and another proof test shall be conducted. Personnel hoisting shall not be conducted until the proof testing requirements are satisfied.

Safe Work Practices

General rules

Employees shall keep all parts of the body inside the platform during raising, lowering, and positioning. This provision does not apply to an occupant of the platform performing the duties of a signal person.

Before employees exit or enter a hoisted personnel platform that is not landed, the platform shall be secured to the structure where the work is to be performed, unless securing to the structure creates an unsafe situation. Tag lines shall be used unless their use creates an unsafe condition.

The crane or derrick operator shall remain at the controls at all times when the crane engine is running and the platform is occupied.

Hoisting of employees

Hoisting of employees shall be promptly discontinued upon indication of any dangerous weather conditions or other impending danger.

Employees being hoisted shall remain in continuous sight of and in direct communication with the operator or signal person. In those situations where direct visual contact with the operator is not possible, and the use of a signal person would create a greater hazard for the person, direct communication alone such as by radio may be used.

Body belt/harness system

Except over water, employees occupying the personnel platform shall use a body belt/harness system with lanyard appropriately attached to the lower load block or overhaul ball, or to a structural member within the personnel platform capable of supporting a fall impact for employees using the anchorage. When working over water, life preservers shall be worn and ring buoys and a lifesaving skiff shall be immediately available. See 1926.106.

Hoisting of employees

No lifts shall be made on another of the crane's or derrick’s loadlines while personnel are suspended on a platform. Hoisting of employees while the crane is traveling is prohibited, except for portal, tower and locomotive cranes, or where the employer demonstrates that there is no less hazardous way to perform the work.

Required meeting

A meeting attended by the crane or derrick operator, signal persons (if necessary for the lift), employees to be lifted, and the person responsible for the task to be performed shall be held to review the appropriate requirements of this section and the procedures to be followed.

This meeting shall be held prior to the trial lift at each new work location, and shall be repeated for any employees newly assigned to the operation.

13.3: Helicoptors

Helicopters

General

Helicopters are becoming more widely used on construction sites today for lifting and rigging purposes. Helicopters have long been in use for setting electrical transmission towers as well. OSHA regulations require that helicopter cranes comply with any applicable regulations of the Federal Aviation Administration.

Briefing

Prior to each day's operation, a briefing shall be conducted. This briefing shall set forth the plan of operation for the pilot and ground personnel.

Slings and tag lines

Load shall be properly slung. Tag lines shall be of a length that will not permit their being drawn up into rotors. Pressed sleeve, swedged eyes, or equivalent means shall be used for all freely suspended loads to prevent hand splices from spinning open or cable clamps from loosening.

Cargo Hooks

All electrically operated cargo hooks shall have the electrical activating device so designed and installed as to prevent inadvertent operation. In addition, these cargo hooks shall be equipped with an emergency mechanical control for releasing the load. The hooks shall be tested prior to each day’s operation to determine that the release functions properly, both electrically and mechanically.

Personal Protective Equipment

Personal protective equipment for employees receiving the load shall consist of complete eye protection and hard hats secured by chinstraps. Loose-fitting clothing likely to flap in the downwash, and thus be snagged on hoist line, shall not be worn.

Loose gear and objects

Every practical precaution shall be taken to provide for the protection of the employees from flying objects in the rotor downwash. All loose gear within 100 feet of the place of lifting the load, depositing the load, and all other areas susceptible to rotor downwash shall be secured or removed.

Housekeeping

Good housekeeping shall be maintained in all helicopter loading and unloading areas.

Operator responsibility

The helicopter operator shall be responsible for size, weight, and manner in which loads are connected to the helicopter. If, for any reason, the helicopter operator believes the lift cannot be made safely, the lift shall not be made.

Hooking and unhooking loads

When employees are required to perform work under hovering craft, a safe means of access shall be provided for employees to reach the hoist line hook and engage or disengage cargo slings. Employees shall not perform work under hovering craft except when necessary to hook or unhook loads.

Static charge

Static charge on the suspended load shall be dissipated with a grounding device before ground personnel touch the suspended load, or protective rubber gloves shall be worn by all ground personnel touching the suspended load.

Weight limitations

The weight of an external load shall not exceed the manufacturer's rating. Hoist wires or other gear, except for pulling lines or conductors that are allowed to "payout" from a container or roll off a reel, shall not be attached to any fixed ground structure, or allowed to foul on any fixed structure.

Visibility

When visibility is reduced by dust or other conditions, ground personnel shall exercise special caution to keep clear of main and stabilizing rotors. Precautions shall also be taken by the employer to eliminate as far as practical reduced visibility.

Signal Systems

Signal systems between aircrew and ground personnel shall be understood and checked in advance of hoisting the load. This applies to either radio or hand signal systems.

Approach distance

No unauthorized person shall be allowed to approach within 50 feet of the helicopter when the rotor blades are turning.

Approaching helicopter

Whenever approaching or leaving a helicopter with blades rotating, all employees shall remain in full view of the pilot and keep in a crouched position. Employees shall avoid the area from the cockpit or cabin rearward unless authorized by the helicopter operator to work there.

Personnel

Sufficient ground personnel shall be provided when required for safe helicopter loading and unloading operations.

Communications

There shall be constant reliable communication between the pilot and a designated employee of the ground crew who acts as a signalman during the period of loading and unloading. This signalman shall be distinctly recognizable from other ground personnel.

Fires

Open fires shall not be permitted in an area that could result in such fires being spread by the rotor downwash

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13.4: Material Hoists and Elevators

Material Hoists, Personnel Hoists and Elevators

General requirements

The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of all hoists and elevators. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a professional engineer competent in the field.

Rated load capacities, recommended operating speeds, and special hazard warnings or instructions shall be posted on cars and platforms. The use of endless belt-type manlifts on construction shall be prohibited.

Material Hoists

Operating rules

Operating rules shall be established and posted at the operator's station of the hoist. Such rules shall include signal system and allowable line speed for various loads. Rules and notices shall be posted on the car frame or crosshead in a conspicuous location, including the statement "No Riders Allowed."

No person shall be allowed to ride on material hoists except for the purposes of inspection and maintenance.

Hoistway entrances

All entrances of the hoistways shall be protected by substantial gates or bars, which shall guard the full width of the landing entrance. All hoistway entrance bars and gates shall be painted with diagonal contrasting colors such as black and yellow stripes.

Overhead protection

Overhead protective covering of two inch planking, 3/4-inch plywood, or other solid material of equivalent strength, shall be provided on the top of every material hoist cage or platform.

Hoist towers

Hoist towers may be used with or without an enclosure on all sides. However, whichever alternative is chosen, the following applicable conditions shall be met:

1. When a hoist tower is enclosed, it shall be enclosed on all sides for its entire height with a screen enclosure of 1/2-inch mesh, No. 18 U.S. gauge wire or equivalent, except for landing access.
2. When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with 1/2-inch mesh of No. 14 U. S. gauge wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading. A six foot high enclosure shall be provided on the unused sides of the hoist tower at ground level.
3. Car arresting devices shall be installed to function in case of rope failure. All material hoist towers shall be designed by a licensed professional engineer.

Personnel Hoists

Outside hoist towers

Hoist towers outside the structure shall be enclosed for the full height on the side or sides used for entrance and exit to the structure. At the lowest landing, the enclosure on the sides not used for exit or entrance to the structure shall be enclosed to a height of at least 10 feet. Other sides of the tower adjacent to floors or scaffold platforms shall be enclosed to a height of 10 feet above the level of such floors or scaffolds.

Inside Hoist towers

Towers inside of structures shall be enclosed on all four sides throughout the full height. Towers shall be anchored to the structure at intervals not exceeding 25 feet. In addition to tie-ins, a series of guys shall be installed. Where tie-ins are not practical, the tower shall be anchored by means of guys made of wire rope at least one-half inch in diameter, securely fastened to anchorage to ensure stability.

Personnel hoist requirements

Hoistway doors or gates shall be not less than six feet six inches high and shall be provided with mechanical locks which cannot be operated from the landing side, and shall be accessible only to persons on the car. Cars shall be permanently enclosed on all sides and the top, except sides used for entrance and exit, which have car gates or doors. A door or gate shall be provided at each entrance to the car, which shall protect the full width and height of the car entrance opening. Overhead protective covering of two inch planking, 3/4- inch plywood or other solid material or equivalent strength shall be provided on the top of every personnel hoist. Doors or gates shall be provided with electric contacts, which do not allow movement of the hoist when door or gate is open. An emergency stop switch shall be provided in the car and marked "Stop."

Data plate

Cars shall be provided with a capacity and data plate secured in a conspicuous place on the car or crosshead.

Inspection

Following assembly and erection of hoists and before being put in service an inspection and test of all functions and safety devices shall be made under the supervision of a competent person. A similar inspection and test is required following major alteration of an existing installation. All hoists shall be inspected and tested at not more than three month intervals. The employer shall prepare a certification record which includes the date the inspection and test of all functions and safety devices was performed; the signature of the person who performed the inspection and test; and a serial number, or other identifier, for the hoist that was inspected and tested. The most recent certification record shall be maintained on file.

Specifications

All personnel hoists used by employees shall be constructed of materials and components, which meet the specifications for materials, construction safety devices, assembly, and structural integrity as stated in the American National Standard A 10.4-1963, Safety Requirements for Workmen Hoists.

Hoist tower that is not enclosed

When a hoist tower is not enclosed, the hoist platform or car shall be totally enclosed (caged) on all sides for the full height between the floor and the overhead protective covering with

3/4-inch mesh of No. 14 U. S. gauge wire or equivalent. The hoist platform enclosure shall include the required gates for loading and unloading.

These hoists shall be inspected and maintained on a weekly basis. Whenever the hoisting equipment is exposed to winds exceeding 35 miles per hour it shall be inspected and put in operable condition before reuse.

13.A: Review Questions

Complete as directed.

Fill in the Blanks:

1. Where manufacturer s specifications are not available, the crane lift limitations assigned to the equipment shall be based on the determinations of a_____ _____ competent in this field and such determinations will be appropriately documented and recorded.
2. The employer shall designate a_____ who shall inspect all machinery and equipment prior to each use, and during use, to make sure it is in safe operating condition.
3. Accessible areas within the swing radius of the rear of the rotating superstructure of the crane either permanently or temporarily mounted shall be _____ in such a manner as to prevent an employee from being struck or crushed by the crane.
4. An accessible _____of 5BC rating, or higher, shall be available at all operations or cabs of equipment.
5. Following assembly and erection of hoists, and before being put in service, an inspection and test of all functions and safety devices shall be made under the supervision of a _____. A similar inspection and test is required following major alteration of an existing installation. All hoists shall be inspected and tested at not more than_____month intervals.
6. A_____shall be worn and a lanyard attached to the boom or basket **when** working from an aerial lift.

Multiple Choice:

1. For energized transmission and distribution lines rated 50kV or below, minimum clearance between the lines and any part of the crane or load shall be_____ feet. a. 3 b. 5 c. 10 d. 15
2. When crane or derrick personnel platforms are used, they shall be capable of supporting, without failure, their own weight and at least_____ times the maximum intended load. a. 2 b. 3 c. 4 d. 5
3. Hoist towers outside the structure shall be enclosed for the full height on the side or sides used for entrance and exit to the structure. At the lowest landing, the enclosure on the sides not used for exit or entrance to the structure shall be enclosed to a height of at least_____ feet. a. 4 b. 8 c. 10 d. 12

General:

1. Describe the minimum personal protective equipment required by OSHA for employees receiving the load lifted by a helicopter.

CHAPTER OVERVIEW

14: Motor Vehicles and Mechanized Equipment

> *"Prepare and prevent, don't repair and repent." – Author Unknown*

Overview

Safety requirements for motor vehicles in general are prescribed by the Society of Automotive Engineers (SAE) and referenced by the US National Highway Traffic Safety Administration (NHTSA). The mission of the NHTSA is to "Save lives, prevent injuries, reduce vehicle-related crashes", and is a unit under the Department of Transportation (DOT). This chapter recognizes the overlap in federal jurisdiction as it relates to 'work' performed on US Highways and specifically as it relates to specialized vehicles performing construction activities. The primary objective of the standards associated with motor vehicles is to ensure vehicle safety when in operation but also when not.

Safety standards associated with traffic control specifically relating to construction on our highway system but also applicable to controls of vehicle traffic on construction sites are outlined in the standard Signs, Signals, and Barricades. These standards are based on those from the Manual on Uniform Traffic Control Devices (MUTCD) for streets and highways.

Chapter Objective:

1. Determine the safety requirements for motor vehicles and mechanized equipment on construction sites.
2. Review the general safety requirements for earthmoving and excavation equipment.
3. Identify the acceptable sign and barricade construction requirements listed in Subpart G.

Learning Outcome:

1. Describe the safety requirements of equipment covered under Subpart O.
2. Apply the hierarchy controls to the requirements of Subpart G.

Standards: 1926 Subpart O-Motor Vehicles, Mechanized Equipment, Marine Operations, Subpart G Signs, Signals, Barricades

Key Terms:

Operable, bulldozer, cribbed, dump body, end loader, flagmen

Mini-Lecture: Signs, Signals, Barricades

Topic Required Time: 1 hrs; Independent Study and reflection 3/4 hour.

14.1: Introduction to Motor Vehicles and Mechanized Equipment

Introduction

Subpart O of the 1926 OSHA Construction Standards contains general safety requirements for motor vehicles and mechanized equipment that are commonly used on all types of construction sites by all trades, including their construction and use. Subpart 0 also contains requirements for lifting and hauling equipment, which is not covered by Subpart N.

Signs, signals, and barricades

Subpart G contains the requirements for the construction of signs, signals and barricades. Included in this subpart are color code and lettering restrictions for signs and requirements for flagmen engaged in signaling operations.

Mechanized Equipment - General

All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of the equipment.

Inflating, mounting, or dismounting tires

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

Working under or between heavy machinery

Heavy machinery, equipment, or parts thereof, which are suspended or held aloft by use of slings, hoists, or jacks shall be substantially blocked or cribbed to prevent falling or shifting before employees are permitted to work under or between them. Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment, shall be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the motors stopped and brakes set, unless work being performed requires otherwise.

Parking brake use

Whenever the equipment is parked, the parking brake shall be set. Equipment parked on inclines shall have the wheels chocked and the parking brake set.

Working Space Clearance

All equipment covered by this subpart shall comply with the workspace clearance requirements of 1926. 550(a)(15) when working or being moved in the vicinity of power lines or energized transmitters.

Motor Vehicles

Applicable regulations

Motor vehicles as covered by this part are those vehicles that operate within an off-highway jobsite not open to public traffic. The requirements of this section do not apply to equipment for which rules are prescribed in 1926.602.

Brake requirements

All vehicles shall have a service brake system, an emergency brake system, and a parking brake system. These systems may use common components, and shall be maintained in operable condition.

Visibility conditions

Whenever visibility conditions warrant additional light, all vehicles, or combinations of vehicles, in use shall be equipped with at least two headlights and two tail lights in operable condition.

Brake lights

All vehicles, or combination of vehicles, shall have brake lights in operable condition regardless of light conditions.

Audible warning systems

All vehicles shall be equipped with an adequate audible warning device at the operator's station and in an operable condition.

Obstructed view

No employer shall use any motor vehicle equipment having an obstructed view to the rear unless:

1. The vehicle has a reverse signal alarm audible above the surrounding noise level, or;
2. The vehicle is backed up only when an observer signals that it is safe to do so.

Vehicles with cabs

All vehicles with cabs shall be equipped with windshields and powered wipers. Cracked and broken glass shall be replaced. Vehicles operating in areas or under conditions that cause fogging or frosting of the windshields shall be equipped with operable defogging or defrosting devices.

Tools and material

Tools and material shall be secured to prevent movement when transported in the same compartment with employees.

Vehicles used to transport employees

Vehicles used to transport employees shall have seats firmly secured and adequate for the number of employees to be carried.

Trucks with dump bodies

Trucks with dump bodies shall be equipped with positive means of support permanently attached and capable of being locked in position to prevent accidental lowering of the body while maintenance or inspection work is being done.

Operating levers

Operating levers controlling hoisting or dumping devices on haulage bodies shall be equipped with a latch or other device which will prevent accidental starting or tripping of the mechanism. Trip handles for tailgates of dump trucks shall be arranged while dumping, so the operator will be in the clear.

Effective date

All rubber-tired motor vehicle equipment manufactured on or after May, 1972 shall be equipped with fenders.

Mud flaps

Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.

Vehicle inspection

All vehicles in use shall be checked at the beginning of each shift to assure that the following parts, equipment, and accessories are in safe operating condition and free of apparent damage that could cause failure while in use: service brakes, including trailer brake connections; parking system (hand brake); emergency stopping system (brakes); tires; horn; steering mechanism; coupling devices; seat belts; operating controls; and safety devices. All defects shall be corrected before the vehicle is placed in service. These requirements also apply to equipment such as lights reflectors, windshield wipers, defrosters, fire extinguishers, etc., where such equipment is necessary.

14.2: Material Handling

Material Handling Equipment Applicable equipment

These rules apply to the following types of earthmoving equipment: scrapers, loaders, crawler or wheel tractors, bulldozers, off-highway trucks graders, agricultural and industrial tractors, and similar equipment.

Seat Belts

Seat belts shall be provided on all equipment covered by this section, unless the equipment is designed only for stand-up operation.

Employer responsibility

No employer shall move, or cause to be moved, construction equipment or vehicles upon any access roadway or grade unless the access roadway or grade is constructed and maintained to accommodate safely the movement of the equipment and vehicles involved.

Service brake

All earthmoving equipment shall have a service braking system capable of stopping and holding the equipment fully loaded.

Pneumatic-tired earth-moving haulage equipment

Pneumatic-tired earth-moving haulage equipment (trucks, scrapers tractors, and trailing units) whose maximum speed exceeds 15 miles per hour shall be equipped with fenders on all wheels.

Bi-directional machines horn requirements

All bi-directional machines, such as rollers, compactors, front-end loaders bulldozers, and similar equipment, shall be equipped with a horn distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction.

The horn shall be maintained in an operative condition.

Obstructed view

No employer shall permit earthmoving or compacting equipment, which has an obstructed view to the rear, to be used in reverse gear unless the equipment has in operation a reverse signal alarm distinguishable from the surrounding noise level or an employee signals that it is safe to do so. This is the most frequently cited violation of Subpart O.

Equipment guarding

Scissor points on all front-end loaders, which constitute a hazard to the operator during normal operation, shall be guarded.

Lifting and Hauling Equipment

(Other than equipment covered under Subpart N)

Lift trucks, stackers, etc., shall have the rated capacity clearly posted on the vehicle so as to be clearly visible to the operator. When auxiliary removable counterweights are provided by the manufacturer, corresponding alternate rated capacities also shall be clearly shown on the vehicle. These ratings shall not be exceeded.

Modifications or additions to equipment

No modifications or additions, which affect the capacity or safe operation of the equipment, shall be made without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

Lifting a load by two or more trucks working in unison

If a load is lifted by two or more trucks working in unison, the proportion of the total load carried by anyone truck shall not exceed its capacity.

Steering or spinner knobs

Steering or spinner knobs shall not be attached to the steering wheel unless the steering mechanism is of a type that prevents road reactions from causing the steering handwheel to spin. The steering knob shall be mounted within the periphery of the wheel.

Unauthorized personnel

Unauthorized personnel shall not be permitted to ride on powered industrial trucks. A safe place to ride shall be provided where riding of trucks is authorized.

Lifting personnel

Whenever a truck is equipped with vertical only or vertical and horizontal controls elevatable with the lifting carriage or forks for lifting personnel, the following additional precautions shall be taken for the protection of personnel being elevated:

1. Use of a safety platform firmly secured to the lifting carriage and/or forks.
2. Means shall be provided whereby personnel on the platform can shut off power to the truck.

Such protection from falling objects as indicated necessary by the operating conditions shall be provided.

14.3: Signs, Signals and Barricades

Signs, Signals and Barricades

General

Signs and symbols shall be visible at all times when work is being performed, and shall be removed or covered promptly when the hazards no longer exist.

Danger signs

Danger signs shall be used only where an immediate hazard exists. Danger signs shall have red as the predominating color for the upper panel; black outline on the borders; and a white lower panel for additional sign wording.

Caution signs

Caution signs shall be used only to warn against potential hazards or to caution against unsafe practices. Caution signs shall have yellow as the predominating color; black upper panel and borders: yellow lettering of "caution" on the black panel; and the lower yellow panel for additional sign wording. Black lettering shall be used for additional wording.

Exit signs

Exit signs, when required, shall be lettered in legible red letters, not less than six inches high, on a white field and the principal stroke of the letters shall be at least three-fourths inch in width.

Safety instruction signs

Safety instruction signs, when used, shall be white with a green upper panel with white letters to convey the principal message. Any additional wording on the sign shall be black letters on the white background. Directional signs, other than automotive traffic signs, shall be white with a black panel and a white directional symbol. Any additional wording on the sign shall be black letters on the white background. Construction areas shall be posted with legible traffic signs at points of hazard.

Accident prevention tags

Accident prevention tags shall be used as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, etc. They shall not be used in place of, or as a substitute for, accident prevention signs.

Signaling Operations

General

When operations are such that signs, signals, and barricades do not provide the necessary protection on, or adjacent to a highway or street, flagmen or other appropriate traffic controls shall be provided.

Applicable standards

Signaling directions by flagmen shall conform to American National Standards Institute 06.1- 1971, Manual on Uniform Traffic Control Devices for Streets and Highways.

Hand signaling

Hand signaling by flagmen shall be by use of red flags at least 18 inches square or sign paddles and red lights in periods of darkness.

Flagmen required equipment

Flagmen shall be provided with and shall wear a red or orange warning garment while flagging. Warning garments worn at night shall be reflectorized material.

Definitions

Definitions for the purpose of Subpart G are as follows:

Barricade: An obstruction to deter the passage of persons or vehicles.

Signs: The warnings of hazard, temporarily or permanently affixed or placed, at locations where hazards exist.

Signals: Moving signs, provided by workers, such as flagmen, or by devices, such as flashing lights, to warn of possible or existing hazards.

Tags: Temporary signs, usually attached to a piece of equipment or part of a structure, to warn of existing or immediate hazards.

MUTCD: Manual of Uniform Traffic Control Devices for Streets and Highways

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14.A: Review Questions

Complete as directed.

Fill in the Blanks:

1. Heavy machinery, equipment, or parts thereof which are suspended or held aloft by use of slings, hoists, or jacks shall be substantially _____or_____ to

prevent falling or shifting before employees are permitted to work under or between them.

2. Equipment parked on inclines shall have the wheels_____and the parking brake set.

3. All vehicles shall be equipped with an adequate_____ warning device at the operator's station and in an operable condition.

4. Motor vehicle equipment having an obstructed view to the rear is not permitted to use reverse gear unless one of two conditions exists.

List the two conditions:

a. _____

b. _____

5. Trucks with dump bodies shall be equipped with positive means of support, permanently attached, and capable of being _____in position to prevent accidental lowering of the body while maintenance or inspection work is being done.

6. No_____ or_____ which affect the capacity or safe operation of

lifting or hauling equipment shall be made without the manufacturer's written approval.

7. _____ or _____shall not be attached to the steering wheel unless the steering mechanism is of a type that prevents road reactions from causing the steering handwheel to spin.

8. Flagmen shall be provided with and shall wear a _____or _____ warning garment while flagging. Warning garments worn at night shall be of_____ material.

Multiple Choice: (Circle the correct answer)

9. Caution signs shall have yellow as the predominating color and shall be used only to warn against _____ hazards or to caution against unsafe practices.

a. safety b. potential c. life d. immediate

10. Danger signs shall have red as the predominating color for the upper panel and shall be used only where a(n) _____ hazard exists.

a. safety b. potential c. life d. immediate

CHAPTER OVERVIEW

15: Excavations

> *"Safety isn't expensive, it's priceless." – Author Unknown*

Overview

Most construction starts with ground preparation and grading. Excavations are man made depressions and removal of soil and considered a part of ground preparation. A special type of excavation, the trench, a deep and narrow excavation is often needed for placement of underground utilities, electrical cables and pipe for water mains and gas lines. The removal of large amounts of soil that leaves a trench vulnerable to cave in is what makes them extremely hazardous. A cubic meter of soil can weigh as much as a small vehicle and without proper trench protection will crush, suffocate and trap a worker if the sides of trench walls fail. This chapter will discuss the importance of various protective systems needed to keep workers safe when performing excavation work and especially while working in trenches.

Chapter Objective:

1. Determine how to Identify Soil Types.
2. Identify the Hazards Associated with Excavations & Trenching.
3. Understand the Responsibilities of the Competent Person.
4. Select the Proper Method of Protection for Workers in Excavations.
5. Properly Prepare for Excavation Work.

Learning Outcome:

1. List the five most critical excavations hazards.
2. Apply the hierarchy of controls to Subpart P.

Standards: 1926 Subpart P-Excavations

Key Terms:

Cohesive, fissure, shoring, surface encumbrance, unconfined compressive strength

Mini-Lecture: Excavations

Topic Required Time: 1 hrs; Independent Study and reflection 3/4 hour.

15.1: Introduction to Excavations

Introduction

Construction workers are frequently called upon to work within excavations and trenches. OSHA studies have confirmed that excavation and trenching work is some of the most dangerous construction work performed. In fact, despite enhanced efforts by OSHA, the fatality rate for excavation work is nearly twice that of regular construction. By Definition, an excavation is any man-made cut, cavity, trench or depression in the earth formed by earth removal. Trenches, on the other hand, are narrow excavations made below the surface of the ground. Generally, the depth of a trench is greater than the width, but the width of a trench is not greater than 15 feet.

General

OSHA defines a competent person as one who is capable of identifying existing and predictable hazards and who has the authority to take prompt corrective measures to eliminate them.

One of the most important factors in reducing worker fatalities and injuries related to excavations and trenching is proper planning prior to the start of the job. The following factors need to be considered before starting the excavation: Surface Encumbrances, Underground Utilities, Access & Egress, Hazardous Atmospheres, Water Accumulation, Inspections, and Fall Protection.

Surface Encumbrances

Surface encumbrances are anything that is located on the ground in the area of the excavation that may get in the way or create a hazard for those working in the excavation or trench. Examples of these encumbrances are street signs, traffic signals, lighting standards, trees sidewalks, etc. OSHA requires that all surface encumbrances that might pose a hazard shall be removed or supported to safeguard employees.

Another consideration when planning for surface encumbrances is the proximity of trenching and excavation work to adjacent structures. Subpart P requires that adequate means, such as shoring, supporting, bracing, etc., be taken when the stability of adjacent structures is endangered by excavation operations.

Underground Utilities

Planning the work

In addition to the surface encumbrances, planning must consider those things under the earth that may be disturbed during the excavation. Utility installations are the most common and the most dangerous item to consider before beginning an excavation. Most states have a "Call Before you Dig" law and OSHA requires that the location of sewer telephone, electric, gas and other utility service installations must be determined prior to the opening of an excavation.

State or local ordinances usually determine the appropriate response time for utilities to identify their lines or piping. If the utility is unable to locate the line within 24 hours or whatever the period of time that state or local ordinances provide for, excavations can begin provided suitable detection equipment is used.

Keep in mind that the locations marked by the utilities are estimated locations only. Hand holes should be dug first to determine the exact location of the lines or piping.

Access and Egress

Means of exit and entry

A means of exit and entry from a trench excavation shall be provided for trench excavations four ft. or more in depth. Ladders, stairways or ramps are permitted means of exit and entry and they must be installed such that any worker does not have to travel more than 25 ft. in a lateral direction to reach the exit.

Ramp design

If ramps are going to be used for employee access and egress, they must be designed by a competent person. If the ramps are going to be used for access and egress of equipment, they shall be designed by a competent person qualified in structural design and the ramp must be constructed in accordance with the design.

Hazardous Atmospheres

One of the most frequently overlooked hazards in excavation and trenching work is hazardous atmospheres. Subpart P requires that where oxygen levels of less than 19.5 % are present or where such oxygen deficient conditions could reasonably be expected to exist, the atmosphere in the excavation or trench shall be tested prior to employees entering any excavations, deeper than four ft. Trenching in areas like landfills and other areas where hazardous substances are stored, are examples of the types of location that will require testing.

