Student Booklet

NAME: _____

Massachusetts Maritime Academy

Freshmen Safety Training 2017

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Session 1

Duration (min)	Topic
10	Instructor Introduction
50	Introduction to OSHA
10	Break
50	Personal Protective Equipment
10	Hands-On Exercise with Personal Protective Equipment
10	Video on Personal Protective Equipment
10	Break
20	Quiz 1

Session 2

Duration (min)	Topic
30	Hand and Portable Power Tools
15	Machine Guarding
10	Break
60	Electrical
10	Break
20	Lockout/Tagout
10	Video on Lockout/Tagout
15	Quiz 2

Session 3

Duration (min)	Topic
45	Fall Protection
15	Video on Fall Protection
10	Break
45	Confined Space
15	Video on Confined Space
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30	Hands-On

Session 4

Duration (min)	Topic
45	Hazard Communication
	MSDS Exercise
15	Video on Hazard Communication
10	Break
15	Bloodborne Pathogens
15	Fire Prevention
10	Emergency Response Planning
	Video on Emergency Response
15	Quiz 4
40	Review

Chapter 1
Introduction to OSHA

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INTRODUCTION

The Occupational Safety and Health Administration is a government agency dedicated to the on-the-job safety of the American worker. To be effective, OSHA needs people like you as a link between it and the facilities where the work is being done. This is intended as an introduction to OSHA, including its history, powers and standards.

OSHA: PAST AND PRESENT

The Occupational Safety and Health Act, the federal legislation that created OSHA, was enacted in 1970. Before that time, there was no comprehensive federal standard for protecting workers.

- 1970: More than 14,000 worker deaths annually
- 1998: Just over 6,000 worker deaths annually
- OSHA develops and enforces standards
- OSHA ensures healthful working conditions
- OSHA's mandate also includes:
  - Reducing workplace hazards
  - Creating or improving safety and health programs
  - Research
  - Sets responsibilities for employers and employees
  - Recordkeeping and reporting requirements
  - Initiatives
  - Working with state agencies.
- Standards exist for:
  - General industry
  - Construction
  - Shipyards
  - Marine terminals
  - Longshoring
  - Workshops and rehabilitation facilities
  - Federal service contracts
  - Agriculture.
- Not covered:
  - Self-employed
  - Workers covered by existing federal statues

SETTING STANDARDS

OSHA standards fall into two main categories. They are described below.

- **Consensus standards**
  - Developed by industry wide organizations
  - OSHA sets discussion period
  - Industry consensus required for acceptance.
- **Proprietary standards**
  - Prepared by professional experts in
    - Specific industries
    - Professional societies
    - Associations.
  - Determined by straight membership vote
- Notices (or advance notices) of proposed rulemaking
  - Usually at least 6o days
  - Public can respond.
- Public hearings
- Published in Federal Register.

THE GENERAL DUTY CLAUSE

Part of the Occupational Safety and Health Act covers possible gaps in existing standards. This part of the Act is called the General Duty Clause.

- Section 5(a)
- Known hazards must be dealt with
- Individuals and facilities/companies can be sued
- Criminal or civil action possible

UNDERSTANDING OSHA STANDARDS

OSHA exists under the direction of the US Department of Labor. The actual code is thousands of pages long, but once you understand the basics, you should be able to find what you need.

- 29 CFR is the main title for OSHA Standards
- Divided into PARTS
  - Check table of contents for part number
    - General Industry is part 1910
    - Construction is part 1926
- Parts divided into SUBPARTS
  - Separate table of contents
  - Uses uppercase alphabetical letters
  - Further divided using decimal system
- PARAGRAPHS – a lowercase letter, in parentheses
- SUB-PARAGRAPHS – a number in parentheses

WHICH RULES APPLY?

To determine which OSHA standards apply to your worksite, employers should perform a job hazards analysis, which will highlight potential risks and thus point the way toward the appropriate standards for your industry.