Protection from Loose Rock or Soil

All materials removed from a trench or excavation must be kept back at least two ft. from the edge of the excavation or trench or by the use of retaining devices sufficient to keep materials and equipment from falling or rolling into the excavation.

Inspection

Daily inspection of trenches and excavations shall be made by a competent person to ensure that there will not be any cave-ins, failures of protective systems, or hazardous atmospheres.

Water Accumulation

One of the most important factors in maintaining the integrity of a trench or excavation is the control of water in and around the excavation. The presence of water in a trench or excavation heightens the possibility of wall failure and threatens the safety of every worker in the excavation. OSHA requirements in Subpart P that are related to water accumulation are as follows:

1. Employees shall not work in excavations in which there is an accumulation of water or water is accumulating, unless adequate precautions have been taken. In general, adequate protection would mean special support or shield systems, water removal systems and life safety systems such as body harness and lifelines.
2. If water removal equipment is used, the status of the removal shall be monitored by a competent person to ensure proper operation.
3. When the location of the excavation is such that it interferes with the natural drainage of surface water, diversion dikes ditches or other means shall be employed to prevent surface water from entering the excavation.

15.2: Protective Systems

Inspections

Daily inspections

One of the most important responsibilities that the designated competent person has for excavation operation is the daily inspection of the excavation, including adjacent areas and structures, protective systems, hazardous atmospheres and personal protective equipment. Inspections are required to be made prior to the start of work and throughout the entire work shift. It is important to remember that conditions in and around trenches can change quickly. Subpart P requires for example, that excavations be re-inspected after every rain storm or other hazard increasing occurrence.

The competent person has the responsibility for the day-to-day operations in and around the excavation. If he/she determines that a hazard exists or the potential for a hazard exists he/she must take immediate corrective action.

Fall Protection

Walkways and guardrails

Fall protection can also be an important part of the excavation plan. OSHA requires that walkways be provided when employees or equipment cross over excavations. If the walkways are over six ft. above the lower level, they shall be equipped with guardrails.

Barriers

Subpart P also requires that barriers or other means of physical protection be provided around all remotely located excavations. In addition, all wells, pits, shafts, etc., shall be covered. Temporary openings shall be back-filled immediately upon completion of the assigned operation.

Analysis of hazards and protective system

Prior to beginning the excavation, a determination will need to be made regarding the types of protective systems that will be used to protect the employees who must work in and around the excavations. OSHA regulations require that each employee in the excavation must be protected against cave-ins by one of the following types of protective systems: Sloping, Benching, Shielding or other Support Systems.

Sloping

Sloping is a protective system that protects employees within excavations and trenches by excavating the sides of the trench or excavation to form sides that slope away from the excavation so as to protect against cave-ins.

The required angle of the slope depends upon several factors. First and foremost are the soil types. Generally speaking, the more cohesive the soil, the greater the angle of the slope permitted.

The general rule for slope angle is not steeper than one and one-half horizontal to one vertical. This results in an angle of about 34 degrees. There are however options for sloping at greater angles when a determination has been made by a competent person that the soil type will permit the additional slope. Appendix B, of Subpart P provides alternates configurations for sloping systems.

Benching

Benching is a method used to provide protection for employees working in and around excavations. Benching means the sides of the excavation are excavated so as to form one or a series of horizontal levels or steps usually with vertical or near-vertical surfaces between the levels.

The permissible benching configurations are provided in Appendix B, of Subpart P and once again generally depend upon the soil classification. Benching is generally permitted in cohesive soil types only.

Shielding

Shielding is a protective system that employs shields or structures, which are capable of withstanding the force imposed on it by cave-ins and still protect the employees within the shield. By design, shields can be permanent structures or they can be portable and be moved along as the work progresses. Shields used in trenches are usually called trench shields or trench boxes.

Shields are permitted to be either pre-manufactured or job-built in accordance with tabulated data or a registered professional engineer design.

The design of shielding systems shall be done in accordance with one of the following: The Appendices A, C, and D, to Subpart P Manufacturers' Tabulated Data, Other Tabulated Data, or a Registered Professional Engineer's Design.

Shield systems shall not be subjected to loads exceeding those for which the system was designed.

Employees are not permitted in shields when they are being installed removed or moved vertically.

When shields are used in trenching excavations, the excavation of the earth is permitted to a level not greater than two ft. below the bottom of the shield only if the shield is designed to resist the forces calculated for the full depth of the trench, and there is no indication, while the trench is open, of a possible loss of soil from behind or below the bottom of the shield.

Support Systems

Support systems are a means of protection for employees working in excavations that utilize a structure such as underpinning, bracing or shoring. Such support systems provide support to an adjacent structure, underground installation, or the sides of an excavation. Shoring is a support system that utilizes a structure such as metal, hydraulic, mechanical or timber shoring system that supports the sides of an excavation to prevent cave-ins.

The members of the support system shall be securely connected together to prevent sliding, failing, kickouts, or other predictable failure.

Support systems shall be installed in a manner that protects the worker from cave-ins, structural collapse or from being struck by members of the support system.

Removal of support systems shall begin at, and progress from, the bottom of the excavation. Backfilling shall begin with the removal of the support system from the excavation.

15.3: Soil Classification

Soil Classifications

OSHA 1926 Subpart “P” Appendix A

Stable Rock

Stable rock is defined as a natural mineral matter that can be excavated with vertical sides and remain intact while exposed.

Type "A"

Type A soil is cohesive soil with the following characteristics:

1. An unconfined compressive strength of 1.5 tons per sq. ft. or greater.
2. Soils like clay, silty clay, sandy clay, clay loam and in some cases silty clay loam and sandy clay loam are classified as Type A.
3. Cemented soils such as caliche and hardpan are classified as Type A soils.
4. Soils cannot be classified as Type A if any of the following conditions exist:
5. The soil is fissured.
6. The soil is subject to vibration from heavy traffic, pile driving or other similar effects.
7. The soil has been previously disturbed.
8. The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical or greater.
9. The material is subject to other factors that would require it to be classified as a less stable material.

Type "B"

Type B soil is cohesive soil with the following characteristics:

1. Unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf.
2. Granular cohesion less soils like angular gravel, silt, silt loam, and in some cases silty clay loam and sandy clay loam are classified as Type B soils.
3. Soils would be classified as Type B if any of the following conditions exist:
4. Previously disturbed soils except those which would otherwise be classified as Type C soil.
5. Soil that meets the unconfined compressive strength or cementation requirements for Type A soil, but is fissured or subject to vibration.
6. Dry rock that is not stable.
7. The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical, but only if the material would otherwise be classified as Type B soil.

Type "C"

Type C soil is cohesive soil with the following characteristics:

1. An unconfined compressive strength of 0.5 tsf or less.
2. Type C soils are granular soils including gravel, sand and loamy soil.
3. Submerged soil or soil from which water is freely seeping.
4. Submerged rock that is not stable.
5. The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical or steeper.

Soil Site Analysis

Each soil and rock deposit shall be analyzed and classified by a competent person as one of the four types identified above, Stable Rock, or Type A, B, or C.

The competent person shall use at least one visual test and one manual test to perform the soil deposit analysis.

Visual tests are done by observing samples of the soil that are excavated and samples taken

from the sides of the excavation. Appendix A, of Subpart P, lists the appropriate procedures for performing visual tests.

Manual tests are performed to determine the quality and type of the soil deposit. Some of the most common manual tests are: Plasticity, Dry Strength, Thumb Penetration and the Drying test. Appendix A, of Subpart P, lists the appropriate procedures for performing manual tests.

15.A: Review Questions

Complete as directed.

Fill in the Blanks:

1. Trenches are narrow excavations may below the surface of the ground. Generally, the depth of light trench is greater than the width, but the width of the trench is not greater than_____feet.
2. A means of exit or entry from a trench excavation shall be provided for trench excavation for_____feet or more depth.
3. A_____ is one who is capable of identifying existing in predictable hazards and who has the authority to take prompt corrective measures to eliminate.
4. Ladders, stairways or ramps are permitted means of exit and entry and they must be installed so that any worker does not have to travel more than_____feet in a lateral direction to reach the exit.
5. Subpart P requires that where oxygen levels of less than_____% are present or where such oxygen deficient conditions could reasonably be expected to exist, the atmosphere in the excavation or trench shall be tested prior to employees entering any excavation deeper than four feet.
6. The designated_____ for an excavation operation does a daily inspection of the excavation, including adjacent areas and structures, protective systems, hazardous atmospheres and personal protective equipment.

Multiple Choice: (Circle the Correct Letter)

7. Soil cannot be classified as type A, if which of the following conditions exists:

a. The soil is fissured.

b. The soil is subject to vibration from heavy traffic, pile driving or other similar effects.

c. The soil has been previously disturbed.

d. Any of the above.

True or False: (Circle the Correct Answer)

8. T or F

The locations marked by the utilities are estimated location only. Hand holes should be dug first to determine the exact location of the lines or piping.

9. T or F

The fatality rate for excavation work is nearly twice that of regular construction.

10. T or F

Employees shall not work in excavations in which there is an accumulation of water or water is accumulating, unless adequate precautions have been taken.

CHAPTER OVERVIEW

16: Concrete and Masonry

> *"Obedience is the mother of success and is wedded to safety." – Aeschylus*

Overview

Concrete and masonry work is specialized work requiring materials handling considerations and use of cutting tools. Some of the materials used also expose workers to health hazards such as silica dust from mortars and grout. Setting precast concrete and formwork requires the use of cranes, hoists and special forklifts. The potential for struck by, crushed, or caught in hazards are considerable when working with concrete and masonry. This chapter will focus on standards that control these hazards.

Chapter Objective:

1. Determine safe work practices for employees required to work on jobsites where masonry and concrete operations are in effect.
2. Identify the hazards associated with masonry and concrete operations.
3. Review OSHA Subpart Q requirements for the use of equipment and tools related to masonry and concrete operations.
4. Understand safety requirements for precast concrete, slip form, lift-slab, and cast-in- place concrete construction.

Learning Outcome:

1. Apply the hierarchy of controls to standards addressing concrete and masonry work.
2. Describe key terminology for concrete and masonry work.

Standards: 1926 Subpart Q-Fall Concrete and Masonry

Key Terms:

Formwork, impalement, precast concrete, shoring, silica

Mini-Lecture: Fall Hazards, Fall Protection

Topic Required Time: 2 hrs; Independent Study and reflection 1 3/4 hour.

16.1: Introduction to Concrete and Masonry

Introduction

OSHA Subpart Q, Concrete and Masonry Construction, contains performance oriented requirements designed to help protect all construction workers from the hazards associated with concrete and masonry construction operations at construction, demolition, alteration or repair worksites.

Subpart Q is divided into seven sections. The first section defines the scope and application of Subpart Q. The second section deals with general provisions applicable to the entire subpart. The third section deals with specific requirements for tools and equipment used in concrete and masonry operations. Sections four thru six cover specific concrete operations and the last section covers masonry construction.

Subpart Q - Scope & Application

Subpart Q sets forth requirements to protect all construction employees from the hazards associated with concrete and masonry construction operations performed in workplaces covered under 29 CFR Part 1926. In addition to the requirements in Subpart Q, other relevant provisions in Parts 1910 and 1926 apply to concrete and masonry construction operations.

Definitions

In addition to the definitions set forth in 1926.32, the following definitions apply to this subpart:

Bull float: A tool used to spread out and smooth concrete.

Formwork: The total system of support for freshly placed or partially cured concrete, including the mold or sheeting (form) that is in contact with the concrete as well as all supporting members including shores, reshores hardware, braces, and related hardware.

Lift slab: A method of concrete construction in which floor, and roof slabs are cast on or at ground level and, using jacks, lifted into position.

Limited access zone: An area alongside a masonry wall, which is under construction, and which is clearly demarcated to limit access by employees.

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

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

Shore: A supporting member that resists a compressive force imposed by a load.

Vertical slip forms: Forms which are jacked vertically during the placement of concrete.

Jacking operation: The task of lifting a slab (or group of slabs vertically from one location to another (e.g., from the casting location to a temporary (parked) location, or to its final location in the structure), during the construction of a building/structure where the lift- slab process is being used.

General Requirements

Construction Loads

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

Protruding reinforcing steel

All protruding reinforcing steel, onto and into which employees could fall shall be guarded to eliminate the hazard of impalement. OSHA has determined that protruding reinforcing steel, at any length, is a hazard and must be guarded. This is the most frequently cited Subpart Q violation.

Employee positioning

No employee (except those essential to the post-tensioning operations) shall be permitted to be behind the jack during tensioning operations. Signs and barriers shall be erected to limit employee access to the post-tensioning area during tensioning operations.

Concrete buckets

No employee shall be permitted to ride concrete buckets. No employee shall be permitted to work under concrete buckets while buckets are being elevated or lowered into position. To the extent practical, elevated concrete buckets shall be routed so that no employee, or the fewest number of employees, is exposed to the hazards associated with falling concrete buckets.

Protective equipment

No employee shall be permitted to apply a cement, sand, and water mixture through a pneumatic hose unless the employee is wearing protective head and face equipment.

Equipment and Tools

Troweling machines

Powered and rotating type concrete troweling machines that are manually guided shall be equipped with a control switch that will automatically shut off the power whenever the hands of the operator are removed from the equipment handles.

Concrete buggies

Concrete buggy handles shall not extend beyond the wheels on either side of the buggy.

Concrete pumping stations

Concrete pumping systems using discharge pipes shall be provided with pipe supports designed for 100 percent overload. Compressed air hoses used on concrete pumping system shall be provided with positive fail-safe joint connectors to prevent separation of sections when pressurized.

Concrete buckets

Concrete buckets equipped with hydraulic or pneumatic gates shall have positive safety latches or similar safety devices installed to prevent premature or accidental dumping. Concrete buckets shall be designed to prevent concrete from hanging up on top and/or on the sides of the buckets.

Bull floats

When bull float handles are used where they might contact energized electrical conductors, they shall be constructed of nonconductive material or insulated with a nonconductive sheath whose electrical and mechanical characteristics provide the equivalent protection of a handle constructed of nonconductive material.

Masonry saws

Masonry saws shall be guarded with a semicircular enclosure over the blade. A method for retaining blade fragments shall be incorporated in the design of the semicircular enclosure.

Maintenance and repair

No employee shall be permitted to perform maintenance or repair activity on equipment (such as compressors, mixers, screens or pumps used for concrete and masonry construction activities) where the inadvertent operation of the equipment could occur and cause injury, unless all potentially hazardous energy sources have been locked out and tagged. Tags shall read "Do Not Start" or similar language to indicate that the equipment is not to be operated.

16.2: Cast in Place Concrete

Cast-in-Place Concrete

General

Formwork shall be designed, fabricated, erected, supported, braced and maintained so that it will be capable of supporting without failure all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork.

Drawings or plans

Drawings or plans, including all revisions, for the jack layout, formwork (including shoring equipment), working decks, and scaffolds, shall be available at the jobsite.

Shoring and Reshoring

General

All shoring equipment (including equipment used in reshoring operations) shall be inspected prior to erection to determine that the equipment meets the requirements specified in the formwork drawings. Shoring equipment found to be damaged, such that its strength is reduced to a point where it is not capable of supporting all vertical and lateral loads, which are reasonably expected to be present, shall not be used for shoring.

Shoring equipment

Erected shoring equipment shall be inspected immediately prior to, during, and immediately after concrete placement. Shoring equipment that is found to be damaged or weakened after erection, such that its strength is significantly reduced, shall be immediately reinforced.

Sills

The sills for shoring shall be sound, rigid, and capable of carrying the maximum intended load.

Single post shores

Whenever single post shores are used one on top of another (tiered), the employer shall comply with the following specific requirements in addition to the general requirements for formwork:

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

Reshoring

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

Vertical Slip Forms

The steel rods or pipes on which jacks climb, or by which vertical slip forms are lifted shall be:

1. Specifically designed for that purpose; and
2. Adequately braced where not encased in concrete.

Design

Forms shall be designed to prevent excessive distortion of the structure during the jacking operation.

Scaffold and work platforms

All vertical slip forms shall be provided with scaffolds or work platforms where employees are required to work or pass.

Jack ratings

Jacks and vertical supports shall be positioned in such a manner that the loads do not exceed the rated capacity of the jacks. The jacks or other lifting devices shall be provided with mechanical dogs or other automatic holding devices to support the slip forms whenever failure of the power supply or lifting mechanism occurs.

Form structure

The form structure shall be maintained within all design tolerances specified for plumbness during the jacking operation. The predetermined safe rate of lift shall not be exceeded.

Reinforcing Steel

Support

Reinforcing steel for walls, piers, columns, and similar vertical structures shall be adequately supported to prevent overturning and to prevent collapse.

Wire mesh

Employers shall take measures to prevent unrolled wire mesh from recoiling. Such measures may include, but are not limited to, securing each end of the roll or turning over the roll.

Removal of Formwork

General

Forms and shores (except those used for slabs on grade and slip forms) shall not be removed until the employer determines that the concrete has gained sufficient strength to support its weight and superimposed loads. Such determination shall be based on compliance with one of the following:

1. The plans and specifications stipulate conditions for removal of forms and shores, and such conditions have been followed.
2. The concrete has been properly tested with an appropriate ASTM standard test method designed to indicate the concrete compressive strength, and the test results indicate that the concrete has gained sufficient strength to support its weight and superimposed loads.

Removing reshoring

Reshoring shall not be removed until the concrete being supported has attained adequate strength to support its weight and all loads in place upon it.

Precast Concrete

Supporting

Precast concrete wall units, structural framing, and tilt-up wall panels shall be adequately supported to prevent overturning and to prevent collapse until permanent connections are completed.

Lifting inserts

Lifting inserts which are embedded or otherwise attached to tilt-up precast concrete members shall be capable of supporting at least two times the maximum intended load applied or transmitted to them.

Lifting inserts which are embedded or otherwise attached to precast concrete members, other than the tilt-up members, shall be capable of supporting at least four times the maximum intended load applied or transmitted to them.

Lifting hardware

Lifting hardware shall be capable of supporting at least five times the maximum intended load applied transmitted to the lifting hardware.

Employee positioning

No employee shall be permitted under precast concrete members being lifted or tilted into position, except those employees required for the erection of those members.

16.3: Lift-Slab Operations

Lift-Slab Operations

Design

Lift-slab operations shall be designed and planned by a registered professional engineer who has experience in lift-slab construction. Such plans and designs shall be implemented by the employer and shall include detailed instructions and sketches indicating the prescribed method of erection. These plans and designs shall also include provisions for ensuring lateral stability of the building/structure during construction.

Jacks/lifting units

Jacks/lifting units shall be marked to indicate their rated capacity as established by the manufacturer. Jacks/lifting units shall not be loaded beyond their rated capacity as established by the manufacturer.

Jacks/lifting units shall be designed and installed so that they will neither lift nor continue to lift when they are loaded in excess of their rated capacity.

Jacks/lifting units shall have a safety device installed which will cause the jacks/lifting units to support the load in any position in the event any jacklifting unit malfunctions or loses its lifting ability.

Jacking equipment

Jacking equipment shall be capable of supporting at least two and one-half times the load being lifted during jacking operations and the equipment shall not be overloaded. For the purpose of this provision, jacking equipment includes any load bearing component, which is used to carry out the lifting operation(s). Such equipment includes, but is not limited to the following: threaded rods, lifting attachments, lifting nuts, hook-up collars, T -caps, shearheads, columns, and footings.

Jacking operations

Jacking operations shall be synchronized in such a manner to ensure even and uniform lifting of the slab. During lifting, all points at which the slab is supported shall be kept within ½ inch of that needed to maintain the slab in a level position.

If leveling is automatically controlled, a device shall be installed that will stop the operation when the ½ inch tolerance level is exceeded or where there is a malfunction in the jacking (lifting) system.

If leveling is maintained by manual controls, such controls shall be located in a central location and attended by a competent person while lifting is in progress. In addition to meeting the definition of "competent person" the competent person must be experienced in the lifting operation and with the lifting equipment being used.

The maximum number of manually controlled jacks/lifting units on one slab shall be limited to a number that will permit the operator to maintain the slab level within specified tolerances of paragraph (g) of this section, but in no case shall that number exceed fourteen.

Employee positioning

No employee, except those essential to the jacking operation, shall be permitted in the building/structure while any jacking operation is taking place unless the building/structure has been reinforced sufficiently to ensure its integrity during erection. The phrase "reinforced sufficiently to ensure its integrity" used in this paragraph means that a registered professional engineer, independent of the engineer who designed and planned the lifting operation, has determined from the plans that if there is a loss of support at any jack location, that loss will be confined to that location and the structure as a whole will remain stable.

Under no circumstances, shall any employee who is not essential to the jacking operation be permitted immediately beneath a slab while it is being lifted.

Masonry Construction

General

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

1. The limited access zone shall be established prior to the start of construction of the wall.
2. The limited access zone shall be equal to the height of the wall to be constructed plus four feet, and shall run the entire length of the wall.
3. The limited access zone shall be established on the side of the wall, which will be unscaffolded.
4. The limited access zone shall be restricted to entry by employees actively engaged in constructing the wall. No other employees shall be permitted to enter the zone.
5. The limited access zone shall remain in place until the wall is adequately supported to prevent overturning and to prevent collapse unless the height of the wall is over eight feet, in which case, the limited access zone shall remain in place until the permanent supporting elements of the structure are in place.

Bracing

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

16.A: Review Questions

Complete as directed.

Fill in the Blanks:

1. _____ means the total system of support for freshly placed or partially cured concrete including the mold or sheeting (form) that is in contact with the concrete as well as all supporting members including shores, reshores hardware, braces, and related hardware.
2. All protruding reinforcing steel, onto and into which employees could fall, shall be _____ to eliminate the hazard of impalement.
3. No employee shall be permitted to apply a cement, sand, and water mixture through a pneumatic hose unless the employee is wearing protective_____ and _____ equipment.
4. Concrete buckets equipped with hydraulic or pneumatic gates shall have _____ safety latches or similar safety devices installed to prevent premature or accidental dumping.
5. Bull float handles used where they might contact energized electrical conductors shall be constructed of_____material or insulated with a nonconductive sheath whose electrical and mechanical characteristics provide the equivalent protection of a handle constructed of nonconductive material.
6. All vertical slip forms shall be provided with_____or work_____ where employees are required to work or pass.
7. No employee shall be permitted_____ precast concrete members being lifted or tilted into position except those employees required for the erection of those members.

Multiple Choice: (Circle the Correct Answer)

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

a. six b. eight c. ten d. twelve

2. Lifting inserts which are embedded or otherwise attached to tilt-up precast concrete members shall be capable of supporting at least_____times the maximum intended load applied or transmitted to them.

a. two b. three c. four d. five

3. Shoring equipment that is found to be damaged or weakened after erection, such that its strength is significantly reduced, shall be immediately _____.

a. destroyed b. discarded c. reinforced d. identified

CHAPTER OVERVIEW

17: Stairways and Ladders

> *"Carefulness costs you nothing. Carelessness may cost you your life." – Safety saying, early 1900s*

Overview

Slips, trips, and Falls account for 20% of all accidents, injuries, and fatalities in the workplace and over 35% in the construction industry. In chapter 11 the focus was on fall hazards that must be managed when work must occur on elevated surfaces. In this chapter the focus will be on the structural design standards for stairways and also the design and performance characteristics of ladders. Ladders are portable and very important to construction activities. Falls may occur from ladders and it is important to ensure this special category of safety equipment is up to the task.

Chapter Objective:

1. Identify the Do's & Don'ts of Ladder Safety.
2. Understand the Requirements of Subpart X-Ladders & Stairways.
3. Understand the Construction Requirements for Temporary Ladders & Stairways.

Learning Outcome:

1. Apply the hierarchy of controls to ladder safety standards.
2. Determine how to select the proper ladder for the job.

Standards: 1926 Subpart X-Stairways and Ladders

Key Terms:

Double-Cleated Ladder, Pan Stairs, Rungs

Mini-Lecture: Ladder Safety

Topic Required Time: 1 hrs; Independent Study and reflection 3/4 hour.

17.1: Introduction to Stairways and Ladders

Introduction

Ladders are one of the most frequently used tools on the jobsite. Unfortunately, they are also one of the most abused and mistreated. Some of the most serious accidents that electrical workers have involve falls from six foot ladders. Accident studies show there are several factors that are common to most ladder accidents. Standing on the top step of a ladder, or standing above the maximum permitted height are frequently cited as factors in ladder accidents. Overreaching on the ladder is another commonly cited contributor to ladder accidents. Another common factor in ladder accidents is the use of the wrong ladder for the job. Using ladders with conductive side rails or using a step-ladder as a straight ladder are two good examples of ladder misapplication.

General Requirements

A stairway or ladder, for personnel access, shall be provided whenever there is a break in elevation of 19 inches or more. Stairways and ladders are not required where a ramp, sloped embankment, runway, or personnel hoist is provided.

Spiral stairways are not permitted for employees on construction sites unless they are part of the structure on which the construction work is being performed.

A double-cleated ladder or two or more separate ladders shall be provided when ladders are the only means of access or exit from a working area for 25 or more employees or when a ladder is used for simultaneous two-way traffic.

Each building or structure shall have at least one point of access between levels and that point shall be kept clear to permit free passage of employees.

Stairways

Installation Requirements

Temporary stairways shall be equipped with landings of not less than 30 inches in the direction of travel and extend at least 22 inches in width at every 12 feet, or less, of vertical rise.

Stairways shall be installed between 30 degrees and 50 degrees from horizontal. Riser height and tread depth shall be within 1/4" of uniform heights and depths in any stairway system.

Where doors or gates open directly on a stairway, the swing of the door or gate shall not reduce the effective width of the platform to less than 20 inches.

Pan stairs

Stairways with pan stairs, where the treads and/or landings are not filled, shall not be used for foot traffic unless the treads and/or landings are temporarily fitted with wood or other material to the top edge of each pan.

Requirements for stairways rising more than 30 inches

Stairways having four or more risers or rising more than 30 inches shall be equipped with the following:

1. At least one handrail.
2. One vertical barrier along the unprotected sides to prevent employees from falling to lower levels.

Construction requirements

Construction of stairways shall also meet the following requirements:

1. The height of the stairrails shall not be less than 36 inches from the upper surface of the stairrail system to the surface of the tread, in line with the face of the riser at the forward edge of the tread.
2. Midrails, when used, shall be installed midway between the top edge of the stairrail and the stairway steps.
3. If Midrails are not used then screens, mesh or intermediate vertical members shall be provided between the top of the stairrail and the stairway steps.
4. When screens or mesh are used, they shall extend from the top rail of the stairway to the stairway step.
5. When intermediate vertical members are used they shall not be more than 19 inches apart.

6. Handrails and the top rails of stairrails shall be capable of withstanding, without failure, a force of at least 200 pounds, applied within two inches of any point along the top edge.
7. The height of handrails shall not be more than 37 inches nor less than 30 inches from the upper surface of the handrail to the surface or the tread.
8. Stairrail systems and handrails shall not be constructed with surfaces that can cause lacerations or puncture, nor shall their ends constitute a projection hazard.
9. Handrails, not part of the permanent structure, shall have a minimum clearance of three inches between the handrail and the walls or other objects.

Ladders

Ladders shall be constructed in accordance with the following requirements:

1. Self-supporting and portable ladders shall be designed to handle four times the maximum intended load. Fixed ladders shall be capable of handling at least two loads of 250 pounds each, concentrated between any two consecutive attachments, plus any anticipated loads. Steps or rungs shall be capable of handling at least 250 pounds, applied in the middle of the step or rung.
2. Rungs, cleats and steps of portable and fixed ladders shall be spaced at not less 10 inches and not more than 14 inches apart.
3. The rungs and steps of fixed metal ladders shall be corrugated, knurled, dimpled, coated with skid resistant material or otherwise treated to minimize slippage.
4. In general, when two or more separate ladders are used to reach an elevated work area, the ladders shall be offset with a platform or landings between ladders.
5. Except for use in elevator pits, the minimum perpendicular clearance between fixed ladder rungs or steps and any objects behind the ladder, shall be seven inches.
6. Where the total length of the climb is equal to or greater than 24 feet, the ladder shall be equipped with one of the following:
    - Ladder safety device.
    - Self-retracting lifelines with rest platforms at intervals not exceeding 150 feet.
    - A cage or well, and multiple ladder sections, each section of which is offset from adjacent sections, with landing platforms at intervals not exceeding 50 feet.