- Horizontal standards
  - Apply to all activities
- Vertical standards
  - Apply during a specific job

INSPECTION TIME

OSHA us authorized by law to conduct workplace inspections. Inspection schedules are prioritized according to the specific situation at a given worksite

- Priority levels
  - Imminent Danger
  - Catastrophes and fatal accidents
  - Employee complaints or referrals
  - Programmed inspections
- Opening conference with compliance officer
  - Why worksite was selected
  - Purpose of visit
  - Scope of inspection
  - Applicable standards
- Walk-around inspection
  - Route and direction determined by compliance officer
  - Small violations may be corrected on the spot
  - Worksite posting and record-keeping

- Closing conference
  - Citations issued
  - Employee representative may be present (also at opening conference)

HANDLING CITATIONS AND PENALTIES

OSHA citations and penalties can be contested. If they are not, you must come up with a plan to fix the problem.

- Contesting the citations and/or penalties
  - Within 15 days in writing
  - Safety and Health Review Commission
- Citations and/or penalties not contested
  - Employer estimates time needed for fix
  - Citations must be posted at or near spot of violation
- Types of penalties
  - Serious violations
  - Willful violations
  - Egregious
- Possible criminal prosecution for:
  - Willful violation causing death
  - Giving unauthorized advance notice of inspection
  - Giving false information
  - Killing, assaulting, or hampering the work of the OSHA inspector

WHAT'S YOUR RESPONSIBILITY?

Employers are responsible for all full-time or part-time employees while they are on the job. There are specific guidelines that cover industries using multiple contractors and subcontractors. Depending on your relationship to a worker, you could be:

- The exposing employer, whose employees were exposed to the hazard
- The creating employer, who created the hazard
- The controlling employer, who is responsible for safety on the site
- The correcting employer, who is responsible for correcting the hazard

ELEMENTS OF A SAFETY PROGRAM

There are four key elements of an effective worksite safety program. They are:

- Management and employee commitment to a safe and healthful workplace
- Worksite analysis
- Hazard prevention and control
- Safety and health training

PROFESSIONAL LIABLILITY

Safety and health professionals – not just their employees – may be held liable in both civil and criminal court, depending on their authority level.

- Make sure OSHA standards are followed within your areas of responsibility
- Never purposely overlook a safety hazard

HIDDEN COSTS OF ACCIDENTS

Accidents cause pain and suffering and even human lives. In addition, OSHA fines can be very costly to a company or employer. But there are even more hidden costs of accidents.

- Rising insurance costs
- Deductible costs paid to injured persons

- Lost wages for those not insured
- The cost of overtime work required as a result of an accident
- Supervisor time related to accident
- Repairing, replacing or cleaning up after an accident
- Returning worker's loss of productivity
- Replacement worker's learning period
- Accident investigation
- Preparing and filing reports
- Possible litigation costs

A WORD ABOUT NIOSH

The National Institute of Occupational Safety and Health works hand in hand with OSHA on employee safety and health issues.

- Recommends standards
- Also established by 1970 Occupational Safety and Health Act
- Agency of the Department of Health and Human Services
- Involved with Department of Labor in training and education

REVIEW/CONCLUSION

OSHA standards should be considered minimum safe practices. And employees also bear a responsibility under the act.

- Section 5(a)(1)(b) – says that employees have the responsibility of following regulations and safety rules.
- As a safety and health professional
  - Recognize and control employee hazards before accidents happen
  - Remember that employees depend on you to instruct and train them

Chapter 2

Personal Protective Equipment

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INTRODUCTION

If you have ever worked without the right personal protective equipment, you are not alone. Many people play the odds, thinking an injury won't happen to them...the chances are too low. Unfortunately, the odds catch up to some, and if you are not wearing the proper PPE, it could be you.

A wise move is to make a pledge that you are going to take your safety seriously. Wear the right personal protective equipment, and wear it correctly every time.

RESPONSIBILITY

Both you and your employer have responsibilities when it comes to PPE.

Your employer is responsible for:

- Identifying hazards in your workplace
  - Where possible, hazards are removed using administrative or engineering controls.
- Providing appropriate personal protective equipment (PPE) when hazards cannot be eliminated
- Ensuring that you are medically qualified for certain tasks
- Training you how to use and care for PPE.

You are responsible for:

- Wearing the correct PPE at all times
- Taking care of your PPE
- Informing your supervisor when your PPE needs to be repaired or replaced.

General Rule for taking care of PPE:

Always store PPE in places that protect it from:

- Light
- Temperature extremes
- Excessive humidity
- Other damaging substances or conditions.

HEAD PROTECTION

Your brain is both **powerful** and **fragile**.

Powerful: it controls nearly every function of your body.

Fragile: it basically "floats" inside your skull, connected to the rest of the body by a network of delicate fibers.

PROTECTING YOUR BRAIN

Your skull protects your brain, but it can withstand only a certain amount of impact. A protective helmet or hard hat is an effective way to protect your brain.

Hard hats are designed for your protection and comfort.

- The tough outer shell is suspended above the head by high-strength webbing, which absorbs the shock of a blow so that no single point on your head takes the whole force.
- Allows ventilation to the head for comfort.

You should always wear a hard hat:

- When there is a danger of objects falling from above
- In areas where you could bump your head against an object
- When there is a chance of accidental head contact with electrical hazards.

TYPES OF HARD HATS

Any hard hat you wear should meet ANSI Standard Z89.1.

Type I hard hats:

- Have a full brim around the hat
- Protect the top of the head from impact.

Type II hard hats:

- Are more like the baseball cap style
- Provide protection from impact from the top, sides, front and back.

Type I and Type II hard hats are broken down into three classes for electrical protection:

Class C is not rated to provide protection from electrical contact.

Class G protects you from low voltage electrical hazards up to 2,200 volts.

Class E protects you from high voltage electrical hazards up to 20,000 volts.

Some hard hats are made with slots or mounts for accessories such as earmuffs, safety glasses or face shields. Other hard hats may have chin straps, brims for sun protection or channels that guide rainwater away from the face. Never use an accessory if it decreases the hard hat's ability to protect you.

FIT AND CARE

A hard hat must fit right in order for it to protect you.

- Choose a size that fits snugly on your head but does not bind or chafe the skin.
- Most hard hats have headbands that you can adjust for a proper fit.
- Test the fit by bending over and shaking your head. If the hat falls off, it is too loose.
- Wear the hard hat level on your head, not tilted.
- Make sure there is always space between your head and the shell of the hard hat.

Inspect your hard hat's shell and suspension system every day. Look for:

- Cracks
- Holes
- Tears
- Other damage.

Replace a damaged hard hat immediately. Also, replace any hard hat that has been subjected to an impact, even if you cannot see any damage.

WARNING DON'T:

- Drill holes into hard hat, which can weaken the shell
- Place stickers on, paint or use markers on hard hat unless the manufacturer approves it
- Throw or drop hard hat

- Store in direct sunlight
- Clean with harsh chemicals

EYE AND FACE PROTECTION

Many things can cause an eye or face injury, including flying particles, chemicals and harmful light, such as from welding or lasers. PPE is needed to protect you against these hazards.

Types of Protection

Safety glasses:

- Have strong frames
- Have impact-resistant lenses
- Provide protection from the side with the use of side shields.

Goggles:

- Are tight-fitting
- Completely cover the eye area
- Protect against impact, dust and splashes
- Without vents can protect against fumes
- Some goggles are designed to fit over prescription or safety glasses.

Face shields:

- Are designed to cover the whole face
- Are made of plastic
- Protect against dust and splashes but not impact, so goggles or safety glasses should be worn underneath for added protection.

Other eye and face protection includes welding shields and laser safety goggles.

Your employer will instruct you if you need to use this type of PPE. Eye or face protection must meet current ANSI Standard Z87.1.

FIT AND CARE

Proper fit is just as important as choosing the right type of eye or face protection.

- Make sure the PPE fits snugly on your face and doesn't slide down your nose.
- Use a headband to secure PPE if necessary.

Clean eye and face protection often so that you can see clearly. Use water and a non-abrasive soap to avoid scratching the lenses, then let air dry.