Ladder Use

All ladders, including job-made ladders, shall be used in accordance with the following requirements:

1. If portable ladders are used to gain access to upper floors, the ladder siderails shall extend at least three feet above the upper landing surface. If the ladders length does not permit such an extension, then the ladder must be secured at the top to a rigid support and a grabrail or other grasping device shall be provided.
2. Ladders shall not be loaded beyond the maximum load and shall not be used for other than the purpose for which they were designed.
3. Non-self-supporting ladders shall be used at an angle such that the horizontal distance from the top of the support to the foot of the ladder is approximately one quarter of the working length of the ladder.
4. Ladders shall only be used on stable and level surfaces unless secured to prevent accidental displacement.
5. Ladders shall be so located that they are protected from displacement by workplace activities. If ladders are placed in such locations, like stairways and doorways, they shall be secured to prevent accidental displacement or a barricade shall be erected.
6. The areas around the top and bottom of ladders shall be kept clear.
7. Ladders, shall not be moved, shifted or extended while occupied. "Walking" ladders to a different location is not permitted.
8. Ladders used where the worker could be exposed to energized electrical equipment, shall be equipped with nonconductive siderails.
9. The top or top step of a step ladder shall not be used as a step.

Training

Employer responsibilities

The employer shall provide a training program for each employee to learn proper usage of ladders and stairways, as necessary. The program shall enable each employee to recognize hazards related to ladders and stairways, and the employer shall conduct training that includes the procedures to be followed to minimize these hazards.

Employee training

The employer shall ensure that each employee has been trained by a competent person in the following areas, as applicable:

- The nature of the fall hazards in the work area.
- The correct procedure for erecting, maintaining, and disassembling the fall protection systems to be used.
- The proper construction, use, placement, and care in handling of all stairways and ladders.
- The maximum intended load-carrying capacities of the ladders used.
- The standards contained in Subpart X.

Retraining

Retraining shall be provided for each employee as necessary so that the employee maintains the understanding and knowledge acquired through compliance with this section.

17.A: Review Questions

Complete as directed.

Fill in the Blanks:

1. A stairway or ladder, for personal access, shall be provided whenever there is a break in elevation of_____inches or more.
2. _____ stairways are not permitted for employees on construction sites unless they are part of the structure on which the construction work is being performed.
3. A_____ ladder, or two or more separate ladders shall be provided when ladders are the only means of access or exit from a working area for 25 or more employees or when a ladder is used for simultaneous two-way traffic.
4. Each building or structure shall have at least_____point of access between levels and the point shall be kept clear to permit free passage of employees.
5. Temporary stairways shall be equipped with landings of not less than_____ inches in the direction of travel and extend at least 22 inches in width at every 12 foot of vertical rise.
6. The construction of stairways shall be such that the height of the stair rails shall not be less than_____inches from the upper surface of the stand rail system to the surface of the tread, in line with the face of the riser at the forward and of the tread.
7. Handrails and the top rails of stair rails shall be capable of withstanding, without failure, a force of at least_____pound, applied within _____inches of any point along the top edge.
8. Self-supporting and portable ladders shall be designed to handle_____times the maximum intended load. Fixed ladder shall be capable of handling at least two loads ofpounds each, concentrated between any two consecutive attachments, plus any anticipated loads.
9. The height of handrails shall not be more than _____inches or less than_____inches from the upper surface of the handrail to the surface of the tread.

True or False: (Circle the Correct Answer)

10. T or F

Stairways with pan stairs, where the tread and/or landings are not fill-in, shall not be used for foot traffic, unless the tread and/or landings are temporarily fitted with wood or other materials to the top edge of the each pan.

CHAPTER OVERVIEW

18: Confined Spaces

> *"The danger which is least expected soonest comes to us." – Voltaire*

Overview

Some of the most hazardous environments workers may encounter are the atmospheres of confined spaces. Workers caught in confined spaces often never even knew what hit them. Oxygen deficient and toxic atmospheres can quickly overcome workers. It is important to recognize the physical characteristics of a confined space as well as recognizing when work impacting air quality in poorly ventilated spaces produces confined space conditions. This chapter will identify the many examples of confined spaces and the hazards that must be managed when working in or near them.

Chapter Objective:

1. Determine how to Identify Confined Spaces.
2. Identify the Hazards Associated with Confined Spaces.
3. Understand the Responsibilities of the Entrant, Attendant and Entry Supervisor.
4. Determine the Proper Procedures for Entering and Working in a Confined Space.

Learning Outcome:

1. Understand the conditions of a permit required confined space.
2. Identify the control measures on a confined space permit.

Standards: 1926 Subpart AA Confined Spaces in Construction, 1910.145 Permit Required Confined Spaces

Key Terms:

Attendant, engulfment, entrapment, entrant, hot work permit

Mini-Lecture: Confined Spaces

Topic Required Time: 1 hrs; Independent Study and reflection 3/4 hour.

18.1: Introduction to Confined Spaces

Introduction

Confined Spaces are encountered on many types of jobsites. OSHA defines a confined space as one that has limited or restricted means of entry or exit, is large enough for an employee to enter and perform work, and is not designed for continuous employee occupancy. OSHA also classifies permit-required confined spaces. The spaces meet the definition of a confined space as above, but have one or more of the following:

1. The potential to contain hazardous atmospheres.
2. Contains materials that have the potential to engulf the entrant.
3. Has an internal configuration with inwardly converging walls or floors that slope downward.
4. Contains other recognized serious safety or health hazards.

Examples of Confined Spaces

Examples of confined spaces include **silos, vats, hoppers, utility vaults, tanks, sewers, pipes, access shafts, truck or rail tank cars**, **aircraft wings, boilers, manholes, manure pits and storage bins. Ditches and trenches** may also be a confined space when access or egress is limited, as well as attic and subfloor crawl spaces or other spaces subject to the accumulation of hazardous atmospheres.

Permit-Required Written Program

If employers have permit-required confined spaces that employees will enter, then they must develop a written PERMIT SPACE program. In addition, if contractors are hired by the employer, they must be made aware of permit spaces and permit space entry requirements, any identified hazards, and precautions or procedures to be followed when in or near permit spaces.

Required components

Some of the required components of the written permit space program that the employer must ensure are carried out are:

1. Identify & evaluate permit space hazards.
2. Test conditions in the Confined space before entry begins and monitor the space during entry.
3. Perform appropriate atmospheric testing for oxygen combustible gases or vapors, and toxic gases or vapors.
4. Means to prevent unauthorized entrance into confined spaces.
5. Means to verify acceptable entry conditions.
6. Identify employee job duties.
7. Provide the required PPE for entrants.
8. Ensure at least one attendant is stationed outside the confined space at all times.
9. Implement proper procedures for summoning rescue and emergency services.

Permit system requirements

An important part of a confined space program is a workable system for issuing confined space entry permits. The permit system must provide means for:

1. Issuance of a permit, signed by the entry supervisor and verifying that pre-entry preparations have been completed and that the space is safe to enter. The duration of the permit must not exceed the time required to complete the work.
2. Use of permits that contain the atmospheric test results, tester's initials, name and signature of entry supervisor, name of permit space to be entered, names of entrant, attendant and supervisor, purpose of entry, control measures, such as lockout/tagout that need to be taken, name & phone number of rescue services, date and duration of entry, acceptable entry conditions, communication procedures, additional permits required, such as: hot work, special equipment or procedures required, and any other information needed to ensure employee safety.

Training and Education

Employer requirements

Employers must ensure that all workers who are required to work in confined spaces be adequately trained. Training must occur before the initial assignment, if job duties change, if there is a change in the permit space program, or when the employee shows

deficiencies in his or her job performance.

Rescue team member training

Training is also required for rescue team members, including CPR and first-aid training. Upon completion of training, employees must receive a certificate of training containing the employee's name, the name of the trainer, and the date of the training.

Job Duties

Authorized Entrant

The authorized entrant is the employee who is permitted to enter the permit-required confined space. The entrant's duties are as follows:

1. Know the space hazards including the signs of exposure.
2. Use the required and appropriate PPE.
3. Maintain communication with authorized attendant.
4. Exit from permit space as soon as ordered by attendant and when signs or symptoms of exposure exist.
5. Alert the attendant when a prohibited condition exists.

Authorized Attendants

The attendant is the employee who stands by, at the entrance to the confined space, while an entrant is inside. The attendant's duties are as follows:

1. Remain outside the space during the entry unless relieved by another authorized attendant.
2. Perform non-entry rescue when necessary.
3. Know existing and potential space hazards.
4. Maintain communication with authorized entrant.
5. Order evacuation of space when a prohibited condition exists or when worker shows signs of exposure.
6. Summon rescue and emergency services when necessary.
7. Ensure that unauthorized personnel do not enter spaces.
8. Inform authorized entrants and entry supervisor of entry by unauthorized persons.
9. Perform no other duties that interfere with the attendant's primary duties.

Entry Supervisor

The entry supervisor is the person who takes the responsibility of implementing the procedures of the confined space program. The responsibilities of the entry supervisor are to

1. Know the space hazards and the signs or symptoms of exposure.
2. Verify that the required emergency plans, permits tests and procedures have been followed before allowing entry.
3. Terminate entry and cancel permits when entry is complete or the entry conditions change.
4. Ensure unauthorized entrants are promptly removed.
5. Ensure that entry procedures remain consistent with the entry permit and that acceptable entry conditions are maintained.

Emergencies

The last part of the standard contains provisions for the summoning of rescue squads or emergency services in the event that there is a problem during the entry. The standard requires that:

1. The rescue squad be trained in the proper use of PPE and rescue equipment and be properly equipped to perform the rescue.
2. All rescuers must be trained in first-aid and CPR and at least one rescue team member must be currently certified as such. The rescue team must practice rescue exercises annually under actual rescue conditions.
3. Entrants who must enter a permit space must wear a chest or full body harness with a retrieval line attached to the center of the back near the shoulder level, or above their heads. Wristlets may be used where the use of a chest or body harness is infeasible or creates a greater hazard.
4. The other end of the retrieval line must be connected to a mechanical device or a fixed point outside the permit space. If the space contains a vertical depth of five feet or more, a mechanical device must be available to retrieve personnel.
5. SDS sheets, for the substances in the confined space(s), must be available to the medical facility treating the exposed entrant.

18.A: Review Questions-Confined Spaces

Complete as directed.

Multiple Choice: (Circle Correct Letter)

1. Which of the following conditions is or are necessary to have an OSHA defined confined space:

a. Limited or restricted means of entry or exit.

b. Large enough for an employee to enter and perform work.

c. Not designed for continuous employee occupancy.

d. All of the above.

e. None of the above.

2. Permit-Required Confined Spaces are confined spaces with which of the following:

a. The potential to contain hazardous atmospheres.

b. Contains materials that have the potential to engulf the entrant.

c. Has an internal configuration with inwardly converging walls or floors that slope downward

d. Contains other recognized serious safety or health hazards,

e. (a.) and (d.) only,

f. Anyone of the above.

3. Employers must ensure that all workers who are required to work in confined spaces be adequately trained. Training must occur:

a. Before the initial assignment.

b. If job duties change.

c. There is a change in the permit space program.

d. When the employee shows deficiencies in his or her job performance.

e. If any of the above occur.

f. If all of the above have occurred.

True or False: (Circle the Correct Answer)

4. T or F

One of the primary responsibilities for the confined space entrant is to use the required and appropriate PPE.

5. T or F

The attendant is the employee who stands by, at the entrance to the confined space, while an entrant is inside. The attendant's primary duty is to perform an entry rescue whenever the entrant needs assistance.

6. T or F

The attendant is not permitted perform any other jobs that may interfere with their primary duties.

General:

7. One of the_____ responsibilities is to ensure that entry

procedures remain consistent with the entry permit and that acceptable entry conditions are maintained.

8. All confined space rescuers must be trained in_____ and

_____ and at least one rescue team member is currently certified as such.

9. Entrants who must enter a permit space must wear a _____ or_____

_____harness with a retrieval line attached to the center of the back near the shoulder level or above their heads.

10. If the permit space contains a vertical depth of_____ft. or more, a mechanical device must be available to retrieve personnel.

11_____for the substances in the confined spaces must be available to the medical facility treating the exposed entrant.

CHAPTER OVERVIEW

19: Lock out Tag out

> *"Your employees learn by example. If they don't see you practicing good safety habits, they won't think safety is important." – Electrical Construction & Maintenance*

Overview

OSHA places much emphasis on equipment safety. Workers are safe when the tools and equipment they use to perform a task are in good working order or operable. Worker safety is therefore wedded to equipment safety. Routine and repetitive maintenance of equipment is a core safety function and an essential workplace practice. Workers whose responsibility it is to repair and maintain equipment, machines, must work safely and be protected during equipment servicing.

It is while equipment is being serviced that machine guards are removed and safety interlocks disabled when workers are the most exposed to operating points and power transmission devices. It is imperative that all energy sources that control the affected equipment be isolated and prevented from being energized. Lockout/Tagout is a hybrid in the hierarchy of controls having elements of both engineering and work practice controls. It is a critical program that must be activated where ever workers service equipment.

Chapter Objective:

1. Determine the Scope and Application of Standard 1910.147.
2. Identify the elements of an effective Lockout/Tagout program.
3. Review the employee role and responsibilities in an effective Lockout/Tagout program.

Learning Outcome:

1. Apply hierarchy of controls to lockout/tagout standard.
2. Select the elements of the 1910.147 standard that can be used to meet the 1926 Lockout/Tagout standard requirements.

Standards: Subpart K 1926.417 Lockout and Tagout of Circuits, 1910.147 Control of Hazardous Energy

Key Terms:

Hazardous Energy, key blocks, self-locking fasteners, wedge

Mini-Lecture: Lockout/Tagout and Machine Guarding

Topic Required Time: 1 hrs; Independent Study and reflection 3/4 hour.

19.1: Introduction to Lock out Tag out

Introduction

Since OSHA's formation in the 1970's they have adopted various lockout/tagout related provisions from existing national consensus standards and other Federal standards, which were developed for specific types of equipment or industries. In 1990 a new standard 1910.147 Control of Hazardous Energy (Lockout/Tagout) went into effect. This standard seeks to safeguard employees from the unexpected startup of machinery or equipment or release of hazardous energy while performing service or maintenance work.

Application to construction

The provisions of 1910.147 standard, while not mandatory for construction, provide a good foundation for safe lockout/tagout procedures no matter where the maintenance operation occurs. The OSHA 1910.147 standard is intended to be used when electrical supply lines are being de-energized for the purpose of performing maintenance type operations. While a comprehensive lockout/tagout standard does not exist for construction there are components of some standards that require this protection. These lockout/tagout provisions will also be reviewed in this lesson.

Scope and Application

The Lockout/Tagout standard covers the servicing and maintenance of machines and equipment in which the "unexpected" energizing or startup of the machines or equipment, or release of stored energy could cause injury to employees. The standard establishes minimum performance requirements for the control of such hazardous energy.

This standard does not cover the following:

1. Construction, agriculture and maritime employment;
2. Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution including related equipment for communication or metering; and
3. Exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations, which is covered by Subpart S.
4. Oil and gas well drilling and servicing.

Normal production operations

Normal production operations are not covered by this standard (See Subpart 0 of this Part). Servicing and/or maintenance which takes place during normal production operations is covered by this standard only if:

1. An employee is required to remove or bypass a guard or other safety device; or
2. An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

Minor tool changes and adjustments

Minor tool changes and adjustments, and other minor servicing activities which take place during normal production operations, are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection.

Application of standard

This standard does not apply to the following:

1. Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energizing or startup of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.
2. Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines, provided that the employer demonstrates that-
    - continuity of service is essential;

- shutdown of the system is impractical; and
- documented procedures are followed, and special equipment is used which will provide proven effective protection for employees.

Definitions

The following definitions are applicable to the lockout/tagout standard:

Affected employee: An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Authorized employee: A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.

Capable of being locked out: An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized: Connected to an energy source or containing residual or stored energy.

Energy isolating device: A mechanical device that physically prevents the transmission or release or energy, including but not limited to the following: A manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

Energy source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Hot tap: A procedure used in the repair maintenance and services activities which involves welding on a piece of equipment (pipelines vessels or tanks) under pressure, in order to install connections or appurtenances, it is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Lockout: The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device: A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

Normal production operations: The utilization of a machine or equipment to perform its intended production function.

Servicing and/or maintenance: Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energizing or startup of the equipment or release of hazardous energy.

Setting up: Any work performed to prepare a machine or equipment to perform its normal production operation.

Tagout: The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout device: A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tag out device is removed.

Energy Control Program

General

The employer shall establish a program consisting of energy control procedures, employee training and periodic inspections to ensure that before any employee performs any servicing or maintenance on a machine or equipment where the unexpected

energizing, startup or release of stored energy could occur and cause injury, the machine or equipment shall be isolated from the energy source and rendered inoperative.

Not capable of being locked out

If an energy isolating device is not capable of being locked out, the employer s energy control program shall utilize a tagout system.

Capable of being locked out

If an energy isolating device is capable of being locked out, the employer energy control program shall utilize lockout, unless the employer can demonstrate that the utilization of a tagout system will provide full employee protection.

Effective date

After January 1990, whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machine or equipment shall be designed to accept a lockout device.

Tag out device use

When a tagout device is used on an energy isolating device which is capable of being locked out, the tagout device shall be attached at the same location that the lockout device would have been attached, and the employer shall demonstrate that the tagout program will provide a level of safety equivalent to that obtained by using a lockout program.

Full employee protection

In demonstrating that a level of safety is achieved in the tag out program which is equivalent to the level of safety obtained by using a lockout program, the employer shall demonstrate full compliance with all tagout-related provisions of this standard together with such additional elements as are necessary to provide the equivalent safety available from the use of a lockout device. Additional means to be considered as part of the demonstration of full employee protection shall include the implementation of additional safety measures such as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle to reduce the likelihood of inadvertent energizing.

19.2: Energy Control Procedure

Energy Control Procedure

General

Procedures shall be developed, documented and utilized for the control of potentially hazardous energy when employees are engaged in the activities covered by this section.

Procedure requirements

The procedures shall clearly and specifically outline the scope, purpose, authorization, rules, and techniques to be utilized for the control of hazardous energy, and the means to enforce compliance.

Protective Materials and Hardware

General

Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided by the employer for isolating, securing or blocking of machines or equipment from energy sources.

Lockout and tagout device requirements

Lockout devices and tagout devices shall be singularly identified; shall be the only device(s) used for controlling energy; shall not be used for other purposes; and shall meet the following requirements:

Durable:

1. Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.
2. Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.
3. Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled and stored.

Standardized:

Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: Color; shape; or size; and additionally, in the case of tagout devices, print and format shall be standardized.

Substantial:

1. Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.
2. Tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece all environment- tolerant nylon cable tie.

Identifiable:

Lockout devices and tag out devices shall indicate the identity of the employee applying the device(s).

Tagout device warnings

Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: "Do Not Start. Do Not Open. Do Not Close. Do Not Energize. Do Not Operate."

Inspection of procedure

The employer shall conduct a periodic inspection of the energy control procedure at least annually to ensure that the procedure and the requirements of this standard are being followed.

The periodic inspection shall

1. be performed by an authorized employee other than the one(s) utilizing the energy control procedure being inspected.
2. be conducted to correct any deviations or inadequacies identified.
3. where lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized employee, of that employee s responsibilities under the energy control procedure being inspected.
4. where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee, of that employees responsibilities under the energy control procedure being inspected, and the limitations of tags.
5. be certified by the employer. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, the employees included in the inspection, and the person performing the inspection.

Training and Communication

Training

The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. The training shall include the following:

1. Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.
2. Each affected employee shall be instructed in the purpose and use of the energy control procedure.
3. All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or re-energize machines or equipment which are locked out or tagged out.

Tagout system training

When tagout systems are used, employees shall also be trained in the following limitations of tags:

1. Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.
2. When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated
3. Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.
4. Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.
5. Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.
6. Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

Retraining

Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change of or to machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

Additional retraining shall also be conducted whenever the periodic inspection, required by the standard, reveals, or whenever the employer has reason to believe that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

19.3: Energy Isolation

Energy Isolation

Lockout or tagout shall be performed only by the authorized employees who are performing the servicing or maintenance.

Affected employees

Affected employees shall be notified by the employer or authorized employee of the application and removal of lockout devices or tagout devices. Notification shall be given before the controls are applied, and after they are removed from the machine or equipment.

Elements of the procedure

The established procedures for the application of energy control (the lockout or tagout procedures) shall cover the following elements and actions and shall be done in the following sequence:

1. **Preparation for shutdown.** Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.
2. **Machine or equipment shutdown.** The machine or equipment shall be turned off or shut down using the procedures established for the machine or equipment. An orderly shutdown must be utilized to avoid any additional or increased hazard(s) to employees as a result of the equipment stoppage.
3. **Machine or equipment isolation.** All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from the energy source(s).
4. **Lockout or tagout device application.** A Lockout or tagout device shall be affixed to each energy isolating device by an authorized employee. Lockout devices, where used, shall be affixed in a manner to that will hold the energy isolating devices in a "safe" or "off" position. Tagout devices, where used, shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the "safe" or "off" position is prohibited. Where tagout devices are used with energy isolating devices designed with the capability of being locked, the tag attachment shall be fastened at the same point at which the lock would have been attached. Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.
5. **Stored energy.** Following the application of logout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected restrained, and otherwise rendered safe. If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.
6. **Verification of isolation.** Prior to starting work on machines or equipment that have been locked out or tagged out; the authorized employee shall verify that isolation and de-energization of the machine or equipment have been accomplished.

Release From Lockout or Tagout

Before lockout or tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized employee(s) to ensure the following:

1. **The machine or equipment.** The work area shall be inspected to ensure that nonessential items have been removed and to ensure that machine or equipment components are operationally intact.
2. **Employees.** The work area shall be checked to ensure that all employees have been safely positioned or removed. Before lockout or tagout devices are removed and before machines or equipment are energized, affected employees shall be notified that the lockout or tagout devices have been removed. After lockout or tagout devices have been removed and before a machine or equipment is started, affected employees shall be notified that the lockout or tagout device(s) have been removed.
3. **Lockout or tagout devices removal.** Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device. When the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of the employer, provided that specific procedures and training for such removal have been developed, documented and incorporated into the employer’s energy control program. The employer shall demonstrate that the specific procedure shall include at least the following elements:

- Verification by the employer that the authorized employee who applied the device is not at the facility:
- Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and
- Ensuring that the authorized employee has this knowledge before he/she resumes work at that facility.

Outside Personnel (Contractors, etc.)

Communication

Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer shall inform each other of their respective lockout or tag out procedures.

The on-site employer shall ensure that his/her employees understand and comply with the restrictions and prohibitions of the outside employer energy control program.

Group Lockout or Tagout

When servicing and/or maintenance is performed by a crew, craft department or other group, they shall utilize a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

Requirements

Group lockout or tagout devices shall be used in accordance with the energy control procedures covered above. They shall include, but not necessarily be limited to, the following specific requirements:

1. Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device (such as an operations lock);
2. Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment and;
3. When more than one crew, craft, department, etc. is involved assignment of overall job-associated lockout or tagged control responsibility to an authorized employee designated to coordinate affected work forces and ensure continuity of protection; and
4. Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

Shift or Personnel Changes

Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees, to minimize exposure to hazards from the unexpected energizing or startup of the machine or equipment, or the release of stored energy.

19.A: Review Questions

Complete as directed.

Multiple Choice: (Circle the Correct Answer)

1. A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment would be classified as a(n)_____ for the purposes of the lockout/tagout standard.

a. Affected person

b. Authorized person

c. Competent person

d. Qualified person

2. An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed would be classified as an_____ for the purposes of the lockout/tagout standard.

a. Affected person

b. Authorized person

c. Competent person

d. Qualified person

3. Lockout and tagout devices shall be standardized within the facility by at least one of the following criteria:

a. Color

b. Shape

c. Size

d. Any of the above

4. The employer shall conduct a periodic inspection of the energy control procedure at least_____to ensure that the procedure and the requirements of this standard are being followed.

a. Daily

b. Weekly

c. Monthly

d. Annually

Fill in the Blanks:

5. _____ shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

6. Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall_____ that isolation and deenergization of the machine or equipment have been accomplished.

7. If an energy isolating device is capable of being locked out, the employer s energy control program shall utilize lockout, unless the employer can demonstrate that the utilization of a_____system will provide full employee protection.

8. _____ shall be developed, documented and utilized for the control of potentially hazardous energy when employees are engaged in the activities covered by this section.

9. Lockout and tagout devices shall be capable of withstanding the _____to which they are exposed for the maximum period of time that exposure is expected.

10. Tagout device attachment means shall be of a non-reusable type attachable by hand self-locking, and non-releasable with minimum unlocking strength of no less than

_____pounds and having the general design and basic characteristics of being at least equivalent to a one-piece all environment-tolerant nylon cable tie.

CHAPTER OVERVIEW

20: Walking and Working Surfaces

> *"An incident is just the tip of the iceberg, a sign of a much larger problem below the surface." – Don Brown*

Overview

Walking and working surfaces are many and vary widely. Yet the walking-working surfaces standard is sparse on specific safety requirements for every type of surface and existing direction is rather generic. This does not mean however that the safety standards are not comprehensive. The standard simply states upfront that: All places of employment, passageways, storerooms, service rooms, and walking-working surfaces are kept in a clean, orderly, and sanitary condition. This simple premise speaks volumes.

Slips, trips, and falls are one of the leading causes of workplace incidents, accidents, and fatalities. Working surfaces should not be the cause of these and every employer must understand what clean, orderly, and sanitary looks like for their specific environments.

The working-walking surfaces standard has within its scope safety requirements on ladders, stairways, scaffolds, and dock boards specifically, but must apply to every surface a worker is expected to perform work.

Chapter Objective:

1. Understand the scope of the walking-working surfaces standard.
2. Discuss fall prevention methods.
3. Discuss fall protection methods.

Learning Outcome:

1. Apply housekeeping best practices for maintaining walking-working surfaces.
2. Understand and apply best fall prevention and protection methods for the job.

Standards: 1910 Subpart D Walking-Working Surfaces, 1910 Subpart F Powered Platforms, Man lifts, Vehicle Mounted Work Platforms

Key Terms:

Arrest, deceleration, guardrails, mid-rail, step bolt, travel restraint

Mini-Lecture: Walking-Working Surfaces

Required Time: 1 hour; Independent Study and reflection 1 ½ hour.

20.1: Introduction to Walking and Working Surfaces

Introduction

Workers in many diverse general industry workplaces are exposed to walking-working surface hazards that can result in slips, trips, falls and other injuries or fatalities. According to the Bureau of Labor Statistics (BLS) data, slips, trips, and falls are a leading cause of workplace fatalities and injuries in general industry, which indicates that workers regularly encounter these hazards.

In January 2017 OSHA finalized rulemaking that increased safety expectations for all surfaces, including but not limited to, floors, ladders, stairways, runways, dock boards, roofs, scaffolds, and elevated work surfaces and walkways. Within the new rules there were changes to safety requirements for fixed ladder standards, rope descent systems, fall protections systems, and training. The intent of the changes was to reduce the risk of falls by any means or cause. The best interpretation is that the surface shall not contribute to a fall and that protection be used to minimize serious injury.

General Requirements

The following general requirements for surface conditions and working surfaces to include ladders and rope descent systems cover traditional surfaces such as floors, subfloors, grounds, platforms, and even flat surfaces such as rooftops. Employers must consider all surfaces that employees occupy for the purposes of performing work to meet requirements for cleanliness, physical condition, load capacity, and maintenance. The standards detailed are not a comprehensive list for each surface type but rather a representation of selected minimum expectations.