Contact lenses and prescription glasses

- If you wear contact lenses or prescription glasses that change tint, check with your employer to make sure they are allowed.
- Normal prescription glasses alone may not give enough protection, so you must wear goggles or a face shield over them, or use prescription safety eyewear.

HEARING PROTECTION

Hearing damage usually occurs slowly over time, so it's often difficult to realize you are losing your hearing until it is too late.

Did you know?

- A decibel is the main unit of measurement of how loud a sound is.
- An increase in decibel level is no small matter. A sound that increases from 90

decibels to 96 decibels has actually doubled in loudness.

Your ear converts sound waves to signals that your brain can understand through small hairs called "cilia." These hairs are very delicate and over time can be damaged by noise.

Hearing protectors comes in different Noise Reduction Ratings (NRR).Your employer will provide you with the correct protection and post signs where hearing protection is required.

TYPES OF PROTECTION

Disposable ear plugs:

- Are the most common type of hearing protector
- Are made of materials such as foam or silicone rubber
- Expand to the shape of the ear canal.

How to properly in ear plugs
The biggest mistake people make with ear plugs is not wearing them correctly. Here is how to do it right:

- Roll and compress the ear plug between your fingers and thumb.
- Reach behind your head, and pull up and back on your ear to open the ear canal.
- Insert the plug and let it expand inside your ear canal.
- Throw away disposable ear plugs after each use.

Reusable canal caps:

- Are similar to ear plugs but are connected by a band
- Can be worn over the head, behind the neck or under the chin
- Should be cleaned after each use. Ear muffs:
- Use foam or liquid for sound insulation
- Must seal perfectly around the ear:
  - Remove glasses or earrings
  - Tie back long hair
  - Trim facial hair
- Should be cleaned regularly by wiping off
- Can be worn along with ear plugs to get the best protection from noise and flying particles.

Warning!

Headphones or ear pods, like the ones used with MP3 players, will not protect you from loud noises.

- In fact, listening to loud music while working can damage your hearing and make it more difficult to hear warning shouts or alarms.
- Most workplaces do not allow individual music devices.

RESPIRATORY PROTECTION

Whether you need respiratory protection, and which type you need, depends on many factors including:

- The contaminant you are exposed to
- How long you are exposed.

Respiratory protection can include:

- Dust mask
- Half-face respirator

- Full-face respirator
- Self-contained breathing apparatus (SCBA)
- In-line filtered breathing system.

If you need respiratory protection, your employer will determine which type is necessary. You will be fit-tested and trained on how to use it. Certain respiratory protection will require a medical evaluation, and you will need to be physically qualified.

Your employer will let you know more about the respiratory protection you may need.

HAND AND ARM PROTECTION

Your hands and arms are critical tools needed to perform almost every task you do each day. That's why it is important to protect them by wearing gloves and arm coverings.

TYPES OF PROTECTION

The hand and arm protection you need depends on the job you do and the hazards you face. Your employer will determine the hazards and provide the necessary PPE.

Cut-Resistant Gloves:

- Are needed when working with sharp objects, such as knives or moving blades
- Are made with materials such as steel mesh, Kevlar® or tough synthetic yarns.
- Temperature-Resistant Gloves:
- Are needed when your work involves extreme hot or cold temperatures
- Are made of special materials that protect the hands, including thick leather, insulation, special synthetic coatings or aluminized backing.

Chemical-Resistant Gloves:

- Are needed when you work with chemicals. Different chemicals require different types of gloves
- Many are made from synthetic rubbers and plastics, such as latex, neoprene and polyvinyl chloride (PVC)
- Employers are responsible for providing the appropriate gloves for the chemicals you use
- Chemicals can cause gloves to break down over time, so be sure to replace gloves when needed.

Warning!

Never use cotton or canvas gloves when working with liquid chemicals; the liquid can soak through and cause irritation or burns.

Insulating Rubber Gloves:

- Are needed when your tasks involve possible contact with electrical voltage.