A. Surface conditions. The employer must ensure:

1. All places of employment, passageways, storerooms, service rooms, and walking-working surfaces are kept in a clean, orderly, and sanitary condition.
2. The floor of each workroom is maintained in a clean and, to the extent feasible, in a dry condition. When wet processes are used, drainage must be maintained and, to the extent feasible, dry standing places, such as false floors, platforms, and mats must be provided.
3. Walking-working surfaces are maintained free of hazards such as sharp or protruding objects, loose boards, corrosion, leaks, spills, snow, and ice.

B. Loads. The employer must ensure that each walking-working surface can support the maximum intended load for that surface.

C. Access and egress. The employer must provide, and ensure each employee uses, a safe means of access and egress to and from walking-working surfaces.

D. Inspection, maintenance, and repair. The employer must ensure:

1. Walking-working surfaces are inspected, regularly and as necessary, and maintained in a safe condition;
2. Hazardous conditions on walking working surfaces are corrected or repaired before an employee uses the walking-working surface again. If the correction or repair cannot be made immediately, the hazard must be guarded to prevent employees from using the walking-working surface until the hazard is corrected or repaired; and
3. When any correction or repair involves the structural integrity of the walking-working surface, a qualified person performs or supervises the correction or repair.

Ladders

E. General requirements for all ladders. The employer must ensure:

- Ladder rungs, steps, and cleats are parallel, level, and uniformly spaced when the ladder is in position for use;
- Ladder rungs, steps, and cleats are spaced not less than 10 inches (25 cm) and not more than 14 inches (36 cm) apart, as measured between the centerlines of the rungs, cleats, and steps, except that:
- Ladder rungs and steps in elevator shafts must be spaced not less than 6 inches (15 cm) apart and not more than 16.5 inches (42 cm) apart, as measured along the ladder side rails; and
- Fixed ladder rungs and steps on telecommunication towers must be spaced not more than 18 inches (46 cm) apart, measured between the centerlines of the rungs or steps;
- Steps on stepstools are spaced not less than 8 inches (20 cm) apart and not more than 12 inches (30 cm) apart, as measured between the centerlines of the steps.

- Stepstools have a minimum clear width of 10.5 inches (26.7 cm);
- Wooden ladders are not coated with any material that may obscure structural defects;
- Metal ladders are made with corrosion-resistant material or protected against corrosion;
- Ladder surfaces are free of puncture and laceration hazards;
- Ladders are used only for the purposes for which they were designed;
- Ladders are inspected before initial use in each work shift, and more frequently as necessary, to identify any visible defects that could cause employee injury;
- Any ladder with structural or other defects is immediately tagged "Dangerous: Do Not Use" or with similar language in accordance with § 1910.145 and removed from service until repaired in accordance with § 1910.22(d), or replaced;
- Each employee faces the ladder when climbing up or down it;
- Each employee uses at least one hand to grasp the ladder when climbing up and down it; and
- No employee carries any object or load that could cause the employee to lose balance and fall while climbing up or down the ladder.

Step Bolts

F. Step bolts. The employer must ensure:

- Each step bolt installed on or after January 17, 2017 in an environment where corrosion may occur is constructed of, or coated with, material that protects against corrosion;
- Each step bolt is designed, constructed, and maintained to prevent the employee's foot from slipping off the end of the step bolt;
- Step bolts are uniformly spaced at a vertical distance of not less than 12 inches (30 cm) and not more than 18 inches (46 cm) apart, measured center to center (see Figure D-6 of this section). The spacing from the entry and exit surface to the first step bolt may differ from the spacing between the other step bolts;
- Each step bolt has a minimum clear width of 4.5 inches (11 cm);
- The minimum perpendicular distance between the centerline of each step bolt to the nearest permanent object in back of the step bolt is 7 inches (18 cm). When the employer demonstrates that an obstruction cannot be avoided, the distance must be at least 4.5 inches (11 cm);
- Each step bolt installed before January 17, 2017 is capable of supporting its maximum intended load;
- Each step bolt installed on or after January 17, 2017 is capable of supporting at least four times its maximum intended load;
- Each step bolt is inspected at the start of the workshift and maintained in accordance with § 1910.22; and
- Any step bolt that is bent more than 15 degrees from the perpendicular in any direction is removed and replaced with a step bolt that meets the requirements of this section before an employee uses it.

20.2: Stairways

Stairways

G. The employer must ensure:

- Handrails, stair rail systems, and guardrail systems are provided in accordance with § 1910.28;
- Vertical clearance above any stair tread to any overhead obstruction is at least 6 feet, 8 inches (203 cm), as measured from the leading edge of the tread. Spiral stairs must meet the vertical clearance requirements in paragraph (d)(3) of this section.
- Stairs have uniform riser heights and tread depths between landings;
- Stairway landings and platforms are at least the width of the stair and at least 30 inches (76 cm) in depth, as measured in the direction of travel;
- When a door or a gate opens directly on a stairway, a platform is provided, and the swing of the door or gate does not reduce the platform's effective usable depth to:
- Less than 20 inches (51 cm) for platforms installed before January 17, 2017; and
- Less than 22 inches (56 cm) for platforms installed on or after January 17, 2017 (see Figure D-7 of this section);
- Each stair can support at least five times the normal anticipated live load, but never less than a concentrated load of 1,000 pounds (454 kg) applied at any point;
- Standard stairs are used to provide access from one walking-working surface to another when operations necessitate regular and routine travel between levels, including access to operating platforms for equipment. Winding stairways may be used on tanks and similar round structures when the diameter of the tank or structure is at least 5 feet (1.5 m).

Dockboards

The employer must ensure:

- Dockboards are capable of supporting the maximum intended load in accordance with § 1910.22(b);
- Dockboards put into initial service on or after January 17, 2017 are designed, constructed, and maintained to prevent transfer vehicles from running off the dockboard edge;
- Portable dockboards are secured by anchoring them in place or using equipment or devices that prevent the dockboard from moving out of a safe position.
- Measures, such as wheel chocks or sand shoes, are used to prevent the transport vehicle (e.g. a truck, semitrailer, trailer, or rail car) on which a dockboard is placed, from moving while employees are on the dockboard; and
- Portable dockboards are equipped with handholds or other means to permit safe handling of dockboards.

Rope Descent Systems

Before any rope descent system is used, the building owner must inform the employer, in writing that the building owner has identified, tested, certified, and maintained each anchorage so it is capable of supporting at least 5,000 pounds (2,268 kg), in any direction, for each employee attached. The information must be based on an annual inspection by a qualified person and certification of each anchorage by a qualified person, as necessary, and at least every 10 years.

No rope descent system is used for heights greater than 300 feet (91 m) above grade unless the employer demonstrates that it is not feasible to access such heights by any other means or that those means pose a greater hazard than using a rope descent system;

The rope descent system is used in accordance with instructions, warnings, and design limitations set by the manufacturer or under the direction of a qualified person;

Each employee who uses the rope descent system is trained in accordance with § 1910.30;

The rope descent system is inspected at the start of each workshift that it is to be used. The employer must ensure damaged or defective equipment is removed from service immediately and replaced.

No employee uses a rope descent system when hazardous weather conditions, such as storms or gusty or excessive wind, are present;

Equipment, such as tools, squeegees, or buckets, is secured by a tool lanyard or similar method to prevent it from falling; and

The ropes of each rope descent system are protected from exposure to open flames, hot work, corrosive chemicals, and other destructive conditions.

Training

Before any employee is exposed to a fall hazard, the employer must provide training for each employee who uses personal fall protection systems or who is required to be trained as specified elsewhere in this subpart. Employers must ensure employees are trained in the requirements of this paragraph on or before May 17, 2017.

The employer must ensure that each employee is trained by a qualified person.

The employer must train each employee in at least the following topics:

1. The nature of the fall hazards in the work area and how to recognize them;
2. The procedures to be followed to minimize those hazards;
3. The correct procedures for installing, inspecting, operating, maintaining, and disassembling the personal fall protection systems that the employee uses; and
4. The correct use of personal fall protection systems and equipment specified in paragraph (a)(1) of this section, including, but not limited to, proper hook-up, anchoring, and tie-off techniques, and methods of equipment inspection and storage, as specified by the manufacturer.
5. Equipment hazards. The employer must train each employee on or before May 17, 2017 in the proper care, inspection, storage, and use of equipment covered by this subpart before an employee uses the equipment.

20.A: Review Questions

Complete as directed.

Fill in the blanks:

1. The floor of each workroom is maintained in a _____ and, to the extent possible, in a _____ condition.
2. Hazardous conditions on walking working surfaces are _____ or _____ before an employee uses the walking-working surface again. If the correction or repair cannot be made _____, the hazard must be guarded to prevent employees from using the walking-working surface until the hazard is corrected or repaired.
3. Wooden ladders are not _____ with any material that may obscure structural defects.
4. No employee _____ any object or load that could cause the employee to lose _____ and fall while climbing up or down the ladder.
5. Any step bolt that is bent more than 15 degrees from the _____ in any direction is removed and replaced with a step bolt that meets the requirements of this section before an employee uses it.
6. The _____ _____ system is used in accordance with instructions, warnings, and design limitations set by the manufacturer or under the direction of a qualified person.
7. Equipment, such as tools, _____, or buckets, is secured by a tool _____ or similar method to prevent it from falling.
8. Training on fall protection systems must include:

a. _____Fall hazard recognition

b. _____Rope descent systems

c. _____Portable dock boards

d. _____Equipment hazards

e. _____Correct use and storage

CHAPTER OVERVIEW

21: Safety and Health Programs

> *"The first question which the priest and the Levite asked was: 'If I stop to help this man, what will happen to me?' But...the good Samaritan reversed the question: 'If I do not stop to help this man, what will happen to him?" — Martin Luther King Jr.*

Overview

In the prior chapters we have looked at specific standards that address specific workplace hazards. However it is not sufficient for employers to just train employees on workplace hazards and the associated safety standards, there must be a systematic, consistent approach to keeping workplaces safe. OSHA requires employers to implement safety and health programs. The operative word is "programs". This simply means there must be a documented or written, logical and consistent process that raises employee awareness of occupational health and safety hazards and the associated standards necessary for keeping workplaces safe.

Chapter Objective:

1. Discuss best practices for establishing an effective health and safety program.
2. Identify typical health and safety programs required in most workplaces.

Learning Outcome:

1. Describe the goals and benefits of an effective safety and health program.

Standards: General Duty Section 5(a)(1)

Key Terms:

Compliance, IIPP, regulatory, plan, practices, program, programmatic, sustainable

Mini-Lecture: Safety and Health Programs

Topic Required Time: 1 hrs; Independent Study and reflection 3/4 hour.

21.1: Introduction to Safety and Health Programs

Programs

A program as defined by Merriman-Webster is a plan or system under which action may be taken toward a goal. It further defines programs to include applications and types that speak to documenting or outlining the details or arrangement of activity. The intent being that what is being communicated in a program can be duplicated and shared with consistency to all receiving the information.

The main goal of safety and health programs is to prevent workplace injuries, illnesses, and deaths, as well as the suffering and financial hardship these events can cause for workers, their families, and employers. An effective program uses a proactive approach to managing workplace safety and health. Traditional programs are often reactive –that is, problems are addressed only after a worker is injured or becomes sick, a new standard or regulation is published, or an outside inspection finds a problem that must be fixed. Programs implementing practices for finding and fixing hazards before they may result in injury or illness are far more effective for achieving health and safety goals. Documenting and highlighting the program approach is a best practice.

Best Practices

It is important to understand that simply complying with safety standards is not evidence that a safety and health program exists. Employers may often be in compliance simply because of institutional requirements for operating a business enterprise in certain jurisdictions. While compliance with standards is an objective, goals for health and safety should be higher. An overarching theme that goes beyond regulatory compliance should be to create a framework for identifying and controlling hazards, ensuring participation and communication, and achieving both safety and health and other organizational goals.

When starting or developing a health and safety program which may address existing workplace standards begin with a basic outline and simple goals and build from there. The focus should be on achieving goals, monitoring performance, and evaluating outcomes. When the focus is on goals or desired outcomes the workplace can achieve higher levels of safety and health.

OSHA suggests that employers implement recommended practices establishing effective programs for not only better worker health outcomes but other benefits as well. A few of those benefits include:

- Improved compliance with laws and regulations;
- Reduced operational costs, including significant reductions in workers' compensation premiums;
- More engaged workers;
- Enhanced social connectedness and responsibility for meeting environmental and sustainability goals;
- Increased productivity and enhanced business operations;

So what is the model for establishing and effective safety and health program? OSHA suggests employers follow these recommended best practices:

1. Set Safety and Health as a Top Priority

Always set safety and health as the top priority. Tell workers that making sure they finish the day and go home safely is the best way to do business. Assure them of the employer’s responsibility to work with them to find and fix any hazards that could injure them or make them sick.

2. Lead By Example

Employers must practice safe behaviors and make safety part of the daily conversations with workers.

3. Implement a Reporting System

Develop and communicate a simple procedure for workers to report any injuries, illnesses, incidents (including near misses/close calls), hazards, or safety and health concerns without fear of retaliation. Include an option for reporting hazards or concerns anonymously.

4. Provide Training

Train workers on how to identify and control hazards using, for example, OSHA’s Hazard Identification Training Tool.

5. Conduct Inspections

Inspect the workplace with workers and ask them to identify any activity, piece of equipment, or material that concerns them. Use checklists, such as those included in OSHA's Small Business Handbook, to help identify problems.

6. Collect Hazard Control Ideas

Ask workers for ideas on improvements and follow up on their suggestions. Provide them time during work hours, if necessary, to research solutions.

7. Implement Hazard Controls

Assign workers the task of choosing, implementing, and evaluating the solutions they come up with.

8. Address Emergencies

Identify foreseeable emergency scenarios and develop instructions on what to do in each case. Meet to discuss these procedures and post them in a visible location in the workplace.

9. Seek Input on Workplace Changes

Before making significant changes to the workplace, work organization, equipment, or materials, consult with workers to identify potential safety or health issues.

10. Make Improvements

Set aside a regular time to discuss safety and health issues, with the goal of identifying ways to improve the program.

The above practices can be implemented at any time, in any place. They can weave together existing policy and procedure based on maintaining compliance with standards for emergency planning, electrical safety, machine guarding, and personal protective equipment. The objective is to evaluate existing safety compliance measures against the best practices to create a programmatic approach to safety.

Stand Alone Safety and Health Programs

There are some standards that currently exist as programs with prescriptive requirements and mechanisms for continuous evaluation and monitoring. They include:

1. Hazard Communication
2. Process Safety Management of Highly Hazardous Chemicals
3. Confined Space Entry
4. Lock out/Tag out
5. Hearing Conservation
6. Bloodborne Pathogens

Other standards that may or may not exist as programs in some workplaces and work sites, but should, are:

1. Respiratory Protection
2. Fall Protection
3. Electrical Safety
4. Personal Protective Equipment
5. Safety Training and Education
6. Record Keeping and Reporting

Programs that may exist without specific standards to align with or result from application of the general duty clause include:

1. Drug testing
2. Sexual Harassment
3. Ergonomic Safety
4. Employee Assistance
5. Automotive Repair Shop Safety

It is important to note that all of the above in some cases may exist as part of an overall injury and illness prevention program or plan (IIPP), typical and required in the state of California, that may be detailed enough to allow for measurement of effectiveness

or merely exist as line items on worksite safety plans.

21.A: Review Questions

Complete as directed.

True or False: **(Circle Letter)**

1. Compliance is the most important thing when implementing safety and health program best practices. T or F
2. Implementing hazards controls is a basic tenet of industrial hygiene. T or F
3. Strong management leadership is the highest priority for implementing effective programs. T or F
4. Reduced operating cost is not a benefit of an effective safety and health program. T or F
5. Employers need not engage workers when implementing safety and health programs. T or F
6. Programs must be written to be effective. T or F
7. The most effective safety and health programs are both documented and assessed. T or F
8. Setting clear goals for worker safety and health is necessary for an effective program. T or F
9. The Hazard Communication Program can exist as a standalone health and safety program. T or F
10. Traditional programs are proactive, nipping problems in the bud before they happen. T of F.

CHAPTER OVERVIEW

22: Managing Safety and Health

> *"We must never forget that the highest appreciation is not to utter words, but to live by them." – Former U.S. President John F. Kennedy*

Overview

Anyone who has ever been under the management or supervision of someone who did not care about the individual, did not care about getting the job done right(effectiveness), or did not care about doing the right thing(compliance), would if given the choice, work for someone else. We instinctively know that care and concern is central to thriving. We see how the effects of a lack of concern for the well being of others show up in all walks of life. When communities are neglected there is poverty, crime, stunted growth, and hopelessness. When workplaces are neglected there are inefficient and ineffective work processes, unsafe and unsanitary working conditions, no motivation, accidents and injuries.

And yet we sometimes also believe that if we manage better, control better we can make things better. Managing Safety and Health is definitely about effective management and control of workplace safety. However, if there is no credibility, integrity, no care and concern in the management approach, if workers do not "see" evidence that worker safety and health is a priority, those same workers will be less likely to make safety a priority as well. They won't see their value as workers or see themselves as the most important stakeholder in worker safety and workplace safety.

Managing safety and health is about setting and establishing the correct tone. In this chapter, eight core elements will demonstrate how "care and concern" is essential to driving compliance with safety and health standards and programs.

Chapter Objective:

1. Discuss seven guiding principles for managing safety and health.
2. Discuss current workplace safety issues and concerns requiring effective safety leadership.

Learning Outcome:

1. Apply practices for effective safety leadership.

Standards: Top most frequently cited standards

Key Terms:

Credibility, integrity, leadership, management, mitigate, plan, principled, stewardship, strategy

Mini-Lecture: Safety Leadership

Topic Required Time: 2 hrs; Independent Study and reflection 1 3/4 hour.

22.1: Introduction to Managing Safety and Health

Managing Safety

Merriman and Oxford dictionaries describe or define ‘management’ as the process of dealing with or controlling things or people. Wiki offers ‘Management’ as being the administration of an organization. On the other hand ‘managing’ is defined as both having authority or supervisory control and being successful at doing or dealing with something, especially if difficult. Implied in the description of both terms is success or goals met. But neither term suggests or implies how or what drives the management or managing activities, the guiding principle. Neither term describes the character or characteristics of the individual doing the managing or the organization under management.

In the last chapter, safety and health programs, emphasis was placed on best practices for creating and implementing safety and health programs. What was not discussed was what drives or is behind the best practice, i.e. what makes it a best practice and why take that action at all.

Core Elements For Managing Safety and Health

Managing safety and health requires effective planning, short and long term strategy. It also requires goals and outcomes to be clear and SMART-specific and measurable, attainable, relevant, and time-bound (timely). Hence a short and long term strategy that implements the plan for achieving safety and health objectives, creating effective safety and health programs, and managing safety and health should adhere to management best practices for efficiency but also be about care and concern for the workplace and its workers.

Several leadership principles that take on care and concern are revealed in different aspects of the core elements that shape safety and health programs. The first, Principled Centered Leadership as described by Stephen Covey, focuses less on what a leader or manager does in an organizational setting but more on what that person brings to the organization. It states in part: “Principled-Centered Leadership is premised on the belief that effective people (managers) sic, are guided both in everyday living and in work relationships by universal principles or “natural laws”, whereas ineffective people(managers) sic, tend to place their energies on finding situation-specific behavioral paths to success as they are confronted by an evolving set of challenges.” This principle speaks to universal or natural laws that are self-evident, such as those of wisdom, fairness, self-awareness, courage, personal strength, and the will to act. Employers and managers who adhere to or serve these natural laws are by far the best with whom to work.

The second principle is that which is rooted in the character of a manager or leader. Credibility as outlined by James M. Kouzes and Barry C Posner in the book titled the same, establishes that ‘honesty’ is essential to leadership. The “Credibility” titled book also calls out six leadership disciplines. Three of the six mentioned here, affirming shared value, serving a purpose, and developing capacity, can be seen in all eight of the core elements of managing safety and health.

Another management principle as outlined in the writings of Peter Block states that rather than being leaders managers become stewards. Specifically, he states that “traditionally leadership meant that managers are somehow responsible for their subordinates who look to the leader for guidance, direction, reward, evaluation, and protection. A manager and an organization committed to stewardship operate in a very different way. Stewardship is predicated on the idea that people in communities and in organizations are willing to choose service over self-interest. Stewardship means empowering people to be accountable for their own actions rather than asking them to be dependent on managers.” Empowering people to accountability is simply engaging them in the processes and outcomes.

Finally, the final distinguishing characteristic or principle of management as revealed in the core elements is that of the “One Minute Manager” as authored by Kenneth Blanchard and Spencer Johnson. The book focuses on management effectiveness. The book weaves a story of a young worker trying to determine which manager type produces more fruit. The type that is more focused on profit or the type that is focused on people. The worker ultimately decides that an effective manager is one who manages so that both the organization and the people involved benefit (win). This is achieved through setting one minute goals, giving one minute praise, and providing one minute critiques or assessments when needed. Effective management does not have to take a lot of time and energy but it does have to focus the time and energy spent to achieve quality of engagement.

The following core elements for managing safety and health are central to any strategy, process, or protocol for reducing accidents and injury in the workplace. These elements are also central to boosting morale, engagement, and stewardship. All are necessary for sustainable organizations. All reflect the management principles above.

Management Leadership

- Top management demonstrates its commitment to continuous improvement in safety and health, communicates that commitment to workers, and sets program expectations and responsibilities.
- Managers at all levels make safety and health a core organizational value, establish safety and health goals and objectives, provide adequate resources and support for the program, and set a good example.

Worker Participation

- Workers and their representatives are involved in all aspects of the program—including setting goals, identifying and reporting hazards, investigating incidents, and tracking progress.
- All workers, including contractors and temporary workers, understand their roles and responsibilities under the program and what they need to do to effectively carry them out.
- Workers are encouraged and have means to communicate openly with management and to report safety and health concerns without fear of retaliation.
- Any potential barriers or obstacles to worker participation in the program (for example, language, lack of information, or disincentives) are removed or addressed.

Hazard Identification and Assessment

- Procedures are put in place to continually identify workplace hazards and evaluate risks.
- Safety and health hazards from routine, non-routine, and emergency situations are identified and assessed.
- An initial assessment of existing hazards, exposures, and control measures is followed by periodic inspections and reassessments, to identify new hazards.
- Any incidents are investigated with the goal of identifying the root causes.
- Identified hazards are prioritized for control.

Hazard Prevention and Control

- Employers and workers cooperate to identify and select methods for eliminating, preventing, or controlling workplace hazards.
- Controls are selected according to a hierarchy that uses engineering solutions first, followed by safe work practices, administrative controls, and finally personal protective equipment (PPE).
- A plan is developed to ensure that controls are implemented, interim protection is provided, progress is tracked, and the effectiveness of controls is verified.

Education and Training

- All workers are trained to understand how the program works and how to carry out the responsibilities assigned to them under the program.
- Employers, managers, and supervisors receive training on safety concepts and their responsibility for protecting workers' rights and responding to workers' reports and concerns.
- All workers are trained to recognize workplace hazards and to understand the control measures that have been implemented.

Program Evaluation and Improvement

- Control measures are periodically evaluated for effectiveness.
- Processes are established to monitor program performance, verify program implementation, and identify program shortcomings and opportunities for improvement.
- Necessary actions are taken to improve the program and overall safety and health performance.

Communication and Coordination for Host Employers, Contractors, and Staffing Agencies

- Host employers, contractors, and staffing agencies commit to providing the same level of safety and health protection to all employees.
- Host employers, contractors, and staffing agencies communicate the hazards present at the worksite and the hazards that work of contract workers may create on site.
- Host employers establish specifications and qualifications for contractors and staffing agencies.
- Before beginning work, host employers, contractors, and staffing agencies coordinate on work planning and scheduling to identify and resolve any conflicts that could affect safety or health.

22.2: Programs

Managing Safety and Health

Employers have a general duty under section 5(a)(1) to furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees. This clause is a stop gap measure to ensure all employers understand that regardless of whether a specific standard exists to address a specific hazard, any known condition, situation, or place known to present a hazardous or unsafe environment for workers must be controlled.

Employees are also expected per section 5(b) to comply with occupational safety and health standards promulgated under this Act.

Several health and safety programs advantaged by the general duty clause are random drug testing/pre-employment drug screening, sexual harassment prevention training and education, and ergonomic safety.

Random drug testing and screening

Many workers experience pre-employment drug screening when their work involves transportation, operating crucial or hazardous equipment, or when working in certain public health and safety organizations. Random drug screening often occurs in workplaces that must ensure ongoing safety of employees operating equipment and when there is a significant public safety interest. Employers will often do post incident drug testing permissible under § 1904.35(b)(1)(iv) In general the types of drug testing authorized include:

- Random drug testing.
- Drug testing unrelated to the reporting of a work-related injury or illness.
- Drug testing under a state workers' compensation law.
- Drug testing under other federal law, such as a U.S. Department of Transportation rule.
- Drug testing to evaluate the root cause of a workplace incident that harmed or could have harmed employees. If the employer chooses to use drug testing to investigate the incident, the employer should test all employees whose conduct could have contributed to the incident, not just employees who reported injuries.

Sexual Harassment and Bullying

Hostile work environment is a phrase associated with workplace sexual harassment and bullying. Every workplace is susceptible to challenging power dynamics and cultures of disrespect. Increasingly workers are representative of every demographic; young, old, every race and ethnicity, socio-economic class, varied genders, and varied cultures. Employers must anticipate that with a diversity of workers with diverse backgrounds there will be the potential for misunderstandings, miscommunications, and even distrust. Preparing for these challenges requires employers to acknowledge their general duty to create a safety culture where every employee is not only physically safe but feels safe as well.

Employers and employees consistent with the OSHA general duty clause are equally responsible for advancing policies and work practices that center on treating all workers with dignity and respect, establishing cultural norms for the workplace that all agree upon. This is often and best achieved by safety and training programs focusing on acceptable workplace interpersonal behaviors and boundaries of propriety. Controlling unacceptable behaviors through education and training gives workers the skills and tools to manage interpersonal relationships in the workplace and reduces the risk of creating hostile work environments.

Ergonomic Safety

Musculoskeletal disorders (MSDs) affect the muscles, nerves, blood vessels, ligaments and tendons. Workers in many different industries and occupations can be exposed to risk factors at work, such as lifting heavy items, bending, reaching overhead, pushing and pulling heavy loads, working in awkward body postures and performing the same or similar tasks repetitively. Employers have a general duty to recognize risk factors that increase a workers risk of injury.

Work-related MSDs can be prevented. Ergonomics --- fitting a job to a person --- helps lessen muscle fatigue, increases productivity and reduces the number and severity of work-related MSDs. An ergonomic safety program reduces time away from work or restricted work activity and has been shown to be effective in reducing the risk of developing MSDs in high-risk industries as diverse as construction, food processing, firefighting, office jobs, healthcare, transportation and warehousing.

Effectively managing ergonomic safety programs means you must have strong commitment by management to set clear expectations and goals. Workers must be involved in identifying the hazards and risk factors, assessing and controlling the work environment and assisting with providing solutions. OSHA encourages education and training on MSDs and prevention methods as well as recognizing when to report possible injury. OSHA stipulates an ergonomic evaluation and process uses the principles of a safety and health program to address MSD hazards. Such a process should be viewed as an ongoing function that is incorporated into the daily operations, rather than as an individual project or one time job hazard assessment.

Employee Assistance Programs (EAP)

The Federal Office of Personnel Management (OPM) describes Employee Assistance Programs as a voluntary, work-based program that offers free and confidential assessments, short-term counseling, referrals, and follow-up services to employees who have personal and/or work-related problems. EAPs address a broad and complex body of issues affecting mental and emotional well-being, such as alcohol and other substance abuse, stress, grief, family problems, and psychological disorders. EAPs are active in helping organizations prevent and cope with workplace violence, trauma, and other emergency response situations.