General Purpose Gloves:

- Protect you from cuts, abrasions and punctures
- Are made from a variety of materials, such as leather, cotton or synthetics
- Are good for general tasks such as lifting, moving or handling objects.

Arm Coverings and Elbow-Length Gloves:

- Are needed for some tasks such as welding, certain electrical work and some chemical handling.

Note: For some tasks, wearing a second pair of gloves provides added protection.

FIT AND CARE

Gloves should fit snugly. Those that are too big can get caught in machinery or moving parts. Also, gloves that are too thick can affect your grip and, therefore, your safety.

- Inspect gloves before every use.

Look for:

- Cuts
- Tears
- Thinning of material.

- Replace gloves when damaged or in bad shape.
- Throw away disposable latex gloves after each use.
- Be aware that some people are allergic to latex and other glove materials. There are several other materials to choose from.

LEG AND FOOT PROTECTION

Foot protection is needed when there is a risk of heavy objects rolling on, falling on, crushing or penetrating your foot. Protective footwear must comply with ANSI Standard Z41.1. Leg protection provides a further safeguard from injury.

TYPES OF PROTECTION

Steel-toed shoes or boots with non-slip soles protect the toes from being crushed and prevent slipping.

- Metatarsal and foot guards give added protection from crush injuries.
- Puncture-resistant insoles or shoes with steel shanks keep sharp objects from penetrating your foot.
- Overshoes and overboots are often made of rubber or synthetic materials and have non-slip soles. They slip over shoes to protect you from things such as hazardous chemicals, slippery floors or extreme cold.
- Shoe covers (booties) provide protection against things such as dirt, grime, liquid splashes and hazardous chemicals.
- Non-conductive shoes should be worn if feet are exposed to electrical hazards.
- Conductive footwear should be worn if you work where static electricity can cause explosions. This type of footwear is designed to drain static charges into the ground.
- Leggings protect the lower legs and feet from hazards like molten metal or welding sparks.
- Shin guards protect the lower leg from rolled logs, brush, steel rods or pipes.

Note: Feet need protection in hot environments, too. Whether you are in a foundry or out in the field, you need the right protection for whatever conditions you work in.

BODY PROTECTION

Body protection may be needed if you are exposed to:

- Intense heat
- Hot metals or liquids
- Hazardous chemicals

- Radiation.

EXAMPLES OF BODY PROTECTION

- Tyvek® suits provide a barrier against particulates such as asbestos.
- Chemical suits prevent hazardous materials from contaminating your skin.
- Leather welding aprons protect against burns from sparks or hot metal.

Your employer will determine the body protection you need for your job. Like all PPE, inspect protective clothing every time before you use it.

CONCLUSION

Wearing PPE greatly reduces the risk of getting hurt. Today there are many styles and designs of PPE available, so PPE is more comfortable and fits better than ever. But the bottom line is that PPE can only protect you if you wear the right PPE and wear it correctly every time.

Chapter 3

Powered Hand Tool Safety

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Introduction

When you work with power tools, you don't set out to be careless. No one does. Yet, power tools cause many accidents at work and at home.

This section discusses three rules of power tool safety:

Avoid: Learn the situations you should avoid and how to spot them before you get hurt.

Protect: Take steps to protect yourself from hazards before you begin any job.

Defend: Learn to expect the unexpected so you know what to do when thing go wrong.

It also examines basic do's and don'ts for the power tools you're likely to use most often.

Knowing how to work safely with power tools helps you be careful enough to do your job while you keep all your body parts whole and undamaged.

Avoid Danger

The first rule of power tool safety is to avoid danger by staying out of the way of things you can't control.

The best way to avoid danger is to know your equipment and to develop protective work habits.

Know Your Equipment:

- Avoid using any tool until you've been trained to use it properly. Know its limitations and hazards.
- Know how to use all controls.
- Know how to spot a problem.
- Avoid contact with moving parts by learning the danger zone for every tool you use.
- Never disable or remove a guard.
- Inspect guards before each use.
- If a guard is missing or not working, tag out the tool for repairs.

You can avoid injuries by following work habits that protect you from contact with the dangers the tool creates.

- Always move your hands back and away from the tool.
- Never reach toward or across the tool.
- Never brush away sawdust, shavings, or turnings while the tool is running.
- Use clamps, vices or other devices to hold and support the piece you're working on so you can use two hands to control the tool.
- Predict where you and the tool would end up if you lost your balance or if the tool slipped, and position yourself safely.
- Control the tool until it comes to a full stop; don't set it down or swing it toward you.
- If a tool is too heavy for you to control comfortably, get a lighter tool, use a rest or set up a counterbalance to support the weight.

Good work habits also help you avoid other hazards:

- Avoid being struck by debris by keeping yourself and others out of its path and by wearing protective equipment.
- Avoid wearing loose clothing, jewelry or non-protective shoes.

- Tie back or confine long hair and loose sleeves.
- Make sure the tool is turned off before you plug it in.
- Remove the battery, or make sure the tool is unplugged or
- Locked off, before you change accessories or make adjustments.
- Use only grounded or double-insulated tools and keep them dry.
- Never remove the ground prong on plugs.
- Stay out of wet areas unless you and the tool are properly protected.
- Be sure to use a ground fault circuit interrupter, called a GFCI.
- Never use regular power tools when explosive vapors, dusts or gases are present.

The second rule of power tool safety is to protect yourself from hazards. You do this by wearing the proper personal protective equipment, called PPE, and by making sure your tools and equipment are safe.

Personal Protective Equipment

You will need to wear eye protection every time you use a power tool. Always wear the right PPE for the job. The exact type you need depends on the work you do, and it may include other equipment to protect your:

- Head
- Face
- Hearing
- Feet
- Hands
- Breathing and lungs.

Inspect your PPE every time you use it, wear it ever y time it's required and clean it when you're done so it's ready the next time you need it.

Always check out the tool and its power supply before you begin any job:

- Inspect the handle, cord, switches, plugs, prongs and guards.
- Look for cracks in the casing and for loose screws.
- Make sure the guard works correctly and doesn't stick.
- Check the grip and trigger and be sure auxiliary handles are firmly attached.
- Look for wear and other problems with padding and other anti-vibration features.
- Check out blades, bits and other accessories to make sure they are the right size and shape for the tool and the job.

If you find a problem, remove the tool from service immediately. Never try to fix a defective tool and never use one that's defective- not even for a minute.

Defending yourself is the third rule of power tool safety. Defending yourself means predicting the unexpected and being ready for it. Before you begin any job, ask, "What could go wrong? What could happen?" Then do what's needed to head off problems.

- Check nearby and your work area to make sure it is safe for you to proceed.
- Check for power lines and electric wires, pipes, and other mechanical hazards in the work area.
- Find out what's behind walls or other areas hidden from your view.

- Make sure there's enough light.
- Clean the area to give you room to work.
- Pick up as you go.

Power Cords

- Get the right type and length of extension cord for the job.
- Plug the cord into a permanent or portable ground fault circuit interrupter, or GFCI.
- Never connect two extension cords together or overload a receptacle.
- Secure cords to prevent damage to the cord and to avoid hazards for people in the area.
- Keep cords and hoses away from heat, water, oil, sharp edges and moving parts.
- Never use the cord or hose to carry a tool or to unplug it.
- Anytime you work in a damp area you should have a cord rated for wet use, use a portable GFCI and check to see if you need special footwear or gloves.

If you work with saws

- Always use the right blade for the job and make sure it's sharp.
- Adjust the blade so it projects about one-eighth inch beyond the material you're cutting.
- Check blade alignment and tightness before you plug the saw in and start it.
- Don't try to cut small pieces that can't be properly secured.
- Remove nails, staples and loose knots before you cut.
- Make sure your footing is secure and that the cord is out of the way of the cut.
- Turn on the saw and let the blade reach full speed before it contacts the piece you're cutting.
- Use both hands to hold the saw and don’t force it.
- Don't reach under or around the material you're cutting.
- Don't put down the saw until the motor stops.