Employers have a general duty to anticipate and recognize that psycho-social hazards are often hidden from view. Similar to expectations for reducing the risk of hostile work environments through education and training, EAPs address the contributors to behaviors that may result from external stresses that can result in causing employees harm in the workplace. Managing safety and health with voluntary intervention programs that address psycho-social hazards endorses the industrial hygiene principle of prevention, through intervention. EAP along with education and training are engineering controls that prepare workers to address a broad spectrum of hazards in the workplace.

22.A: Chapter 21 Review Questions

Complete as directed.

True or False: **(Circle Letter)**

1. Safety and health goals must be SMART. T or F
2. Managing hazards controls is a basic tenet of industrial hygiene. T or F
3. Strong management leadership is demonstrates concern for worker safety. T or F
4. Principled Leadership is only concerned with self. T or F
5. Managers should only tell employees what they want to hear. T or F
6. Effective stewardship means you control or are in charge of everything. T or F
7. One minute praise is only effective if it is honest and sincere. T or F
8. Random drug testing keeps work places safe. T or F
9. Repetitive motion is a risk factor for work in any industry. T or F
10. An EAP can be an effective tool for managing workplace violence. T of F.

CHAPTER OVERVIEW

23: Medical, First-aid, and Bloodborne Pathogens

> *"Safety brings first-aid to the uninjured." – F.S. Hughes*

Overview

Employers are required to maintain workplaces in a safe and sanitary condition. While maintaining an accident free workplace is ideal there will be occasions that do not require employees to receive immediate medical attention by a medical professional onsite or be transported offsite to an emergency facility. The employer or designee must be able to render first-aid and make available to employees first-aid kits including guidance for when to access and render first-aid.

Employers are required to log on the OSHA 300 form injuries occurring in the workplace including those requiring first-aid. There are also industries such as healthcare where workers are exposed to hazards that require continuous medical monitoring if an exposure is acute, such as when a needle stick exposes the healthcare worker to blood or equivalents. Finally, medical monitoring of workers is required when they are continuously exposed to physical, chemical, and biological hazards. OSHA expects employers to swiftly respond to an employee injury or exposure no matter the severity.

Hazardous Materials and Waste cleanup may also include bio hazards such as blood and human/animal waste. Emergency responders, healthcare workers, and even workers who are part of housekeeping and maintenance can be exposed to biohazards. This chapter will review employer requirements for rendering care, protecting workers from harm, and the duty to provide medical attention after exposure events.

Chapter Objective:

1. Discuss employer responsibility for providing first-aid to employees.
2. Identify some injuries requiring first-aid.
3. Discuss employer responsibilities under Bloodborne pathogen standard.

Learning Outcome:

1. Distinguish first-aid, medical treatment, medical monitoring reporting requirements.

Standards: 1910.151 Subpart K Medical Services and first-aid,1910.1020 Access to employee exposure and medical records, 1910.1030 Bloodborne Pathogens, 1926.50 Subpart D Medical Services and first-aid

Key Terms:

Bloodborne Pathogen, first aid, hepatitis, HIV, medical treatment, surveillance

Mini-Lecture: first-aid

Topic Required Time: 1 hrs; Independent Study and reflection 3/4 hour.

23.1: Medical, First-aid, and Bloodborne Pathogens

A duty of care

Every workplace and therefore every employer must render first aid to an injured employee. Depending on the severity of the injury, i.e. if the employer's emergency plan is activated, then the duty of care is to get the employee to an emergency facility as soon as possible. When the workplace is a construction site or some distance away from an urgent care or hospital emergency room the employer must have the capacity to provide immediate first aid commensurate with the injury and then proceed if necessary to offsite care for medical treatment. The employer must ensure the availability of medical personnel for advice and consultation no matter the work location.

General

Prior to a project or construction start provisions shall be made as part of the emergency action plan to address serious injury occurring at the worksite. In the absence of an infirmary, clinic, hospital, or physician, that is reasonably accessible in terms of time and distance to the worksite, which is available for the treatment of injured employees, a person who has a valid certificate in first-aid training from the U.S. Bureau of Mines, the American Red Cross, or equivalent training that can be verified by documentary evidence, shall be available at the worksite to render first aid.

First-aid

First aid supplies are required to be easily accessible under paragraph Sec. 1926.50(d)(1). An example of the minimal contents of a generic first aid kit is described in American National Standard (ANSI) Z308.1-1978 "Minimum Requirements for Industrial Unit-Type First-aid Kits". The contents of the kit listed in the ANSI standard should be adequate for small work sites. When larger operations or multiple operations are being conducted at the same location, employers should determine the need for additional first aid kits at the worksite, additional types of first aid equipment and supplies and additional quantities and types of supplies and equipment in the first aid kits.

If it is reasonably anticipated employees will be exposed to blood or other potentially infectious materials (OPIM) while using first-aid supplies, employers shall provide personal protective equipment (PPE). Appropriate PPE includes gloves, gowns, face shields, masks and eye protection.

Rendering Aid

The employer or designee when rendering aid to an injured worker shall adhere to the following:

1. First aid supplies shall be easily accessible when required.
2. The contents of the first aid kit shall be placed in a weatherproof container with individual sealed packages for each type of item, and shall be checked by the employer before being sent out on each job and at least weekly on each job to ensure that the expended items are replaced.
3. Proper equipment for prompt transportation of the injured person to a physician or hospital, or a communication system for contacting necessary ambulance service, shall be provided.
4. In areas where 911 emergency dispatch services are not available, the telephone numbers of the physicians, hospitals, or ambulances shall be conspicuously posted.
5. In areas where 911 emergency dispatch services are available and an employer uses a communication system for contacting necessary emergency-medical service, the employer must:
    - Ensure that the communication system is effective in contacting the emergency-medical service; and
    - When using a communication system in an area that does not automatically supply the caller's latitude and longitude information to the 911 emergency dispatcher, the employer must post in a conspicuous location at the worksite either:

1. The latitude and longitude of the worksite; or
2. Other location-identification information that communicates effectively to employees the location of the worksite.
3. Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

First Aid vs 911

Part 1904 Recordkeeping distinguishes “first aid” from emergency or urgent care “medical treatment” by a medical professional for the purposes of recordkeeping and reporting requirements. Each employee is granted the right to have access to employer injury and illness records. Employers must keep records of employee injuries via OSHA 300 Log but not all injuries are reportable to OSHA. The following are defined as first aid injuries for the purposes of distinguishing OSHA 300A reporting requirements:

- Using a non-prescription medication at nonprescription strength (for medications available in both prescription and non-prescription form, a recommendation by a physician or other licensed health care professional to use a non-prescription medication at prescription strength is considered medical treatment for recordkeeping purposes);
- Administering tetanus immunizations (other immunizations, such as Hepatitis B vaccine or rabies vaccine, are considered medical treatment);
- Cleaning, flushing or soaking wounds on the surface of the skin;
- Using wound coverings such as bandages, Band-Aids™, gauze pads, etc.; or using butterfly bandages or Steri-Strips™ (other wound closing devices such as sutures, staples, etc., are considered medical treatment);
- Using hot or cold therapy;
- Using any non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc. (devices with rigid stays or other systems designed to immobilize parts of the body are considered medical treatment for recordkeeping purposes);
- Using temporary immobilization devices while transporting an accident victim (e.g., splints, slings, neck collars, back boards, etc.).
- Drilling of a fingernail or toenail to relieve pressure, or draining fluid from a blister;
- Using eye patches;
- Removing foreign bodies from the eye using only irrigation or a cotton swab;
- Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means;
- Using finger guards;
- Using massages (physical therapy or chiropractic treatment are considered medical treatment for recordkeeping purposes); or
- Drinking fluids for relief of heat stress.

"Medical treatment" means the management and care of a patient to combat disease or disorder. It does not include diagnostic procedures or counseling outside of those required by medical monitoring under the bloodborne pathogen standard or exposures to toxic substances.

Bloodborne Pathogens

Bloodborne pathogens are infectious microorganisms in human blood or other potentially infectious materials (OPIM) that can cause disease in humans. These pathogens include, but are not limited to, hepatitis B (HBV), hepatitis C (HCV) and human immunodeficiency virus (HIV). Workers routinely (through occupational exposure) exposed to needles and sharps, broken glass or other mechanisms which expose them to bodily fluids are the most at risk.

In order to reduce or eliminate the hazards of occupational exposure to bloodborne pathogens, an employer must implement an exposure control plan (ECP) for the worksite with details on employee protection measures. The plan must also describe how an employer will use engineering and work practice controls, personal protective clothing and equipment, employee training, medical surveillance, hepatitis B vaccinations, and other provisions as required by OSHA's Bloodborne Pathogens Standard.

Although not all industries or employers are required to implement an ECP, OSHA’s general duty clause (Section 5(a)(1) of the OSH Act) will be used, where appropriate, to protect employees from bloodborne hazards in construction, longshoring, marine terminals and agriculture. Employees who are trained as first responders in any organization are covered under the Bloodborne Pathogen Standard. Any employee exposed to blood or OPIM must have the hepatitis vaccine made available to them as soon as possible but in no event later than 24 hours after the exposure incident. If an exposure incident as defined in the standard has taken place, other post-exposure follow-up procedures must be initiated immediately, as per the requirements of the standard.

In general the ECP must contain the following:

- The exposure determination which identifies job classifications with occupational exposure and tasks and procedures where there is occupational exposure and that are performed by employees in job classifications in which some employees have occupational exposure.

- The procedures for evaluating the circumstances surrounding exposure incidents;
- A schedule of how other provisions of the standard are implemented, including methods of compliance, HIV and HBV research laboratories and production facilities requirements, hepatitis B vaccination and post-exposure evaluation and follow-up, communication of hazards to employees, and recordkeeping;
- Methods of compliance include:

1. Universal Precautions;
2. Engineering and work practice controls, e.g., safer medical devices, sharps disposal containers, hand hygiene;
3. Personal protective equipment;
4. Housekeeping, including decontamination procedures and removal of regulated waste.

- Documentation of:

1. the annual consideration and implementation of appropriate commercially available and effective safer medical devices designed to eliminate or minimize occupational exposure, and
2. the solicitation of non-managerial healthcare workers (who are responsible for direct patient care and are potentially exposed to injuries from contaminated sharps) in the identification, evaluation, and selection of effective engineering and work practice controls.

23.2: Medical Surveillance

Medical Surveillance

If a worker is exposed to blood or OPIM the employer must implement protection protocols:

- Following an exposure incident, employers are required to document, at a minimum, the route(s) of exposure, and the circumstances under which the exposure incident occurred. To be useful, the documentation must contain sufficient detail about the incident.
- Record incident on the OSHA 300 log if punctured or cut and if not penetrated but exposed(splash) and illness occurs
- Make hepatitis vaccines available free of charge to employees. Employees may refuse vaccine.
- Test employee blood for presence of disease
- Require and provide for post-exposure counseling be given to employees following an exposure incident. Counseling concerning infection status, including results and interpretation of all tests, will assist the employee in understanding the potential risk of infection and in making decisions regarding the protection of personal contacts.

Regulated Waste

The Bloodborne Pathogens Standard uses the term, "regulated waste," to refer to the following categories of waste which require special handling: (1) liquid or semi-liquid blood or OPIM; (2) items contaminated with blood or OPIM and which would release these substances in a liquid or semi-liquid state if compressed; (3) items that are caked with dried blood or OPIM and are capable of releasing these materials during handling; (4) contaminated sharps; and (5) pathological and microbiological wastes containing blood or OPIM.

Although not considered an emergency operation some elements of the HAZWOPER Standard 1910.120 can be followed when workers are exposed to blood and infectious materials during regulated waste cleanup operations.

23.A: Review Questions-Medical, first-aid and bloodborne pathogens

Complete as directed.

True or False: **(Circle Letter)**

1. Employers are required to render first aid to injured employees. T or F
2. Rendering first aid includes providing for emergency services and response. T or F
3. Only small employers are required to have first aid kits. T or F
4. If employees are exposed to caustics or hazardous materials emergency wash stations must be available. T or F
5. Setting a broken bone is considered first aid. T or F
6. Applying a cold or hot compress is considered medical treatment. T or F
7. An ECP is required of all employers. T or F
8. Employees exposed to OPIM must wear PPE. T or F
9. If an employee refuses hepatitis vaccine the employer does not have to medically monitor the employee. T or F
10. Exposed employees must receive post exposure counseling. T of F.

CHAPTER OVERVIEW

24: Safety, Health, and Risk Management

24.1: Introduction to Improving Workplace Safety

What you'll learn to do: Explain how to improve workplace safety

If you are a manager, HR manager or business owner interested in improving workplace safety, you will find OSHA's website an excellent resource. In this section, we'll mine their site and cite SHRM research to identify key workplace safety factors and HR's role in improving workplace safety.

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24.2: Workplace Safety Factors

Learning Objectives

- Identify factors that contribute to workplace safety

According to OSHA, most successful safety and health programs are based on a common set of key elements that include management leadership, worker participation, and a systematic approach to finding and fixing hazards. OSHA's Safe and Sound page provides resources to support the development of a Safe + Sound Program and promotes an annual Safe + Sound week (August 12–19 in 2019). Resources include a variety of why and how materials including videos/webinars, tip sheets, course offerings and recommended practices.

There are three core elements of effective safety and health programs:

1. Management Leadership
2. Worker Participation
3. Find & Fix

Let's take a closer look at each of these elements.

Management Leadership

Executive commitment to implementing a program and using it to drive continuous improvements in safety and health.

Associated action items:

- Developing and communicating a safety and health policy statement.
- Providing the resources needed to implement and operate the program.
- Factoring safety and health into operational planning and decisions.
- Recognizing or rewarding safety and health contributions and achievements.
- Leading by example, by practicing safe behaviors and making safety part of daily conversations.
- Additional perspective and specifics in OSHA's Be Safe + Sound at Work: Management Leadership Guide

Worker Participation

Effective safety and health programs tap into workers' collective experience, knowledge, and insight in order to find solutions to workplace safety and health challenges.

Opportunities for worker participation include:

- Developing the initial program design.
- Reporting incidents (including near misses) so they can be investigated.

- Analyzing hazards associated with routine and nonroutine jobs, tasks, and processes.
- Defining and documenting safe work practices.
- Conducting site inspections and incident investigations.
- Training current coworkers and new hires.
- Evaluating program performance and identifying ways to improve it.
- Additional perspective and specifics in OSHA's Be Safe + Sound at Work: Worker Participation

Find & Fix

Developing a systematic process for identifying and controlling (i.e., finding and fixing) workplace hazards is at the core of every effective safety and health program.

A systematic approach includes:

- Involving workers, who often have the best understanding of the conditions that create hazards and insights into how they can be controlled.
- Reviewing all available information about hazards that might be present.
- Conducting inspections to identify new or emerging hazards.
- Investigating incidents to identify root causes and potential solutions.
- Evaluating options using the "hierarchy of controls."
- Considering how to protect workers during emergencies and nonroutine activities.
- Checking that existing controls are intact and remain effective.
- Additional perspective and specifics in OSHA's Be Safe + Sound at Work: Find & Fix Hazards Resource Guide

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24.3: HR and Health and Safety

Learning Objectives

- Discuss human resource management's role in supporting workplace health and safety

Given their responsibility for people, culture, and associated policies and procedures, human resource management plays a critical role in supporting workplace health and safety. The points made in OSHA's Be Safe + Sound Management Leadership Guide are particularly relevant to HR management, and include:

- Making worker safety and health a core organizational value
- Eliminating hazards, protecting workers, and continuously improving workplace safety and health
- Providing sufficient resources to implement and maintain the safety and health program
- Visibly demonstrate and communicate their safety and health commitment to workers and others.

For example, HR management has a responsibility to ensure that the organization is in compliance with OSH Act requirements and that supervisors and managers understand that it is their duty to ensure that the workplace is free from recognized hazards that are causing or likely to cause death or serious physical harm. Management training and evaluation should ensure that managers understand employee rights, including, for example, the right to safety training in a language that the employee understands.

This duty of care also extends to workplace violence, which includes "any act or threat of physical violence, harassment, intimidation, or other threatening disruptive behavior that occurs at the work site"[1] As discussed previously, workplace violence ranges from threats and verbal abuse to homicide. SHRM research indicates that approximately 33% of American employees and almost 20% of HR professionals either don't know are unsure of what to do if they witness or are involved in a workplace violence incident.[2] Research also found that while the majority of HR professionals reported having developed workplace violence training, one third didn't provide training to employees. Additionally, while almost all HR professionals reported having a process for identifying employees with a history of violence, over 50% were unsure of whether they have a workplace violence prevention program. As SHRM-SCP, SHRM president and CEO Johnny C. Taylor, Jr. stated: "Companies and HR should and must do more to make employees feel safe at work," adding that "If you make the investment in security and preparation, your employees will feel safer and respect you for valuing their safety."

? PRactice Question

https://assessments.lumenlearning.co...essments/18228

OSHA Resources

OSHA recognizes that its regulatory and enforcement efforts alone are inadequate to achieve the compliance of over 10 million employers. That's where outreach activities come in. Specifically, OSHA's consulting, training and outreach efforts are designed to shift the safety curve, prompting organizations to adopt Safety and Health Programs that build a culture of and commitment to safety, as illustrated in Figure 1.

Figure 1. Shifting the Safety Curve

To that end, OSHA offers are range of consulting services, training and supporting resources, including the following:

- An OSHA Compliance Quick Start Tool
- On-Site Consultation—Free and confidential occupational safety and health services for small- and medium-sized businesses.
- A broad range of safety and health tools, publications and guides for specific OSHA standards, programs (e.g., SHP) and safety and health topics (e.g., Workplace Violence)
- OSHA's Safe and Sound page—everything you need to develop and implement a safety and health program
- Recognition ("Cooperative") programs
- A range of data and statistics and informational resources, including its QuickTakes bi-weekly e-newsletter

Note that the OSHA website is available in both English and Spanish.

? Practice Question

https://assessments.lumenlearning.co...essments/18229

1. "Workplace Violence." Occupation Safety and Health Administration, United States Department of Labor. Accessed August 20, 2019. ↵
2. "With Workplace Violence on the Rise, 1 out of 7 People Don't Feel Safe at Work." Society for Human Resource Management. March 19, 2019. Accessed August 20, 2019. ↵

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24.4: Introduction to Risk Management

What you'll learn to do: Discuss human resource management risk management

The International Organization for Standardization (ISO) defines risk as the "effect of uncertainty on objectives."[1] In the introduction to its risk management standard—ISO 31000—the organization notes that "risks affecting organizations can have consequences in terms of economic performance and professional reputation, as well as environmental, safety and societal outcomes. Therefore, managing risk effectively helps organizations to perform well in an environment full of uncertainty."[2] In this section, we'll identify risks associated with human resources activities and how to manage them.

1. "ISO 31000 2018 Plain English Definitions." Praxiom Research Group Limited. Accessed August 20, 2019. ↵
2. "ISO 31000 Risk Management." ISO.org. Accessed August 20, 2019. ↵

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24.5: Risks in Human Resources

Learning Objectives

- Identify the risks associated with human resource activities

Almost everything that can go wrong in a business has a human capital component.

—David Creelman, Creelman Research[1]

The Center for Safety and Health Sustainability notes the "An organization's human capital includes the skills, knowledge and abilities that workers bring to their work as well as how they use them. . . . Effective management of an organization's human capital underpins corporate performance and sustainability."[2] Human capital risks include dangers to personnel and risks arising from loss of or inappropriate use of those skills, knowledge and abilities, including unauthorized use or distribution of confidential or proprietary information.

Risk mitigation consulting firm Lowers & Associates identifies the five critical human capital risk areas:[3]

1. **Complacency.** For perspective, the Risk Management Society states that "complacency comes from a place where 'I don't know' and 'I don't care' run rampant."
2. **Turnover**
   - Companies pay between 25% to 250% of an employee's annual salary to replace that employee
   - Direct and indirect costs including temporary staffing, training, lost productivity, reduced morale and loss of clients and know-how
3. **Occupational fraud.** Costs businesses 5–7% of annual revenue, including management costs and damages to brand, employee morale, external business relationships, regulator relationships and stock value
4. **Catastrophic workplace events**
   - Injuries and illnesses, fatalities and homicides
   - Potentially significant damage to people, brands and profits
   - The annual cost of workplace violence for employers is estimated to be roughly $121 billion[4]
5. **Negligent hiring or retention.** Perspective point: employers lose 75–80% of negligent hiring claims

Practice Question

https://assessments.lumenlearning.co...essments/18230

To elaborate on the fourth point, with increased socio- and geo-political tension and instability, there has been an increase in business risk, including risk to people. According to OSHA, "acts of violence and other injuries [are] the third-leading cause of fatal occupational injuries in the United States."[5] Bureau of Labor Statistics data indicates that 458 of the fatal workplace injuries that occurred in the United States in 2017 were cases of intentional injury by another person. A March 2019 Society of Human Resource Management (SHRM) press release reported that one out of 7 people don't feel safe at work, "[demonstrating the] need for more workplace violence education, prevention and training."[6] Underscoring both the sentiment and recommendations, SHRM's 2019 study of workplace violence found that almost half of HR professionals indicated their organization had experienced a workplace violence incident and over half of those who reported workplace violence indicated their organization had experienced an incident in the last year.

1. Lower & Associates. "5 Critical Areas of Human Capital Risk." The Risk Management Blog. August 8, 2013. Accessed August 20, 2019. ↵
2. "The Human Capital Project." Center for Safety & Health Sustainability. Accessed August 20, 2019. ↵
3. Lower & Associates. "5 Critical Areas of Human Capital Risk." The Risk Management Blog. ↵
4. Johnson, Denise. "Risk Management: Employers Benefit from Mitigating Workplace Violence." Insurance Journal. April 17, 2017. Accessed August 20, 2019. ↵
5. "Workplace Violence." Occupational Safety and Health Administration, United States Department of Labor. Accessed August 20, 2019. ↵
6. "With Workplace Violence on the Rise, 1 out of 7 People Don't Feel Safe at Work." Society for Human Resource Management. March 19, 2019. Accessed August 20, 2019. ↵

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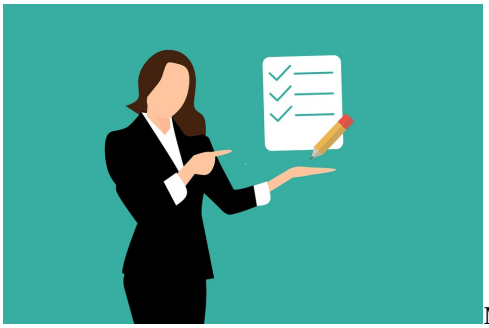
24.6: Managing Risk in Human Resources

Learning Objectives

- Describe the process of managing Human Resources–related risks



Managing HR-related risks involves addressing the five critical areas mentioned above, including workplace violence and risk of international travel. The points that Lowers & Associates recommends for addressing turnover are applicable to all five risk areas and represent basic block-and-tackle elements of HR management, including:

- Use pre-employment screening
- Establish fair benefits and compensation and review relative to market annually
- Pay attention to employees' needs
- Increase employee engagement
- Create a positive work environment
- Create clear, challenging career paths

Specific recommendations to address:

- Occupational fraud
  - Establish and enforce a code of conduct
  - Develop a fraud prevention strategy
  - Implement prevention and detection processes, including risk assessment and internal audits; evaluate fraud controls on a regular basis
  - Conduct fraud awareness training and provide a means of reporting fraud online
  - Screen suppliers and third party providers
- Workplace violence
  - Understand risk factors and develop and implement training and prevention programs. OSHA states that "in most workplaces where risk factors can be identified, the risk of assault can be prevented or minimized if employers take appropriate precautions."[1]
  - OSHA also emphasizes that establishing a zero-tolerance policy toward workplace violence—applicable to all who come in contact with employees or alternative workers—is one of the best protections.
  - For related resources, including risk assessment, training and prevention, refer to OSHA's Workplace Violence page.

Perspective Point

Lowers & Associates notes that although the probability of catastrophic workplace events is low, the potential damage to people, brands and profits justifies risk mitigation.

Practice Question

https://assessments.lumenlearning.co...essments/18231

Meng Wanzhou at Russia Calling! Investment Forum.

Although geo-political risks have always been a part of conducting business internationally, trade tensions have recently escalated into economic warfare, increasing the stakes in both financial and human terms. The attempt in 2019 to extradite and prosecute Chinese technology firm Huawei's CFO Meng Wanzhou has resulted in retaliatory arrests and harassment of American business executives and Canadians in China.

In an article for Risk Management magazine associate editor Adam Jacobson notes that "companies have a legal obligation, known as a 'duty of care,' to prepare employees and address potential risks they may face while traveling."[2] Pre-trip preparation and planning is key, including evaluating the risks, setting up tracking systems, establishing communication processes and identifying sources of support in the event of crisis. Jacobsen notes that there are also a range of insurance options that can mitigate some of the risk of travel.

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1. "Workplace Violence." Occupational Safety and Health Administration, United States Department of Labor. Accessed August 20, 2019. ↵
2. Jacobson, Adam. "Preparing Employees for Travel Risks." Risk Management. Accessed August 20, 2019. ↵

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24.7: Putting It Together- Safety, Health, and Risk Management

Although it's been proven that a good working environment yields the best business results, many industries and workplaces are still—some, chronically—failing to meet OSHA's general duty to protect clause. This clause requires that employees be protected from all hazards, including safety, health and workplace violence. These management—and, specifically, human capital management—failures have serious business, human and macroeconomic impacts.

George Washington University environmental and occupational health professor David Michaels and occupational health and safety consultant John Henshaw (both formerly assistant secretary of labor for OSHA) argue that "a stronger commitment to safety and health can benefit workers by decreasing the number of illnesses, injuries and fatalities; increasing their engagement and satisfaction; and enabling them to be productive participants in the organization and their communities. When emphasizing the safety, health and welfare of workers, businesses also see benefits in decreased costs associated with workers' compensation payments, training and recruitment; increased productivity and quality; and improved reputational and financial performance."[1]

Gallup's State of the Global Workplace research supports these assertions, finding that high engagement was associated with the following benefits:[2]

- Increased performance, including:
  - 21% higher profitability
  - 20% higher sales
  - 17% higher productivity and
  - 10% higher customer metrics
- Decreases in factors that undermine performance, including:
  - 70% fewer employee safety incidents
  - 41% lower absenteeism
  - 40% fewer defects
  - 28% less shrinkage (wastage or theft)
  - 24% or 59% lower turnover in low- and high-turnover organizations, respectively.

The National Safety Council reports that "every 7 seconds, a worker is injured on the job; that's 510 injuries per hour, 12,600 per day, 88,500 per month and 4,600,000 per year."[3] Grim statistics, made even more appalling since each one is preventable. The International Labor Organization reports that the cost of work-related injuries and deaths totals almost $3 trillion or approximately 4% of global GDP (gross domestic product).[4] For additional perspective, ILO Director-General Guy Ryder noted that "the economic impact of failing to invest in worker safety and health is nearly equal to the combined gross domestic product of the 130 poorest countries in the world." This is not only a constraint on business growth, it reduces national and global GDP and represents an unacceptable human and societal cost.

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1. Michaels, David and John Henshaw. "Here's Why Worker Safety is a Sustainability Essential." GreenBiz. January 26, 2017. Accessed August 20, 2019. ↵
2. "State of the Global Workplace." Gallup. Accessed August 20, 2019. ↵
3. "Workplace Injuries." National Safety Council. Accessed August 20, 2019. ↵
4. "ILO: Global Cost of Work-related Injuries and Deaths Totals Almost $3 Trillion." National Safety Council, Safety + Health. September 6, 2017. Accessed August 20, 2019. ↵

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24.8: Discussion- Safety, Health, and Risk Management

Even though the rate of worker deaths and reported injuries has decreased by more than 60% since the inception of the Occupational Safety and Health Act, there are still 3.6 million serious job-related injuries and more than 5,000 workers killed on the job each year.

As an HR manager at an ophthalmic medicine research lab at a major university, you provide safety guidance for about 400 faculty and staff. These 400 people are actively engaged in research that involves chemicals, sharp tools like scalpels and needles, easily-broken glassware, and machinery that cryogenically and deep-freezes biological and chemical materials.

Safety concerns for the lab would include fire and being able to safely extinguish it; proper use of chemicals that follow biohazard rules, use of them in properly vented areas, and careful procedures for use of radioactive materials; safely operating all machinery; and proper use and disposal of “sharps,” which include needles and syringes, scalpels and the like. Safety and risk management are a large part of your job as the HR manager.

Discussion Prompt

The director of the safety department just approached you to investigate OSHA’s resources. He’s looking for a recognition program for workplace safety that would work well for the lab. Particularly, the director is proud of the work his team has done to instill safety into the workplace and wants them to get some official recognition. Using the resources provided to you in this module, determine which of OSHA’s offerings might be best suited to what the director is looking for, and what next steps you’d recommend. Write a paragraph or two with your recommendation, and then review the recommendations of at least two other classmates.

Grading

Share your opinions below and respond to two of your classmates’ thoughts.

Discussion Grading Rubric

Criteria	Not Evident	Developing	Exemplary	Points
Submit your initial response	**0 pts** No post made	**5 pts** Post is either late or off-topic	**10 pts** Post is made on time and is focused on the prompt	10 pts
Respond to at least two peers’ presentations	**0 pts** No response to peers	**2 pts** Responded to only one peer	**5 pts** Responded to two peers	5 pts
			Total:	**15 pts**

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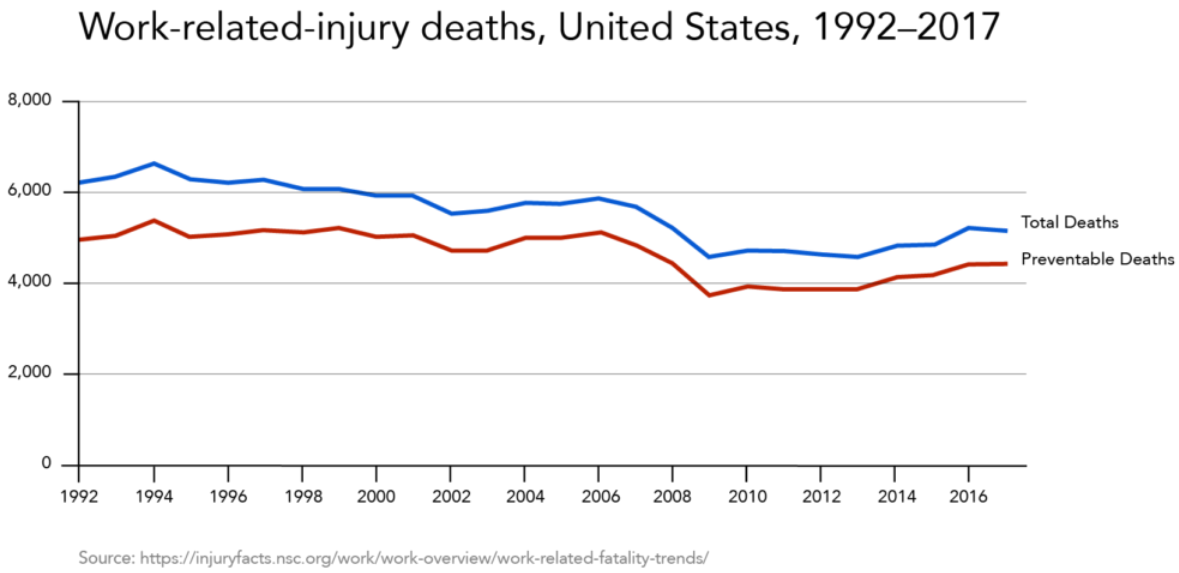
24.9: Why It Matters- Safety, Health, and Risk Management

Why learn about safety, health and risk management?

Although serious and often fatal injuries were common in the early industrial age, many of us assume that the modern workplace is a kinder—or at least safer—place. We assume that the laws passed in response to atrocities such as the Triangle Shirtwaist fire (discussed in Module 13: Union–Management Relations) and horrific workplace conditions in the meatpacking and other industries have addressed these risks and created an environment free of—at the very least, preventable—work-related injuries. As Figure 1 illustrates, that assumption would be wrong. In 2017, over 5,000 people died due to work-related-injuries in the United States. What is particularly shocking is that 86% of those fatalities were preventable. That is, 4,414 of the 5,147 deaths could have been avoided. At a global level, the International Labor Organization estimates the number of deaths due to occupational injuries and illnesses is 2,780,000 annually.[1]



Work-related-injury deaths, United States, 1992–2017[2]

Year	Total deaths	Preventable Deaths
1992	6,217	4,965
1993	6,331	5,034
1994	6,632	5,338
1995	6,275	5,015
1996	6,202	5,069
1997	6,238	5,160
1998	6,055	5,117
1999	6,054	5,184
2000	5,920	5,022
2001	5,915	5,042
2002	5,534	4,726
2003	5,575	4,725

Year	Total deaths	Preventable Deaths
2004	5,764	4,995
2005	5,734	4,984
2006	5,840	5,088
2007	5,657	4,829
2008	5,214	4,423
2009	4,551	3,744
2010	4,690	3,896
2011	4,692	3,901
2012	4,628	3,903
2013	4,585	3,899
2014	4,821	4,132
2015	4,836	4,190
2016	5,190	4,398
2017	5,147	4,414

The total cost of work injuries in the United States was $161.5 billion in 2017 (see Figure 2 for the breakdown).[3] According to Liberty Mutual Workplace Safety Index, U.S. employers spent $58.5 billion—over $1 billion per week—on the most disabling nonfatal injuries and illnesses in 2018.[4]

Work Injury Costs[5]

Total Cost in 2017	$161.5 billion
Cost per worker	$1,100
Cost per death	$1,150,000
Cost per medically consulted injury	$39,000

Although significant, these costs are a fraction of the total cost of ineffective safety and health management. As occupational health and safety experts David Michaels and John Henshaw note in a GreenBiz article, “a strong commitment to safety and health can . . . decrease training and recruitment costs, increase worker engagement and satisfaction, increase productivity and quality and improve reputational and financial performance.”[6]

In this module, we’ll discuss a business’s legal obligations for workplace safety and health, the enforcement process, how to improve workplace safety and risk management.

1. "ILO: Global Cost of Work-related Injuries and Deaths Totals Almost $3 Trillion." Safety + Health Magazine. September 6, 2017. Accessed August 20, 2019. ↵
2. National Safety Council. “Work-Related Fatality Trends.” Injury Facts. Accessed November 18, 2019. ↵
3. "ILO: Global Cost of Work-related Injuries and Deaths Totals Almost $3 Trillion." ↵
4. "Liberty Mutual Workplace Safety Index." Liberty Mutual Insurance. February 2018. Accessed August 20, 2019. ↵
5. “Workplace Safety Index.” Liberty Mutual Group. Accessed November 18, 2019. ↵
6. Michaels, David and John Henshaw. "Here's Why Worker Safety is a Sustainability Essential." Accessed August 20, 2019. ↵

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24.10: Introduction to Workplace Safety and Health

What you'll learn to do: Describe the legal obligations for workplace safety and health

Workplace safety isn't just a business best practice, it is, as OSHA posters declare, the law. Passed by Congress in 1970, the Occupational Safety and Health (OSH) Act created the Occupational Safety and Health Administration (OSHA), whose mission is "to assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance."[1] In this section, we'll discuss employer requirements and employee rights under the OSH Act and associated state plans.

1. "Occupational Safety and Health Act." United States Department of Labor. Accessed August 20, 2019. ↵

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24.11: Employer Requirements

Learning Objectives

- Identify employer requirements under the Occupational Safety & Health Act (OSH Act)

Alberta Department of Public Health Work Safety Poster

An agency of the U.S. Department of Labor, OSHA has the primary responsibility for administering and enforcing the Occupational Safety and Health (OSH) Act, with covers a majority of employers and workers; the primary exceptions are (many) public sector employees and the self-employed. Youth worker safety and health is addressed in the Fair Labor Standards Act (FLSA). However, all OSHA rules also apply to young workers.

The OSH Act establishes an employer's responsibility to provide a safe workplace. In brief, the act requires employers to "provide a workplace free from serious recognized hazards and comply with standards, rules and regulations issued under the OSH Act."[1] On it's website, OSHA highlights the following supporting actions:

- Examine workplace conditions to make sure they conform to applicable OSHA standards.
- Make sure employees have and use safe tools and equipment and properly maintain this equipment.
- Use color codes, posters, labels or signs to warn employees of potential hazards.
- Establish or update operating procedures and communicate them so that employees follow safety and health requirements.
- Provide safety training in a language and vocabulary workers can understand.
- If hazardous chemicals are present, develop and implement a written hazard communication program and train employees on the hazards they are exposed to and proper precautions. A copy of safety data sheets must be readily available.
- Provide medical examinations and training when required by OSHA standards.
  - For more details on training, refer to the Training Requirements in OSHA Standards publication.
- Post the OSHA poster or the state-plan equivalent in a prominent location in the workplace.
  - OSHA regulations do not require employers to display the poster in a foreign language. However, However, OSHA encourages employers with Spanish-speaking workers to also display the Spanish version of the poster.
- Report all significant work-related injuries, including those requiring hospitalization, amputation, loss of an eye or death.
- Maintain records of work-related injuries and illnesses and provide access as appropriate.
- Provide to the OSHA compliance officer the names of authorized employee representatives who may be asked to accompany the compliance officer during an inspection.
- Do not discriminate or retaliate against employees who exercise their rights under the Act.
- Post OSHA citations at or near the work area involved. Each citation must remain posted until the violation has been corrected, or for three working days, whichever is longer. Post abatement verification documents or tags.
- Correct cited violations by the deadline set in the OSHA citation and submit required abatement verification documentation.

PRactice Question

https://assessments.lumenlearning.co...essments/18221

1. "OSHA Worker Rights and Protections: Employer Responsibilities." Occupational Safety and Health Administration, United States Department of Labor. Accessed August 20, 2019. ↵

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24.12: Worker Rights

Learning Objectives

- Identify worker rights under the OSH Act

Worker rights under the OSH Act are summarized in the OSHA poster (see Figure 1), which employers are required to post in a prominent location in the workplace. The poster is available in 12 languages, including Spanish, Arabic, Chinese, Korean and Vietnamese. OSHA regulations do not specify or require employers to display the OSHA poster in a foreign language. However, posting a version or versions that reflect the employee language mix is a recommended practice.

Figure 1. Job Safety and Health: It's the Law (Click on this image to view the full PDF.)

In brief, the OSH Act establishes that workers have a fundamental right to a safe workplace. That right includes the right to voice a safety or health concern, to report a work-related injury or illness and view medical records. The Act also provides for protection from retaliation for expressing a concern or reporting an injury or illness. OSHA's Whistleblower Protection Program investigates claims of retaliation and enforces protections for employees for engaging in protected activities." OSHA investigators handle allegations of retaliation from private sector and U.S. Postal Service employees. Federal employees are covered by environmental statutes and each agency is required to establish procedures to protect employees from "retaliation for reporting unsafe or unhealthful working conditions, or for otherwise engaging in safety or health activities."[1] Similarly, public sector employees should report safety or health hazards to their respective agency's Designated Agency Safety and Health Officer (DASHO).

Note

Federal government agencies are required to post the Federal Agency poster, which is available as a Word doc to allow individuals agencies to customize it with their logos and other identifying information.

In addition to the rights listed on the OSHA poster, employees have the right to the following:[2]

- Be trained in a language you understand

- Work on machines that are safe
- Be provided required safety gear, such as gloves or a harness and lifeline for falls
- Be protected from toxic chemicals
- Request an OSHA inspection, and speak to the inspector
- See copies of the workplace injury and illness log
- Review records of work-related injuries and illnesses
- Receive copies of test results done to find hazards in the workplace

? Learn More

OSHA also has a Frequently Asked Questions on their Worker Rights and Protections page.

? Practice Question

https://assessments.lumenlearning.co...essments/18222

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1. "Whistle Blower Protection." Occupational Safety and Health Administration, United States Department of Labor. Accessed August 20, 2019. ↵
2. "OSHA Worker Rights and Protections." Occupational Safety and Health Administration, United States Department of Labor. Accessed August 20, 2019. ↵

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24.13: Record-Keeping Requirements

Learning Objectives

- Summarize OSH Act record-keeping requirements

In general, employers with more than 10 employees are required to keep a record of serious work-related injuries and illnesses. A recordable injury or illness includes the following:[1]

- Any work-related fatality.
- Any work-related injury or illness that results in loss of consciousness, days away from work, restricted work, or transfer to another job.
- Any work-related injury or illness requiring medical treatment beyond first aid.
- Any work-related diagnosed case of cancer, chronic irreversible diseases, fractured or cracked bones or teeth, and punctured eardrums.
- There are special recording criteria for work-related cases involving needlesticks and sharps injuries; medical removal; hearing loss; and tuberculosis; refer to the linked page for specific criteria.

Minor injuries—specifically, those requiring first aid only—do not need to be recorded. Employers in low-risk industries are exempted from the recording rule unless otherwise notified in writing. Industries that are designated as low risk are identified by North American Industry Classification System (NAICS) code and listed on the Partially Exempt page on OSHA's website. Examples of industries that are exempt from recording include Florists, Health and Personal Care Stores, Legal Services and Junior Colleges.

Note that "all employers, including those partially exempted by reason of company size or industry classification, must report to OSHA any workplace incident that results in a fatality, in-patient hospitalization, amputation, or loss of an eye."[2]

Employers must report any worker fatality within 8 hours and any amputation, loss of an eye, or hospitalization of a worker within 24 hours. Reports can be submitted online or by calling the nearest OSHA office or OSHA's 24-hour hotline.

Injury and illness records must be maintained on site for at least five years. Each February through April, employers are required to post a summary of the injuries and illnesses recorded the previous year. If requested, copies of the Log of Work-Related Injuries and Illnesses (OSHA Form 300) must be provided to current and former employees, or their representatives. Employers must also provide employees or their authorized representatives access to their medical records and exposure records.

? Practice Question

https://assessments.lumenlearning.co...essments/18223

1. "OSHA Injury and Illness Record-Keeping and Reporting Requirements." Occupational Safety and Health Administration, United States Department of Labor. Accessed August 20, 2019. ↵
2. "Non-Mandatory Appendix A to Subpart B – Partially Exempt Industries." Occupational Safety and Health Administration, United States Department of Labor. Accessed August 20, 2019. ↵

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24.14: Safety and Health Standards

Learning Objectives

- Discuss state workplace safety and health standards

State plans are OSHA-approved workplace safety and health programs operated by individual states or U.S. territories. These plans are regulated by OSHA and must be at least as effective as OSHA in protecting workers and in preventing work-related injuries, illnesses and deaths. When there is an OSHA-approved state plan in operation, employers can post the state version of the OSHA poster instead of the federal version. In states where there is an OSHA-approved State plans vary in their applicability, with twenty-one plans covering both private sector and state and local government employees and five states covering only state and local government workers.

States with plans covering private sector and state and local government employees:

- Washington
- Oregon
- California
- Nevada
- Utah
- Arizona
- New Mexico
- Wyoming
- Minnisota
- Iowa
- Michigan
- Indiana
- Kentucky
- Tennessee
- South Carolina
- North Carolina
- Virginia
- Maryland
- Vermont
- Alaska
- Hawaii

States with plans covering only state and local government workers:

- Illinois
- New York
- New Jersey
- Connecticut
- Maine

Check out the coverage for your state below:

A link to an interactive elements can be found at the bottom of this page.

The California State Plan

For example, the California State Plan covers state and local government employers and a majority of private sector workplaces.[1] The plan does not apply to federal government employers or private sector employers operating within federal properties such as military installations, national parks and United States Postal Service mail operations or to maritime employers or aircrafts. California's plan also does not apply to employers operating within the borders of Native American reservation and trust lands recognized by the federal government.

In addition to OSHA standards, Cal/OSHA has adopted state-specific standards addressing the following:

- Toxic Chemical Handling and Exposure
- Agriculture
- Repetitive Motion Injuries
- Child Labor
- Heat Exposure
- Noise Exposure
- Injury and Illness Prevention Program
- Aerosol Transmissible Diseases
- Petroleum Drilling and Production
- Petroleum Refining, Transport, and Handling
- Workplace Violence Prevention in Health Care

The state of California's Department of Industrial Relations (DIR) administers the California State Plan through Cal/OSHA and investigates private and state and local government workplace claims of retaliation; federal OSHA is responsible for enforcement of anti-retaliation protections. OSHA retains the right to exercise concurrent federal authority for safety and health-related actions broadly, including the right to inspect any establishment and take appropriate enforcement action when Cal/OSHA (or any State Plan) is unable to fully or effectively exercise its enforcement authority due to employer non-compliance, reduction of resources or staff, limitations on enforcement authority, disasters or emergencies or other factors.

? Practice Question

https://assessments.lumenlearning.co...essments/18224

1. "California State Plan." Occupational Safety and Health Administration, United States Department of Labor. Accessed August 20, 2019. ↵

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24.15: Introduction to Inspection and Enforcement

What you'll learn to do: Describe the Occupational Safety and Health Administration's (OSHA's) inspection & enforcement process

In its enforcement role, OSHA sets enforcement policy, conducts targeted inspections and responds to fatalities, catastrophes and complaints. The on-the-ground inspection and enforcement role is conducted by OSHA inspectors, industrial hygienists and safety professionals referred to as compliance safety and health officers. In this section, we'll discuss the OSHA enforcement process and how penalties are determined.

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24.16: OSHA Inspection

Learning Objectives

- Describe OSHA's inspection process

Alberta Department of Public Health Work Safety Poster

With jurisdiction for approximately 7 million worksites, OSHA prioritizes inspections based on hazard in the following order:[1]

1. **Imminent danger.** A situation where hazards could cause death or serious harm.
2. **Severe illness or injury.** Based on employer reporting of fatality, severe illness or injury.
3. **Worker complaints.** Investigating worker allegations of hazards or violations.
4. **Referrals.** Notice of hazards referred from other agencies, individuals, organizations or the media.
5. **Targeted inspections.** Inspections focused on high-hazard industries or workplaces.
6. **Follow-up inspections.** To ensure abatement (resolution) of prior violations

Lower priority hazards may be addressed without an on-site inspection, with compliance officers and employers discussing safety and health concerns, findings and corrective actions by phone and in writing.

OSHA's on-site inspections are a six-step process as detailed below.

1. **Preparation.** This includes researching inspection history, determining what standards are more likely to apply based on operations and collecting the appropriate safety gear and testing instruments.
2. **Presentation of credentials.** OSHA compliance officers generally do not provide advance notice of inspections. Employers have the right to require compliance officers to obtain an inspection warrant before entering the worksite.
3. **Opening conference.** The compliance officer will explain why the site was selected for inspection, describe the inspection scope and procedures. The employer selects a representative to accompany the compliance officer during the inspection. An authorized representative of the employees—for example, a union representative—also has the right to accompany an inspector.
4. **Walkaround.** The compliance officer and company representative(s) will walk through the areas of the workplace covered by the inspection, looking for hazards that could lead to employee injury or illness. The officer will also review worksite injury and illness records and note whether the OSHA poster is on display.
5. **Closing Conference.** The compliance officer will hold a closing conference with the employer and the employee representatives to discuss the findings and possible courses of action. The officer will also cover employer rights (e.g., right to content citations and proposed penalties), employee rights and discuss OSHA consultation services.
6. **Results.** If an inspector finds serious hazards or violations of OSHA standards, the agency must issue a citation and proposed penalty within six months. Citations describe OSHA requirements allegedly violated, list any proposed penalties, and give a deadline for correcting the alleged hazards.
7. **Settlement or Appeal.** When OSHA issues a citation, it also extends an offer to discuss the findings with the OSHA Area Director. The objective of this meeting is to arrive at a settlement agreement to eliminate the hazards and resolve the issue.

Alternately, employers can contest the alleged violations and/or penalties. This appeal must be submitted in writing within 15 working days after receipt of results. Contests are forwarded to the Occupational Safety and Health Review Commission for independent review. Inspection results—citations, penalties, and abatement dates—that are not challenged or settled become a final order of the Occupational Safety and Health Review Commission.

? Practice Question

https://assessments.lumenlearning.co...essments/18225

1. "OSHA Fact Sheet." Occupational Safety and Health Administration, United States Department of Labor. Accessed August 20, 2019. ↵

Contributors and Attributions

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24.17: OSHA Penalties

Learning Objectives

- Describe how OSHA penalties are determined

OSHA penalties are determined by the type of violation, as illustrated in Table 1. Violation types range in significant/penalty from minor (posting requirements) to willful or repeated. In settling a penalty, OSHA has a policy of reducing penalties for small employers and those acting in good faith. For serious violations, OSHA may also reduce the proposed penalty based on the gravity of the alleged violation. No good faith adjustment will be made for alleged willful (intentional) violations. States that operate their own Occupational Safety and Health Plans are required to adopt maximum penalty levels that are at least as effective as Federal OSHA's.

Table 1. Maximum OSHA Penalties[1]

Type of Violation	Penalty
Serious Other-Than-Serious Posting Requirements	$13,260 per violation
Failure to Abate	$13,260 per day beyond the abatement date
Willful or Repeated	$132,598 per violation

PRactice Question

https://assessments.lumenlearning.co...essments/18226

For perspective on actual penalties assessed, see OSHA's top penalties by state page, that provides a clickable map of enforcement cases with initial penalties of $40,000 or more. A repeat offender: the U.S. Postal Service (USPS); the most recent violation was 6/13/19 (San Francisco), with a $85,248 penalty. Also on the list: Tesla, Inc. with a $82,000 penalty on 2/28/2019, Skechers USA, Inc. with a $42,370 penalty on 12/14/2018 and

Southern California Edison, with a $95,435 penalty on 11/19/2018. Ironically, Aerotek, Inc.—"the leading recruitment and staffing agency…focused on bringing great people and great organizations together"[2] – was fined $55,010 on 4/23/19. So much for their "our people are everything" tagline.

1. "OSHA Penalties." Occupational Safety and Health Administration, United States Department of Labor. Accessed August 20, 2019. ↵
2. "Aerotek Recruiting and Staffing." Accessed August 20, 2019. ↵

Contributors and Attributions

CHAPTER OVERVIEW

25: Safety and Health at Work

25.1: Introduction

Training for Safety

As the HR manager of a large construction company, your workers' health and safety is of paramount concern. Last week, you reported an incidence rate of 7.5 accidents per 100 employees to the Occupational Safety and Health Administration (OSHA). When you compared these numbers to last year, you found the number had significantly increased, as it was 4.2. This is concerning, because you know an unsafe workplace is not only bad for employees and bad for business, but it could result in fines from OSHA. You ask your operations managers to meet with you about the situation. When you bring this to his attention, he doesn't seem at all concerned about the almost double increase in accidents over the last year. He says the increase in accidents is a result of scaffolding falling during a building project where several workers were hurt. He says this one accident skewed the numbers. He mentions that the supervisor responsible for the scaffolding had been let go six months ago for other reasons, and he assures you that there is no reason to be concerned. A few weeks after this conversation, two of your workers spend time in the hospital because of a falling scaffolding injury. Again, you approach the operations manager and he assures you that those employees were just new and he will implement proper procedures. You know the incident will result in another high incident percentage, even if there isn't another accident the rest of the year. You consider your options.

You look back over ten years of accident reports and find there are three areas for which your company seems to have 90 percent of all accidents. You decide you will develop a training program to address these safety issues in your workplace. You refer to your HRM textbook for tips on how to prepare and communicate this training to your employees. When you present this option to your operations manager, he says that employees don't have the time to take from their jobs to go through this training and suggests you just let it go. You are prepared for this response, and you give him the dollar figure of money lost owing to worker injury in your organization. This gets his attention, especially when you compare it to the small cost of doing a two-hour training for all employees. Both of you check your Outlook schedules to find the best day of the week to schedule the training, for minimum impact on employees' work.

25.2: Workplace Safety and Health Laws

Learning Objectives

1. Be able to explain OSHA laws.
2. Understand right-to-know laws.

Workplace safety is the responsibility of everyone in the organization. HR professionals and managers, however, play a large role in developing standards, making sure safety and health laws are followed, and tracking workplace accidents. Occupational Safety and Health Administration (OSHA) Laws addresses workplace laws as they relate to safety.

Occupational Safety and Health Administration (OSHA) Laws

In 2009 (the most recent data available at the time of this writing), 4,340 fatalities and 3.3 million injuries were reported[1]. This staggering number represents not only the cost to employees' well-being but also financial and time costs to the company. This is why health and safety is a key component of any human resource management (HRM) strategic plan.

What Is OSHA About?

A short video on the purpose of OSHA.

The **Occupational Safety and Health Act (OSHA)**, passed in 1970, created the Occupational Safety and Health Administration, which oversees health and safety in the workplace. The organization's mission is to ensure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education, and assistance. For example, OSHA offers ten- and thirty-hour courses on workplace hazards and also provides assistance to ensure companies are in compliance with standards. OSHA is part of the US Department of Labor, with the main administrator being the assistant secretary of labor for occupational safety and health. This person reports to the labor secretary, who is a member of the president's cabinet.

Although OSHA applies to all companies, health and safety standards are specifically mentioned for the following types of businesses:

1. Construction
2. Shipyard
3. Marine terminals

Although OSHA standards may appear to apply only to companies in production, manufacturing, or construction, even companies with primarily an office function are required to abide by the laws set by OSHA. Examples (not at all an exhaustive list) of the types of safety laws (for all types of businesses) that are overseen by OSHA are as follows:

1. **Regulations on walking/working surfaces.** According to OSHA, slips, trips, and falls constitute the majority of general industry accidents and 15 percent of all accidental deaths. The standards apply to all permanent places of employment. The provision says that "all passageways, storerooms, and service rooms shall be kept clean and orderly. Every floor and working space shall be kept free of protruding nails, splinters, holes, or loose boards." These are a few examples included in this provision.
2. **Means of egress (exiting), which includes emergency evacuation plans.** "Every building or structure shall be arranged and maintained as to provide free and unobstructed egress from all part of the buildings. No lock or fastening to prevent free escape from inside the building should be installed (except in penal or corrective institutions)." The provision also says that exits shall be marked by a visible sign.
3. **Occupational noise exposure.** "Protection against the effects of noise exposure shall be provided when the sound levels reach a specified level. Controls should be used to control the sound, and protective equipment should be provided."
4. **Hazardous handling of materials.** OSHA regulates exposure to four hundred substances and requires communication about the possible chemical hazards to employees.
5. **Protective equipment, such as eye, face, and respiratory protection.** OSHA requires the use of personal protective equipment to reduce employee exposure to hazards. For example, head protection is required when workers are in an area where there is potential for falling, and eye and face protection is required when workers are exposed to eye or face hazards such as flying particles and molten metal.
6. **Sanitation.** Some examples of these OSHA requirements include the following: Potable water should be provided in all places of employment. Vermin control is required in all enclosed workplaces. Toilet facilities must be provided, separate for each sex. The number of toilets provided depends on the number of employees.
7. **Requirement of first aid supplies on-site.** First aid kits are mandatory and should include gauze pads, bandages, gauze roller bandages, and other required items.
8. **Standards for fire equipment.** Fire extinguishers are required to be on-site for use by employees, unless there is a written fire policy that requires the immediate and total evacuation of employees.
9. **Standards for machine guards and other power tools.** Moving machine parts require safeguards (depending upon the industry) to prevent crushed fingers, hands, amputations, burns, or blindness. Safeguards might include a guard attached to the machine.
10. **Electrical requirements and standards.** OSHA electrical standards are designed to protect employees from electric shock, fires, and explosions. Electrical protective devices are required to cover wiring. OSHA also addresses the installation of electrical wiring.
11. **Commercial diving operation requirements.** OSHA provides information on the safety aspects of commercial diving such as pre- and postdive procedures, mixed-gas diving, and necessary qualifications of the dive team.

HR professionals and managers should have a good understanding of these laws and make sure, no matter which industry, that all these standards are followed in the workplace. These standards are normally part of the overall strategic HRM plan of any organization and are even more crucial to organizations involved in manufacturing.

There exist many examples of OSHA violations. For example, in a Queensbury, Pennsylvania, Dick's Sporting Goods store, OSHA found six violations, including blocked access to a fire extinguisher and workers' entering a trash compactor with the power supply on. Dick's was fined $57,300 by OSHA and told it had fifteen days to comply or contest the findings (Churchill, 2011).

The Most Frequently Violated and Cited OSHA Standards

1. 1926.451—Scaffolding
2. 1926.501—Fall Protection
3. 1910.1200—Hazard Communication
4. 1910.134—Respiratory Protection
5. 1926.1053—Ladders
6. 1910.147—Lockout/Tagout
7. 1910.305—Electrical, Wiring Methods
8. 1910.178—Powered Industrial Trucks
9. 1910.303—Electrical, General Requirements
10. 1910.212—Machine Guarding

Right-to-Know Laws

The **Emergency Planning and Community Right to Know Act (EPCRA)** or more simply, right-to-know laws, were established by Congress in 1986. The purpose of this act was to require local and state governments to provide emergency response plans to respond to a chemical emergency[2]. The other requirement is that these plans must be reviewed on an annual basis. Companies that handle **extremely hazardous substances (EHSs)** in large quantities must develop response plans as well. In addition, any organization that manufactures, processes, or stores certain hazardous chemicals must make available to local fire departments and state and local officials **material data safety sheets**. The material data safety sheet should also be provided to employees, as the data lists not only the chemical components but health risks of the substance, how to handle the material safely, and how to administer first aid in the case of an accident. This requirement also states that inventories of all on-site chemicals must be reported to local and state governments, but the data sheets must also be made public, too.

This law and how it will be reported should be facilitated by the HR professional. Although the HRM may not know the chemical makeup of the materials used, he or she is responsible for facilitating the process to ensure that reporting is done timely and accurately. For organizations that use EHSs often, it is worthwhile to include the reporting process within the orientation training and provide ongoing training as the law changes. The A-Treat Bottling facility in Allentown, Pennsylvania, was cited by OSHA for repeat violations of lacking material safety data sheets for the chemicals it uses in manufacturing, among other infractions such as blocked exits and forklift violations. The fines totaled $110,880, and the company had fifteen days to comply or contest the allegations[3].

It is also important to note that some state standards are different from federal standards, which means the HR professional will need to be aware of the laws in the individual state in which the company is operating.

Human Resource Recall

How do you think the OSHA requirements apply to office work settings?

OSHA Enforcement

The record-keeping aspect of OSHA is perhaps as important as following the laws. Companies having fewer than ten employees in some industries are not required to keep records. The purpose of the record keeping does not imply that the employee or the company is at fault for a illness or injury. In addition, just because a record is kept doesn't mean the employee will be eligible for workersworker's compensation#8217; compensation. The record-keeping aspect normally refers to the keeping of incidence rates, or the number of illnesses or injuries per one hundred full-time employees per year, as calculated by the following formula:

incidence rate=number of injuries and illness × 200,000total hours worked by all employees in the period

Two hundred thousand is the standard figure used, as it represents one hundred full-time employees who work forty hours per week for fifty weeks per year. An HR professional can then use this data and compare it to other companies in the same industry to see how its business is meeting safety standards compared with other businesses. This calculation provides comparable information, no matter the size of the company. If the incidence rate is higher than the average, the HR professional might consider developing training surrounding safety in the workplace.

Knowing what should be reported and what shouldn't be reported is an important component to OSHA. Figure 25.2.1 provides a decision tree that explains this. Data are reported using a form called OSHA 300, which is shown in Figure 25.2.2

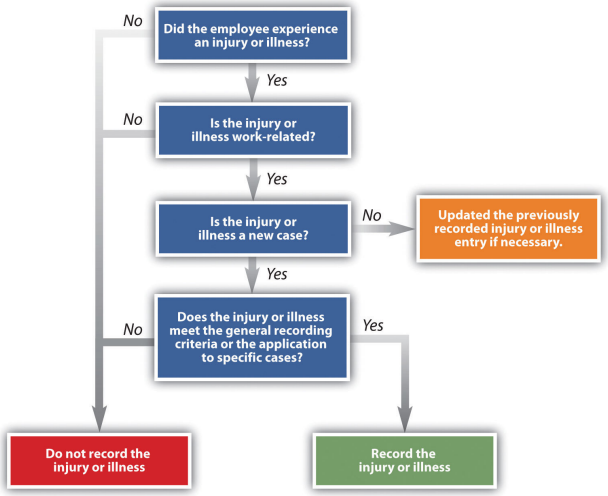
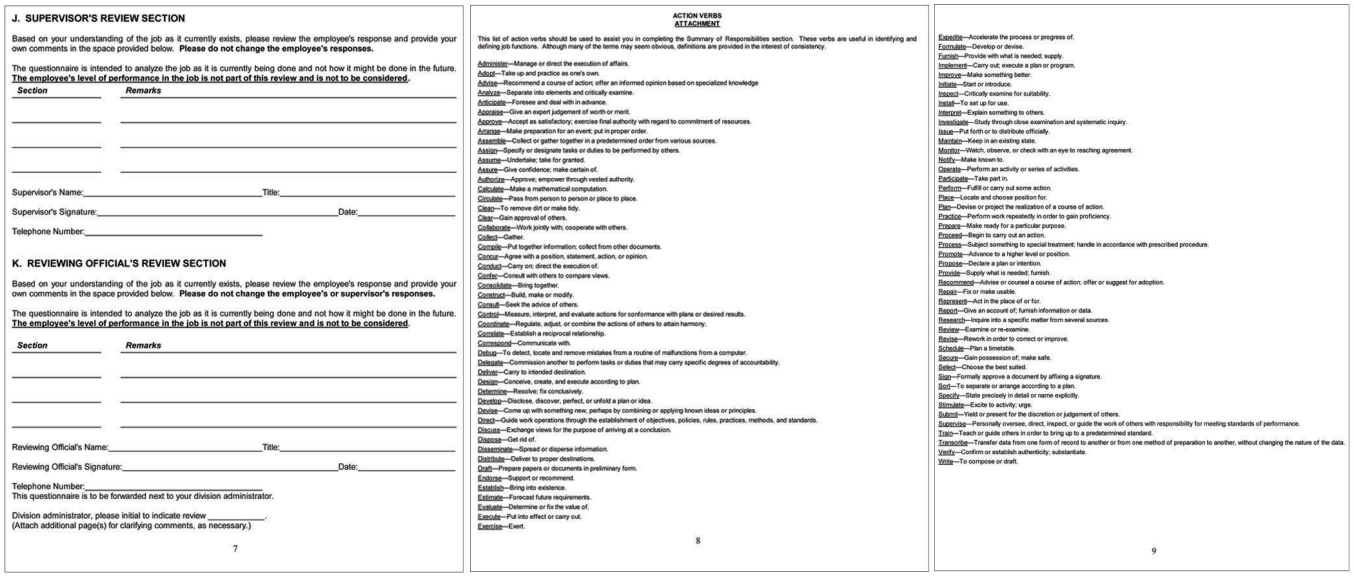


Figure 25.2.1: The OSHA Decision Tree for Determining If an Injury or Illness Should Be Recorded Source: www.osha.gov/recordkeeping/ppt1/RK1flowchart.html (accessed September 2, 2011).



J. SUPERVISOR'S REVIEW SECTION

Based on your understanding of the job as it currently exists, please review the employee's response and provide your own comments in the space provided below. **Please do not change the employee's responses.**

The questionnaire is intended to analyze the job as it is currently being done and not how it might be done in the future. **The employee's level of performance in the job is not part of this review and is not to be considered.**

Section *Remarks*

Supervisor's Name:_____ Title:_____

Supervisor's Signature:_____ Date:_____

Telephone Number:_____

K. REVIEWING OFFICIAL'S REVIEW SECTION

Based on your understanding of the job as it currently exists, please review the employee's response and provide your own comments in the space provided below. **Please do not change the employee's or supervisor's responses.**

The questionnaire is intended to analyze the job as it is currently being done and not how it might be done in the future. **The employee's level of performance in the job is not part of this review and is not to be considered.**

Section *Remarks*

Reviewing Official's Name:_____ Title:_____

Reviewing Official's Signature:_____ Date:_____

Telephone Number:_____

This questionnaire is to be forwarded next to your division administrator.

Division administrator, please initial to indicate review _____.

(Attach additional page(s) for clarifying comments, as necessary.)

7

ACTION VERBS ATTACHMENT

This list of action verbs should be used to assist you in completing the Summary of Responsibilities section. These verbs are useful in identifying and defining job functions. Although many of the terms may seem obvious, definitions are provided in the interest of consistency.

Administer—Manage or direct the execution of affairs.
Adopt—Take up and practice as one's own.
Advise—Recommend a course of action; offer an informed opinion based on specialized knowledge
Analyze—Separate into elements and critically examine.
Anticipate—Foresee and deal with in advance.
Appraise—Give an expert judgement of worth or merit.
Approve—Accept as satisfactory; exercise final authority with regard to commitment of resources.
Arrange—Make preparation for an event; put in proper order.
Assemble—Collect or gather together in a predetermined order from various sources.
Assign—Specify or designate tasks or duties to be performed by others.
Assume—Undertake; take for granted.
Assure—Give confidence; make certain of.
Authorize—Approve; empower through vested authority.
Calculate—Make a mathematical computation.
Circulate—Pass from person to person or place to place.
Clean—To remove dirt or make tidy.
Clear—Gain approval of others.
Collaborate—Work jointly with; cooperate with others.
Collect—Gather.
Compile—Put together information; collect from other documents.
Concur—Agree with a position, statement, action, or opinion.
Conduct—Carry on; direct the execution of.
Confer—Consult with others to compare views.
Consolidate—Bring together.
Construct—Build, make or modify.
Consult—Seek the advice of others.
Control—Measure, interpret, and evaluate actions for conformance with plans or desired results.
Coordinate—Regulate, adjust, or combine the actions of others to attain harmony.
Correlate—Establish a reciprocal relationship.
Correspond—Communicate with.
Debug—To detect, locate and remove mistakes from a routine of malfunctions from a computer.
Delegate—Commission another to perform tasks or duties that may carry specific degrees of accountability.
Deliver—Carry to intended destination.
Design—Conceive, create, and execute according to plan.
Determine—Resolve; fix conclusively.
Develop—Disclose, discover, perfect, or unfold a plan or idea.
Devise—Come up with something new, perhaps by combining or applying known ideas or principles.
Direct—Guide work operations through the establishment of objectives, policies, rules, practices, methods, and standards.
Discuss—Exchange views for the purpose of arriving at a conclusion.
Dispose—Get rid of.
Disseminate—Spread or disperse information.
Distribute—Deliver to proper destinations.
Draft—Prepare papers or documents in preliminary form.
Endorse—Support or recommend.
Establish—Bring into existence.
Estimate—Forecast future requirements.
Evaluate—Determine or fix the value of.
Execute—Put into effect or carry out.
Exercise—Exert.

8

Expedite—Accelerate the process or progress of.
Formulate—Develop or devise.
Furnish—Provide with what is needed; supply.
Implement—Carry out; execute a plan or program.
Improve—Make something better.
Initiate—Start or introduce.
Inspect—Critically examine for suitability.
Install—To set up for use.
Interpret—Explain something to others.
Investigate—Study through close examination and systematic inquiry.
Issue—Put forth or to distribute officially.
Maintain—Keep in an existing state.
Monitor—Watch, observe, or check with an eye to reaching agreement.
Notify—Make known to.
Operate—Perform an activity or series of activities.
Participate—Take part in.
Perform—Fulfill or carry out some action.
Place—Locate and choose position for.
Plan—Devise or project the realization of a course of action.
Practice—Perform work repeatedly in order to gain proficiency.
Prepare—Make ready for a particular purpose.
Proceed—Begin to carry out an action.
Process—Subject something to special treatment; handle in accordance with prescribed procedure.
Promote—Advance to a higher level or position.
Propose—Declare a plan or intention.
Provide—Supply what is needed; furnish.
Recommend—Advise or counsel a course of action; offer or suggest for adoption.
Repair—Fix or make usable.
Represent—Act in the place of or for.
Report—Give an account of; furnish information or data.
Research—Inquire into a specific matter from several sources.
Review—Examine or re-examine.
Revise—Rework in order to correct or improve.
Schedule—Plan a timetable.
Secure—Gain possession of; make safe.
Select—Choose the best suited.
Sign—Formally approve a document by affixing a signature.
Sort—To separate or arrange according to a plan.
Specify—State precisely in detail or name explicitly.
Stimulate—Excite to activity; urge.
Submit—Yield or present for the discretion or judgement of others.
Supervise—Personally oversee, direct, inspect, or guide the work of others with responsibility for meeting standards of performance.
Train—Teach or guide others in order to bring up to a predetermined standard.
Transcribe—Transfer data from one form of record to another or from one method of preparation to another, without changing the nature of the data.
Verify—Confirm or establish authenticity; substantiate.
Write—To compose or draft.

9

Figure 25.2.2: OSHA Reporting Form 300. Public Domain Source: www.osha.gov/recordkeeping/new-osha300form1-1-04.pdf (accessed September 2, 2011).

As mentioned earlier, OSHA is responsible for enforcing standards. Besides requiring reporting, OSHA also performs inspections. OSHA is responsible for 7 million worksites across the country and so, of course, has to prioritize which ones it visits. OSHA has five main priorities for inspecting sites. First, it will inspect imminent danger situations. These are serious dangers that could cause

death or serious harm. The second priority is for those sites where three or more employees were harmed, suffered illness, or were killed. These events are classified as fatalities or catastrophes and must be reported within an eight-hour time frame. The next priority is responding to complaints, which employees are allowed to file anonymously. Organizations that have had previous violations are prioritized next, and finally, planned programs. A planned program might be an organization that has had safety problems in the past and is working with OSHA to remedy the problem.

Most site visits are unannounced and begin with the inspector introducing himself or herself. Prior to this, the inspector has performed research on the organization to be inspected. Once this occurs, a representative of the organization is assigned to accompany the inspector and the inspector discusses the reasons for the site visit. The HR professional is normally responsible for this task.

The inspector then walks around, pointing out any obvious violations, and then the inspector and representative discuss the findings. Within six months a complete report is sent, along with any citations or fines based on what the inspector found. If the organization is in disagreement with the violation or citation, a follow-up meeting with the OSHA director is scheduled and some fines may be reduced if the organization can show how it has improved and met the standards since the original visit.

OSHA has several penalties (per violation) it can assess on organizations, ranging from $7,000 to $70,000. The higher penalties often are a result of very serious offenses, in which an employee could have been killed, but also are imposed for willful offenses that the employer was aware could cause serious injury or death and did nothing about them. This is considered blatant indifference to the law. For example, Northeastern Wisconsin Wood Products was issued $378,620 in fines for willful violations in the summer of 2011. The violations stemmed from repeat visits and citations to the facility, where no safety changes had been made. Some of the willful violations included lack of guards on dangerous machine belts and band saw blades and open-sided floors without a guardrail to prevent falls. Michael Connors, OSHA's regional administrator in Chicago, said, "Northeastern Wisconsin Wood Products has a history of failing to comply with OSHA standards. The company has yet to abate many violations cited in previous inspections and are unduly placing their workers at risk[4]." While any violation of OSHA is serious, a willful violation is more serious, and the fines associated with it represent this.

Fortune 500 Focus

PepsiCo is the world's largest manufacturer, seller, and distributor of Pepsi-Cola products and generates $119 billion in sales every year[5]. Tropicana juice is owned by Pepsi-Co. In October of 2005, a spark triggered an explosion at a Tropicana juice processing plant in Bradenton, Florida, causing burns to two-thirds of a worker's body. While the worker survived, he underwent multiple surgeries to treat his burns. In this case, OSHA concluded that the fire could have been prevented if Tropicana had followed basic safety requirements such as risk evaluation, given tools to workers that did not produce sparks, and monitored for a buildup of flammable vapors and ventilated the area. OSHA inspectors tallied up a dozen violations, including two serious ones. Vice president of operations Mike Haycock said the plant has an incidence rate that is far lower than others in the industry, and plants around the country have immediately addressed many of the problems and are constantly working to correct other problems (Just-drinks editorial team, 2006).

The irony is that although the Tropicana factory paid $164,250 in fines to OSHA, the company was part of the VPP or Voluntary Protection Program, whose membership benefits include exemption from regular inspections. Even after the fire, in 2007, OSHA formally reapproved the plant as a "star site," the highest level in VPP, meaning the plant pledged to exceed OSHA standards (Hamby, 2011). OSHA contends the VPP program isn't perfect but is still a useful model to all employers of what can be achieved. For admission into the VPP program, workplaces must show they have fewer accidents and missed work days than average for their industry. According to Robert Tuttle, president of the local Teamsters union representing Tropicana workers, accidents are more common when employees are shifted out of their normal responsibilities, which is more common as the weak economy has led to staff cuts (Gulliver, 2011). Tropicana plants have had more than eighty deaths since 2000, varying from preventable explosions to chemical releases to crane accidents (Hamby, 2011). PepsiCo and Tropicana have taken a hard stance on these types of accidents, as each of the plants now has a safety manager trained on OSHA standards to prevent accidents. In addition, strict operating procedures have been implemented to prevent future problems.

Key Takeaways

- Every year, 4,340 fatalities and 3.3 million injuries occur in the workplace in the United States.
- The *Occupational Safety and Health Act* was passed in 1970, with the goal of providing a safe and healthy work environment for all US workers.

- The *Occupational Safety and Health Administration* is part of the US Department of Labor and was created as a result of the act in 1970.
- OSHA applies to some specific industries, such as construction, shipyards, and marine terminals. However, some of the OSHA regulations apply to all industries.
- Some states may also have safety requirements that may be more stringent than federal laws.
- Right-to-know laws refer to a *material data safety sheet*, which discusses the types of chemicals, proper handling and storage, and first aid in case of an accident. These data sheets should be made available to the general public and employees.
- Right-to-know laws also require specific reporting to local and state agencies on chemicals used in certain quantities for some industries.
- OSHA requires recording keeping for all workplace accidents or illness. Record keeping is usually the responsibility of HR, and reports are made via OSHA Form 300.
- OSHA can inspect any site without prior notification. Usually, OSHA will gather information, visit the site, and ask for a representative. The representative is normally the HR person. The site visit will be performed, followed by discussion with the company representative. Within six months of the visit, a report and any penalties will be communicated.

Exercises

1. Research the Internet for recent OSHA violations and write two paragraphs describing one.
2. Research possible strategies to reduce OSHA violations and write a paragraph on at least two methods.

[1]"Workplace Injuries and Illnesses: 2009," Bureau of Labor Statistics, US Department of Labor, news release, October 21, 2010, accessed April 14, 2011, www.bls.gov/news.release/archives/osh_10212010.pdf.

[2]"Emergency Planning and Community Right-to-Know Act (EPCRA)," United States Environmental Protection Agency, accessed April 15, 2011, www.epa.gov/epahome/r2k.htm.

[3]"OSHA Cites Allentown Soft Drink Company," NewsWire.com, August 4, 2011, accessed August 21, 2011, http://www.mmdnewswire.com/us-labor-departmen-57793.html.

[4]"$378,620 in Fines Issued for Willful Violations," *Occupational Health and Safety*, July 31, 2011, accessed August 21, 2011, http://ohsonline.com/articles/2011/07/31/378620-in-fines-issued-to-wisconsin-wood-firm-for-willful-violations.aspx?admgarea=news.

[5]"PepsiCo Annual Report," accessed September 15, 2011, www.pepsico.com/Download/PepsiCo_Annual_Report_2010_Full_Annual_Report.pdf.

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Just-drinks editorial team, "US: Tropicana in Safety Hazards Payout," just-drinks, April 18, 2006, accessed August 21, 2011, www.just-drinks.com/news/tropicana-in-safety-hazards-payout_id86183.aspx.

25.3: Health Hazards at Work

Learning Objectives

1. Be able to explain health concerns that can affect employees at work.

While OSHA covers many areas relating to health and safety at work, a few other areas are also important to mention. Stress management, office-related injuries such as carpal tunnel syndrome, and no-fragrance areas are all contemporary issues surrounding employee health and safety. We will discuss these issues in this section.

Stress

In its annual survey on stress in America (American Psychological Association, 2011), the American Psychological Association found that money (76 percent), work (70 percent), and the economy (65 percent) remain the most oft-cited sources of stress for Americans. Job instability is on the rise as a source of stress: nearly half (49 percent) of adults reported that job instability was a source of stress in 2010 (compared to 44 percent in 2009). At the same time, fewer Americans are satisfied with the ways their employers help them balance work and nonwork demands (36 percent in 2010 compared to 42 percent in 2009). The implications of these findings are obviously important for HRM professionals.

Before we discuss what HR professionals can do, let's discuss some basic information about stress. As it is currently used, the term *stress* was coined by Hans Selye in 1936, who defined it as "the nonspecific response of the body to any demand for change" (The American Institute of Stress, 2011). In other words, we can say that **stress** is the reaction we have to a stressor. A **stressor** is some activity, event, or other stimulus that causes either a positive or negative reaction in the body. Despite what people may think, some stress is actually good. For example, receiving a promotion at work may cause stress, but this kind of stress is considered to be positive. Stress is very much a personal thing, and depending on individual personalities, people may have different opinions about what is a stressor and what is not. For example, a professor does not normally find public speaking to be a stressor, while someone who does not do it on a daily basis may be very stressed about having to speak in public.

Stress Management

Some tips on how to deal with stress

Selye recognized that not all stress is negative. Positive stress is called **eustress**. This type of stress is healthy and gives a feeling of fulfillment and other positive feelings. Eustress can cause us to push ourselves harder to meet an end goal. On the other hand, **distress** is the term used for negative stress. While eustress can push us, distress does not produce positive feelings and can go on for a long time without relief. We can further classify distress by **chronic stress**, which is prolonged exposure to stress, and acute stress, which is short-term high stress. For example, someone who receives little or no positive result from stress and is continuously stressed may experience chronic stress. **Acute stress** occurs in shorter bursts and may be experienced while someone is on a tight deadline for a project.

Two other terms related to stress are hyperstress and hypostress. **Hyperstress** is a type of stress in which there are extremes with little or no relief for a long period of time. This type of stress often results in burnout. **Hypostress** is the lack of eustress or distress

in someone's life. Remember, some stress can be good and pushes us to work harder. We see this type of stress with people who may work in a factory or other type of repetitive job. The effect of this type of stress is usually feelings of restlessness.

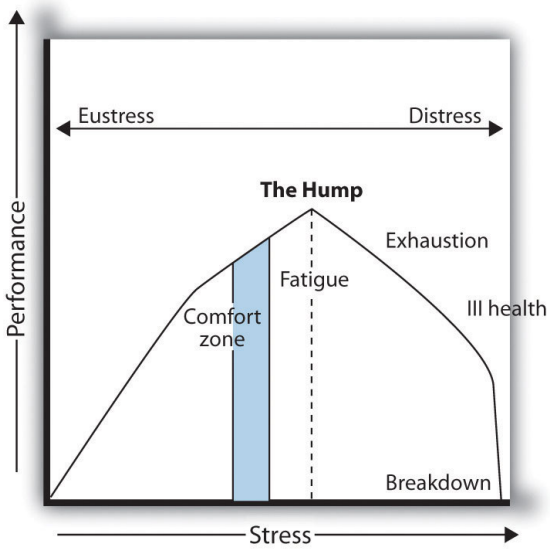

Figure 25.3.1:The Stress Curve, Source. Adapted from P. Nixon, 1979.

One last important thing to note is how a person goes through the cycle of stress. Figure 25.3.1 shows an example of how stress is good up to a point, but beyond that point, the person is fatigued and negatively affected by the stress. Bear in mind, this varies from person to person based on personality type and stress-coping mechanisms.

As you have already guessed, stress on the job creates productivity issues, which is why it concerns HR professionals. We know that stress can cause headaches, stomach issues, and other negative effects that can result in lost productivity but also result in less creative work. Stress can raise health insurance costs and cause employee turnover. Because of this, according to *HR Magazine* (Tyler, 2011), many employers are taking the time to identify the chief workplace stressors in employees' lives. With this information, steps can be taken to reduce or eliminate such stress.

PricewaterhouseCoopers, for example, implemented several strategies to reduce stress in its workplace. The firm restructured its work teams so that rather than having one employee work with one client, teams of employees work with groups of clients. Rather than having an employee say, "I can't go to my son's baseball game because I need to wait for this client call," this arrangement allows employees to cover for each other.

The organization also requires employees to take vacation time and even promotes it with posters throughout the office. In fact, even weekends are precious at PricewaterhouseCoopers. If an employee sends an e-mail on the weekend, a popup screen reminds her or him it is the weekend and it is time to disconnect.

Being a Student Can Be Stressful

Here are the most common stressors for college students:

- Death of a loved one
- Relocating to a new city or state
- Divorce of parents
- Encounter with the legal system
- Transfer to a new school
- Marriage
- Lost job
- Elected to leadership position
- New romantic relationship
- Serious argument with close friend
- Increase in course load or difficulty of courses
- Change in health of family member

- First semester in college
- Failed important course
- Major personal injury or illness
- Change in living conditions
- Argument with instructor
- Outstanding achievement
- Change in social life
- Change in sleeping habits
- Lower grades than expected
- Breakup of relationship
- New job
- Financial problems
- Change in eating habits
- Chronic car trouble
- Pregnancy
- Too many missed classes
- Long commute to work/school
- Working more than one job
- Impending graduation
- Argument with family member
- Sexual concerns
- Changes in alcohol and/or drug use
- Roommate problems
- Raising children

Offering flextime is also a way to reduce employee stress. It allows employees to arrange their work and family schedule to one that reduces stress for them. This type of creative scheduling, according to Von Madsen, HR manager at ARUP Laboratories (Tyler, 2011), allows employees to work around a schedule that suits them best. Other creative ways to reduce stress might be to offer concierge services, on-site child care, wellness initiatives, and massage therapy. All these options can garner loyalty and higher productivity from employees.

Human Resource Recall

What does your organization do to reduce stress? What should it do that it is not doing?

Cumulative Trauma Disorders

Cumulative trauma disorders (CTDs) are injuries to the fingers, hands, arms, or shoulders that result from repetitive motions such as typing.

Carpal tunnel syndrome, or CTS, is a common cumulative disorder in which the hand and wrist is particularly affected. CTS is a disabling syndrome that fortunately can be prevented or at least minimized. According to one study of CTS (Matias, et. al., 1998), the percentage of a workday at a computer, posture while at the workstation, and the individual's body features all contribute to this workplace issue. More recently, CTD can be found in people who text a lot or use their smartphones to type or surf the Internet.

There are a number of keyboards, chairs, and other devices that can help limit or prevent CTD issues. CTD disorders cost companies money through higher health-care costs and workersworker's compensation#8217; compensation payments. CTD is a required recordable case under OSHA. OSHA has voluntary employer guidelines for reducing CTD in specific industries such as poultry processing, shipyards, retail grocery, and nursing homes. OSHA is currently developing standards for industry-specific and task-specific jobs[1].

Microsoft is attempting to relieve CTD by developing "surface" technology. First introduced in 2007, the system is controlled through intuitive touch rather than the traditional mouse and keyboard. Microsoft and Samsung in early 2011 introduced the newest consumer-ready product, which looks like a large tablet (or iPad) used to perform the same functions as one normally would on her computer (Microsoft News Center, 2011).

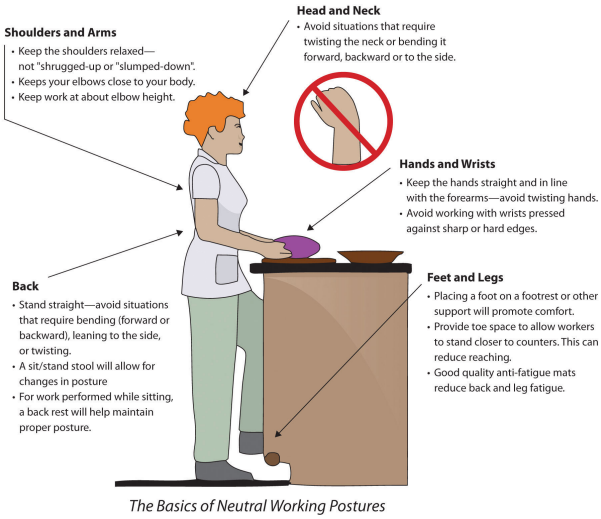

Figure 25.3.2: Example of an OSHA Standard for Retail Grocery Stores to Avoid CTD Source: www.osha.gov/ergonomics/guidelines/retailgrocery/retailgrocery.html#storewide (accessed September 2, 2011)

How Would You Handle This?

To Tell or Not?

You work for a large multinational organization as a manager on the factory floor. One of your employees was moving large barrels of chemicals from one workstation to another, when the barrel burst and gave him mild burns. When you talk with him about it, he says it was his own fault, and he doesn't want to take any days off or see a doctor. How would you handle this?

Video Display Terminals (VDTs)

In 1984, only 25 percent of people used computers at work, and today that number is 68 percent[2]. Awareness of the effects of computer monitors and other similar terminals are necessary to ensure a healthy workplace. Vision problems; fatigue; eye strain; and neck, back, arm, and muscle pain are common for frequent users of VDTs. OSHA recommands taking a break after every hour on a computer screen and reducing glare on screens. Proper posture and seat adjustment also limits the amount of injuries due to VDTs.

Video Display Terminal (VDT) Checklist

Can the work station be adjusted to ensure proper posture by

- adjusting knee and hip angles to achieve comfort and variability, ☐ Yes ☐ No
- supporting heels and toes on the floor or on a footrest, ☐ Yes ☐ No
- placing arms comfortably at the side and hands parallel to the floor, and ☐ Yes ☐ No
- supporting wrist (nearly straight) on a padded surface? ☐ Yes ☐ No

Does the work area

- provide enough clearance for the feet, knees, and legs relative to the edge of the work surface, ☐ Yes ☐ No
- provide sufficient space for the thighs between the work surface and the seat, ☐ Yes ☐ No
- include arm rests for intensive or long duration keying jobs, and ☐ Yes ☐ No
- include headsets for use when frequent telephone work is combined with hand tasks such as typing, using a calculator, or writing? ☐ Yes ☐ No

Does the chair

- adjust easily from the seated position, ☐ Yes ☐ No
- have a padded seat pan, ☐ Yes ☐ No
- have a seat that is approximately 18 inches wide (45.72 centimeters), ☐ Yes ☐ No
- have a back rest that provides lumbar support that can be used while working, ☐ Yes ☐ No
- have a stable base with casters that are suited to the type of flooring, ☐ Yes ☐ No
- have different seat pan lengths (15 to 17 inches or 38.10 and 43.18 centimeters) with a waterfall design available, and ☐ Yes ☐ No
- allow the seat pan to adjust for both height (minimum of 4 1/2 inches or 10.16–1.27 centimeters) and angle (plus or minus 5 degrees)? ☐ Yes ☐ No

Is the keyboard

- height from the floor and the slope of the keyboard surface adjustable, ☐ Yes ☐ No
- prevented from slipping when in use, and ☐ Yes ☐ No
- detachable? ☐ Yes ☐ No

Are other inputs/devices (mouse, pointer, calculator)

- at keyboard height? ☐ Yes ☐ No

Is the display screen

- clean and free from flickering, and ☐ Yes ☐ No
- able to swivel horizontally and tilt or elevate vertically? ☐ Yes ☐ No

Is the monitor situated so that

- the work can be performed with the head in a neutral posture for most of the work shift, ☐ Yes ☐ No
- it is between 18 and 30 inches (45.72 and 76.20 centimeters, respectively) away from the operator, ☐ Yes ☐ No
- the top line of text is at or slightly below eye height, and ☐ Yes ☐ No
- there is sufficient lighting without glare on the screen from lights, windows, or surfaces? ☐ Yes ☐ No

Does the monitor

- have brightness and contrast controls? ☐ Yes ☐ No

Is the job organized so that

- workers can change postures frequently, ☐ Yes ☐ No
- workers can perform different job tasks to reduce intensive keying, ☐ Yes ☐ No
- workers can leave their workstations for at least 10 minutes after each hour of intensive keying and for at least 15 minutes after every 2 hours of intermittent keying, and ☐ Yes ☐ No
- the workers have received training in ergonomics and know how to make adjustments to their work stations, chairs, and other accessories? ☐ Yes ☐ No

Figure 25.3.3: VDT Checklist to Reduce Workplace Injuries

Chemical and Fragrance Sensitivities

The EEOC defines a disability as a physical or mental impairment that substantially limits one or more of the major life activities of individuals and the ability to provide evidence of such an impairment[3]. Because of this definition, people who have **multiple chemical sensitivity (MCS) or environmental illness (EI)** are eligible for reasonable accommodations in the workplace. MCS or EI is the inability to tolerate an environmental chemical or class of foreign chemicals. Symptoms can include headache, dizziness, inability to breathe, muscle pain, and many more depending on the person. As a result, implementing policies surrounding MCS may be not only a legal requirement but a best practice to keep employees safe and healthy in the workplace. Some examples of such policies might include the following:

1. Institute a fragrance-free workplace policy (e.g., no scented lotions, hair products, or perfumes).
2. Limit use of restroom air fresheners, cleaning agents, and candles.
3. Ensure the ventilation system is in good working order.
4. Provide a workspace with windows where possible.
5. Consider providing an alternate workspace.
6. Be cautious of remodels, renovations, and other projects that may cause excessive dust and odors.

If an organization is going to implement a fragrance-free work policy, this is normally addressed under the dress code area of the organization's employee manual. However, many employers are reluctant to require employees to refrain from wearing or using scented products. In this case, rather than creating a policy, it might be worthwhile to simply request a fragrance-free zone from employees through e-mail and other means of communication. An example of such a policy is used by Kaiser Permanente:

We recognize that exposure to strong scents and fragrances in the environment can cause discomfort, as well as directly impact the health of some individuals. Since we hope to support a healthful environment for employees, physicians, and visitors, it is the intent of Quality and Operations Support to strive for a fragrance-controlled workplace. Therefore, for the comfort and health of all, use of scents and fragrant products by QOS employees, other than minimally scented personal care products, is strongly discouraged (Kaiser Permanente Fragrance Policy, 2011).

Chemicals and Substances

OSHA, as we mentioned earlier, has certain standards for how chemicals should be handled and how they should be labeled. Chemicals should be labeled in English, and employees must be able to cross-reference the chemicals to the materials safety data sheet, which describes how the chemicals should be handled.

It is estimated that 1,200 new chemicals are developed in North America alone every year (International Labor Organization, 2011). For many of these chemicals, little is known about their immediate or long-term effects on the health of workers who come into contact with them. As a result, policies should be developed on how chemicals should be handled, and proper warnings should be given as to the harmful effects of any chemicals found in a job site.

In the United States, twenty-six of the fifty states have smoking bans in enclosed public spaces. These smoking bans are designed to protect workers' health from the dangers of secondhand smoke. A recent report released by the Centers for Disease Control and Prevention (Steenhuysen, 2011) says that state or local smoke-free laws cover 47.8 percent of workplaces. The report says if the trend continues, the United States will be 100 percent smoke free by 2020. Many companies implement no-smoking policies because of health-care costs, and some companies, such as Humana, Inc., say their no-tobacco policy is simply setting a good example (since they are a health-care organization). Humana tests all applicants for tobacco in a preemployment screening that

applies to all tobacco products[4]. Most workplaces have no-smoking policies, and some even prefer not to hire smokers because of the higher cost of health care. Policies dealing with substances and chemicals are an important part of any employee training and orientation.

Benefits to a Smoke-Free Work Environment and Sample Policy

For the employees

- A smoke-free environment helps create a safer, healthier workplace.
- Workers who are bothered by smoke will not be exposed to it at work.
- Smokers who want to quit may have more of a reason to do so.
- Smokers may appreciate a clear company policy about smoking at work.
- Managers are relieved when there is a clearly defined process for dealing with smoking in the workplace.

For the employer

- A smoke-free environment helps create a safer, healthier workplace.
- Direct health-care costs to the company may be reduced.
- A clear plan that is carefully put into action by the employer to lower employees' exposure to secondhand smoke shows the company cares.
- Employees may be less likely to miss work due to smoking-related illnesses.
- Maintenance costs go down when smoke, matches, and cigarette butts are taken out of work facilities.
- Office equipment, carpets, and furniture last longer.
- The risk of fires is lower.
- It may be possible to get lower rates on health, life, and disability insurance coverage as fewer employees smoke.

Sample smoking policy

Because we recognize the hazards caused by exposure to environmental tobacco smoke, it shall be the policy of _____ to provide a smoke-free environment for all employees and visitors. This policy covers the smoking of any tobacco product and the use of oral tobacco products or "spit" tobacco, and it applies to both employees and nonemployee visitors of _____.

Source: American Cancer Society, http://www.cancer.org/Healthy/StayAwayfromTobacco/Smoke-freeCommunities/CreateaSmoke-freeWorkplace/smoking-in-the-workplace-a-model-policy (accessed August 20, 2011).

Drugs and alcohol are discussed in Chapter 10 on managing performance issues. Substance abuse in the workplace can cause many problems for the organization. Not only does it create impaired ability to perform a job—resulting in more accidents—but it results in more sick days and less productivity, and substance abusers are more likely to file workersworker's compensation#8217; compensation claims. Keep in mind that taking prescription drugs, if not used in the proper amounts or used long after the prescribed use, is considered substance abuse. A drug-free policy, according to OSHA[5], has five parts:

1. A policy
2. Supervisor training
3. Employee education
4. Employee assistance
5. Drug testing

According to the National Clearinghouse for Alcohol and Drug Information, substance abuse costs companies over $100 billion in the United States alone (Buddy, 2011). This staggering figure alone makes it worthwhile for companies to implement a policy and training on substance abuse.

Workplace Substance Abuse

This video provides some advice on how to deal with employee personal problems, including drug abuse.

Workplace Violence and Bullying

According to OSHA, 2 million American workers are victims of workplace violence every year[6]. OSHA addresses some of the workers who are at increased risk for workplace violence:

1. Workers who exchange money with the public
2. Workers who deliver goods, passengers, or services
3. People who work alone or in small groups
4. Workers who work late at night or early in the morning
5. Workers who work in high-crime areas

It is up to the organization and human resources to implement policies to ensure the safety of workers and provide a safe working environment. OSHA provides tips to provide a safer workplace:

1. Establish a workplace violence prevention policy, with a zero tolerance policy.
2. Provide safety education.
3. Secure the workplace with cameras, extra lighting, and alarm systems.
4. Provide a drop safe to limit the amount of cash on hand.
5. Provide cell phones to workers.
6. Require employees to travel in groups using a “buddy system.”

Development of workplace policies surrounding these items is important. Ongoing training and development in these areas are key to the creation of a safe workplace. While outside influences may affect employee safety, it is also important to be aware of the employee’s safety from other employees. There are several indicators of previolence as noted by the Workplace Violence Research Institute (Mattman, 2010):

1. Increased use of alcohol and/or illegal drugs
2. Unexplained increase in absenteeism
3. Noticeable decrease in attention to appearance and hygiene
4. Depression and withdrawal
5. Explosive outbursts of anger or rage without provocation
6. Threats or verbal abuse to coworkers and supervisors
7. Repeated comments that indicate suicidal tendencies
8. Frequent, vague physical complaints
9. Noticeably unstable emotional responses
10. Behavior indicative of paranoia

11. Preoccupation with previous incidents of violence
12. Increased mood swings
13. Has a plan to “solve all problems”
14. Resistance and overreaction to changes in procedures
15. Increase of unsolicited comments about firearms and other dangerous weapons
16. Repeated violations of company policies
17. Escalation of domestic problems

Workplace Violence

A video on workplace violence training.

Anyone exhibiting one or more of these preincident indicators should get the attention of HRM. The HR professional should take appropriate action such as discussing the problem with the employee and offering counseling.

Workplace bullying is defined as a tendency of individuals or groups to use persistent or repeated aggressive or unreasonable behavior against a coworker or subordinate. The Workplace Bullying Institute found that 35 percent of workers have reported being bullied at work. This number is worth considering, given that workplace bullying reduces productivity with missed work days and turnover. The Workplace Bullying Institute found that litigation and settlement of bullying lawsuits can cost organizations $100,000 to millions of dollars, in addition to the bad publicity that may be created. Examples of workplace bullying include the following:

1. Unwarranted or invalid criticism
2. Blame without factual information
3. Being treated differently than the rest of your work group
4. Humiliation
5. Unrealistic work deadlines
6. Spreading rumors
7. Undermining or deliberately impeding a person’s work

In an Indiana Supreme court case, a hospital employee who was repeatedly bullied by a surgeon sued for emotional distress and won. This ruling drew national attention because it was an acknowledgment by the courts of the existence of workplace bullying as a phenomenon (Klein, 2008). Prevention of workplace bullying means creating a culture in which employees are comfortable speaking with HR professionals and managers (assuming they are not the ones bullying) about these types of situations. Similar to traditional bullying, **cyberbullying** is defined as use of the Internet or technology used to send text that is intended to hurt or embarrass another person. Examples include using Facebook to post negative comments or setting up a fake e-mail account to send out fake e-mails from that person. Comments or blogs and posts that show the victim in a bad light are other examples of cyberbullying. Similar to workplace bullying, cyberbullying is about power and control in workplace relationships. Elizabeth

Carll's research on cyberbullying shows that people who experience this type of harassment are more likely to experience heightened anxiety, fear, shock, and helplessness, which can result in lost productivity at work and retention issues (White, 2011), a major concern for the HR professional. The US Justice Department shows that some 850,000 adults have been targets of online harassment (White, 2011). Many states, including New York, Missouri, Rhode Island, and Maryland, have passed laws against digital harassment as far back as 2007 (National Conference of State Legislatures, 2011). In a recent cyberbullying case, a US Court of Appeals upheld a school's discipline of a student for engaging in off-campus cyberbullying of another student (Solove, 2011). In the case, the victim said a MySpace profile was created that included inappropriate pictures of her, and the page's creator invited other people to join. The student who created the page sued the school after she was disciplined for it, saying it violated her right to free speech, but courts found that students do not have the right to cyberbully other students. While it seems that cyberbullying is for young people, as mentioned earlier, 35 percent of American workers feel they have been bullied. Bullying should be identified immediately and handled, as it affects workplace productivity, customer satisfaction, and eventually, profits.

Workplace Bullies

This video provides tips on how to deal with a workplace bully.

Employee Privacy

In today's world of identity theft, it is important that HR professionals work to achieve maximum security and privacy for employees. When private information is exposed, it can be costly. For example, in March of 2011, the Texas Comptroller's office inadvertently disclosed on a public website the names, addresses, and social security numbers of 3.5 million state workers (Hart, 2011). The state has already spent $1.8 million to remedy this problem by sending letters to affected parties and hiring technology consultants to review office procedures. While keeping employee information private is the responsibility of all management in an organization, ensuring privacy remains the job of the HR professional.

Some of the things to combat employee identity theft include the following:

1. Conduct background and criminal checks on employees who will have access to sensitive data.
2. Restrict access to areas where data is stored, including computers.
3. Provide training to staff who will have access to private employee information.
4. Keep information in locked files or in password-protected files.
5. Use numbers other than social security numbers to identify employees.

Another privacy issue that comes up often is the monitoring of employee activities on devices that are provided to them by the organization. Case law, for the most part, has decided that employees do not have privacy rights if they are using the organization's equipment, with a few exceptions. As a result, more than half of all companies engage in some kind of monitoring. According to an American Management Association[7] survey, 73 percent of employers monitor e-mail messages and 66 percent monitor web

surfing. If your organization finds it necessary to implement monitoring policies, ensuring the following is important to employee buy-in of the monitoring:

1. Develop a policy for monitoring.
2. Communicate what will be monitored.
3. Provide business reasons for why e-mail and Internet must be monitored.

Working with your IT department to implement standards and protect employee data kept on computers is a must in today's connected world. Communication of a privacy policy is an important step as well. Agrium, a Canadian-based supplier of agricultural products in North America, states its employee privacy policy on its website and shares with employees the tactics used to prevent security breaches[8].

At Agrium we are committed to maintaining the accuracy, confidentiality, and security of your personal information. This Privacy Policy describes the personal information that Agrium collects from or about you, and how we use and to whom we disclose that information.

Terrorism

Since the 9/11 attacks, terrorism and its effect on the workplace are in the forefront of the HR professional's mind. Planning for evacuations is the job of everyone in an organization, but HR should initiate this discussion. OSHA provides free assistance in implementing plans and procedures in case of a terror attack. OSHA also provides a fill-in-the-blank system (www.osha.gov/SLTC/etools/evacuation/expertsystem/default.htm) to help organizations write a comprehensive report for evacuations and terrorist attacks.

Promoting a Culture of Safety and Health

Employee health and safety is a must in today's high-stress work environments. Although some may see employee health as something that shouldn't concern HR, the increasing cost of health benefits makes it in the best interest of the company to hire and maintain healthy employees. In fact, during the recession of the late 2000s, when cutbacks were common, 50 percent of all workplaces increased or planned to increase investments in wellness and health at their organization (Sears, 2009).

Example of Health and Safety Policy

Cordis (A Johnson & Johnson Company) Environmental, Health, and Safety Policy

Cordis Corporation is committed to global Environmental, Health, and Safety (EHS) performance and leadership with respect to its associates, customers, suppliers, contractors, visitors, and communities. To fulfill this commitment, Cordis Corporation conducts its business emphasizing regulatory compliance and collaboration.

We strive for:

- Comprehensive risk management
- Pollution prevention
- Healthy lifestyle culture
- Continuous improvement and sustainability
- Engaging partnerships
- Possession of outstanding EHS capabilities and skill sets

We affirm that EHS is:

- A core business value and a key indicator of organizational excellence
- Considered in every task we perform and in every decision we make

We believe that:

- All incidents and injuries are preventable
- Process Excellence is the driver for continuous improvement and sustainable results in all aspects of EHS
- Every associate is responsible and accountable for complying with all aspects of EHS, creating a safe and healthy work environment while leaving the smallest environmental footprint

A safe culture doesn't happen by requiring training sessions every year; it occurs by creating an environment in which people can recognize hazards and have the authority and ability to fix them. Instead of safety being a management focus only, every employee should take interest by being alert to the safety issues that can exist. If an employee is unable to handle the situation on his or her own, the manager should then take suggestions from employees seriously; making the change and then communicating the change to the employee can be an important component of a safe and healthy workplace.

A culture that promotes safety is one that never puts cost or production numbers ahead of safety. You do not want to create a culture in which health and safety priorities compete with production speedup, which can lead to a dangerous situation.

Another option to ensure health and safety is to implement an **employee assistance program (EAP)**. This benefit is intended to help employees with personal problems that could affect their performance at work. The EAP usually includes covered counseling and referral services. This type of program can assist employees with drug or alcohol addictions, emotional issues such as depression, stress management, or other personal issues. Sometimes these programs are outsourced to organizations that can provide in-house training and referral services to employees. For example, REI (Recreation Equipment Inc.), based in Seattle, has a comprehensive EAP for its employees in both retail stores and corporate offices.

Possible techniques you can implement to have a safe and healthy work environment include the following:

1. Know OSHA and other safety laws.
2. Provide training to employees on OSHA and safety laws.
3. Have a written policy for how violations will be handled.
4. Commit the resources (time and money) necessary to ensure a healthy work environment.
5. Involve employees in safety and health discussions, as they may have good ideas as to how the organization can improve.
6. Make safety part of an employee's job description; in other words, hold employees accountable for always practicing safety at work.
7. Understand how the health (or lack of health) of your employees contributes to or takes away from the bottom line and implement policies and programs to assist in this effort.

Key Takeaways

- Stress is a major concern for organizations, since it can decrease productivity in the workplace. There are several types of stress.
- *Eustress* is a positive type of stress that can cause people to work harder toward a goal. *Distress*, on the other hand, is a type of negative stress.
- *Acute stress* occurs in short bursts, such as when finishing a project, while *chronic stress* tends to persist for long periods of time.
- *Hyperstress* is stress that is unrelieved for long periods of time and can often result in employee burnout. *Hypostress* is the lack of eustress in one's life, which can be as damaging as other types of stress, since stress is sometimes what pushes people harder.
- HR professionals can encourage employees to take vacation time, offer flextime, and encourage employees to take weekends off to help reduce stress.
- *Cumulative trauma disorder (CTD)* affects the hands, fingers, arms, or shoulders as a result of continuous repetitive motions. *Carpel tunnel syndrome (CTS)* is a type of CTD that affects the hand and wrist. People with these disorders often work in a factory or at a desk where they are doing repetitive motions constantly, such as typing or cashiering.
- OSHA has voluntary guidelines for reducing CTD in the workplace. HR can assist by ensuring employees are provided with proper equipment and training.
- *Multiple chemical sensitivity (MCS)* or *environmental illness (EI)* is extreme sensitivity to chemicals found in products such as hairsprays or lotions. Some individuals are extremely sensitive to other types of chemicals, such as those used in the manufacturing of carpets.
- MCS can be considered a disability if it limits one or more life activities. In this case, reasonable accommodations must be made, such as implementing fragrance-free zones as part of a workplace dress code.
- *OSHA* has specific guidelines on how to handle chemicals, but other chemicals, such as those from secondhand smoke, are an important consideration in workplace safety. Twenty-six states, for example, have implemented no-smoking policies to help protect the health of workers.
- *Workplace violence* affects 2 million Americans every year. A number of groups, such as those who deliver goods, people, or services, are at greatest risk. However, workplace violence can occur internally, which is why we must be aware of the warning signs.

- *Workplace bullying* is when a person is aggressive and unreasonable in his or her behavior toward another individual. *Cyberbullying* is similar, except technology is used to humiliate and intimidate the employee.
- Keeping employee information private is the job of HR and IT. In addition, some organizations may engage in web or e-mail monitoring to ensure employees are on task. Specific policies should be developed and communicated to let employees know how they may be monitored.
- Some organizations have *employee assistance programs (EAPs)* that can provide assistance, counseling, and the like in case of personal problems or drug or alcohol abuse.
- To maintain a healthful working environment, know OSHA policies and make sure people are trained on the policies. Also ensure that specific policies on all areas of health and safety are communicated and employees are trained in those areas where necessary.

Exercises

1. Visit www.osha.gov/SLTC/etools/evacuation/expertsystem/default.htm and create your own evacuation plan using the tool on the OSHA website. (Note: web addresses sometimes change, so you may have to search further for the tool.) Bring your plan to class to share.
2. Research examples of workplace bullying, write two paragraphs about two examples, and share your findings with the class.

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25.4: Cases and Problems

Chapter Summary

- Every year, 4,340 fatalities and 3.3 million injuries occur in the workplace in the United States.
- The *Occupational Safety and Health Act* was passed in 1970, with the goal of providing a safe and healthy work environment for all US workers.
- The *Occupational Safety and Health Administration* is part of the US Department of Labor and was created as a result of the act in 1970.
- OSHA applies to some specific industries such as construction, shipyards, and marine terminals. However, some of the regulations of OSHA apply to all industries.
- Some states may also have safety requirements, which may be more stringent than federal Laws.
- Right-to-know laws refer to a *material data safety sheet*, which discusses the types of chemicals, proper handling and storage, and first aid in case of an accident. These data sheets should be made available to the general public and employees.
- Right-to-know laws also require specific reporting to local and state agencies on chemicals used in certain quantities for some industries.
- OSHA requires recording keeping for all workplace accidents or illness. The record keeping is usually the responsibility of HR; OSHA Form 300 is used for reporting purposes.
- OSHA can inspect any site without prior notification. Usually, it will gather information, visit the site, and ask for a representative. The representative is normally the HR person. The site visit will be performed, followed by discussion with the company representative. Within six months of the visit a report and any penalties will be communicated.
- Stress is a major concern for organizations, since it can decrease productivity in the workplace. There are several types of stress.
- *Eustress* is a positive type of stress that can cause people to work harder toward a goal. *Distress*, on the other hand, is a type of negative stress.
- *Acute stress* occurs in short bursts, such as when finishing a project, while *chronic stress* tends to persist for long periods of time.
- *Hyperstress* is stress that is unrelieved for long periods of time and can often result in employee burnout. *Hypostress* is the lack of eustress in one's life, which can be as damaging as other types of stress, since stress is sometimes what pushes people harder.
- HR professionals can encourage employees to take vacation time, offer flextime, and encourage employees to take weekends off to help reduce stress.
- *Cumulative trauma disorder (CTD)* affects the hands, fingers, arms, or shoulders as a result of continuous repetitive motions. *Carpel tunnel syndrome (CTS)* is a type of CTD that affects the hand and wrist. People with these disorders often work in a factory or at a desk where they are doing repetitive motions constantly, such as typing or cashiering.
- OSHA has voluntary guidelines for reducing CTD in the workplace. HR can assist by ensuring employees are provided with proper equipment and training.
- *Multiple chemical sensitivity (MCS)* or *environmental illness (EI)* is extreme sensitivity to chemicals found in products such as hairsprays or lotions. Some individuals are extremely sensitive to other types of chemicals, such as those used in the manufacturing of carpets.
- MCS can be considered a disability if it limits one or more of life activities. In this case, reasonable accommodations must be made, such as implementing fragrance-free zones as part of a workplace dress code.
- *OSHA* has specific guidelines on how to handle chemicals, but other chemicals, such as those from secondhand smoke, are an important consideration in workplace safety. Twenty-six states, for example, have implemented no-smoking policies to help protect the health of workers.
- *Workplace violence* affects 2 million Americans every year. A number of groups, such as those that deliver goods, people, or services, are at greatest risk. However, workplace violence can occur internally, which is why we must be aware of the warning signs.
- *Workplace bullying* is when a person is aggressive and unreasonable in his or her behavior toward another individual. *Cyberbullying* is similar, except technology is used to humiliate and intimidate the employee.
- Keeping employee information private is the job of HR and IT. In addition, some organizations may engage in web or e-mail monitoring to ensure employees are on task. Specific policies should be developed and communicated to let employees know how they may be monitored.

- Some organizations have *employee assistance programs (EAPs)* that can provide assistance, counseling, and the like in case of personal problems or drug or alcohol abuse.
- To maintain a healthful working environment, know OSHA policies and make sure people are trained on the policies. Also ensure that specific policies on all areas of health and safety are communicated and employees are trained in those areas where necessary.

Chapter Case

Bullying Ming

- You just ended a meeting with Ming (one of your six employees), who gave you some disturbing information. She feels she is being bullied by one of her coworkers and is seeking your advice on how to handle it. Ming said that Mindy has been saying "good morning" to everyone as she walks by their office but doesn't say it to Ming. Ming also said that Mindy organized a farewell lunch for one of your departing employees last week and didn't invite Ming. She also told you of nasty things that Mindy tells other colleagues about her. For example, last month when Ming ran into Mindy at the grocery store, Mindy told everyone the next day the medications that Ming had in her cart, which included medication for irritable bowel syndrome. Ming also showed you an e-mail that Mindy had sent blaming Ming for the loss of one of Mindy's clients. Mindy had copied the entire department on the e-mail. Ming thinks that other employees have been reluctant to involve her in projects as a result of this e-mail. Ming left your office quite upset, and you think you may need to take some action.
    1. Do you think Ming is correct in saying Mindy is bullying her? What are the indications of bullying?
    2. What advice would you give to Ming?
    3. How would you handle this situation with Mindy, without embarrassing Ming?

Team Activity

1. Calculate the yearly incidence rates for Organic Foods Company:
    1. 2010: 10 injuries with 300,000 hours worked
    2. 2011: 5 injuries with 325,000 hours worked
    3. 2012: 20 injuries with 305,000 hours worked
2. What are some of the possible causes for the increase in incidence rates?

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