If you work with a power drill

- Select the right bit or attachment for the job.
- Don't use bits or attachments that are dull, bent or damaged.
- Tighten the chuck securely and remove the key.
- Secure the article being drilled.
- Never reach under or around the stock being drilled.
- Wait until the drill stops turning to set it down.
- Never carry it or move it by the cord.

Grinding

If you use a drill for grinding:

- Check to see where sparks might fall.
- Keep the area clear of debris.
- Allow the wheel to reach full speed.
- Move the work piece slowly across the wheel face.
- Use locking pliers or a clamp to hold small pieces.

Pneumatic Tools

Powered by compressed air, pneumatic tools include nailing and stapling guns, grinders, drills, jackhammers, and a variety of hammers, chippers, riveters and wrenches.

You need added training and must review the manufacturer's specifications and instructions before using pneumatic tools.

If you use pneumatic tools, you should:

- Protect yourself and others from flying debris and noise.
- Protect the hoses, filters and gauges from damage.
- Never use compressed air to clean or blow away dust or debris.
- Never point the tool toward yourself or anyone else.
- Never pull the trigger unless the nose piece of the tool is directed at a safe work surface.

Powder-Actuated Tools

Powder-actuated tools use an explosive cartridge to shoot fasteners that attach one material to another.

Operators of powder-actuated tools should be trained on their particular tools according to the Occupational Safety and Health Administration (OSHA) standards and recommendations of the American National Standards Institute (ANSI). Never touch this kind of tool unless you have the required training and approvals.

If you work with powder-actuated tools:

- Treat them like loaded guns and handle them with the same care and respect.
- Load them only just before use.
- Never carry or move them once loaded.
- Never walk behind a wall or other area where power actuated tools are being fired.
- Never pick up or handle unattended cartridges.
- Never put a cartridge in your pocket.

You can work safely with power tools if you follow the three rules of Powered Hand Tool Safety:

- Avoid dangerous situations by controlling or removing hazards.
- Protect yourself by using the right protective equipment and tools...and by keeping them in good condition.
- Defend yourself by planning ahead so you're ready when the unexpected happens.

Chapter 4
Machine Guarding

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Introduction

The dangerous aspects of machine work are apparent as soon as the power is activated. Using machinery is a big part of your job, but it also puts you at risk. That's why it is so important to understand your first and best form of protection, machine safeguards. Any machine part, function or process which may cause injury must be safeguarded. Hazards from operations or accidental contact must be controlled or eliminated.

Becoming Too Comfortable

Often, working with your machine becomes routine, sometimes to the point that the machine begins to feel like an extension of yourself -like another hand or arm. You find yourself no longer concentrating on operation, because operation is second nature, just like breathing. This feeling of security can lead to disaster. Therefore, always be alert to the dangers of the machines with which you work.

Mechanical Hazards

There are three places where most mechanical hazards occur and where safeguarding is the most important:

- The point of operation
- The power-transmission apparatus
- Transverse motion.

It may seem like a large task to provide protection against all these possible hazard spots, but it's not impossible.

Safeguard Qualities

Regardless of the specific type, a guard should:

- Be designed and constructed so that it may not be removed or tampered with easily
- Not create interference with the operation of any machinery
- Keep all human parts out of danger
- Prevent hand tools from falling into moving machinery.

Altering Safeguards

Safeguards can be safely changed or improved upon, but only if authorized. Your supervisor will know what safety requirements must be met and will help in creating a better system that protects you without slowing your work.

Guards

Guards are physical barriers that prevent access to danger areas. Guards can be divided into four general types:

Fixed

- A permanent part of the machine.
- Not dependent on any moving or supplemental parts to perform their intended function.
- Made of sheet metal, screen, wire cloth, bars, plastic or any material strong enough to withstand whatever impact and prolonged use they may receive.
- Usually the preferred type of guard because of its simplicity and durability.

Interlocked

- Connected to a tripping mechanism which cuts off the power automatically.
- Use electrical, mechanical, hydraulic or any combination of these systems.
- Should rely on manual resetting.

Adjustable

- Flexible in accommodating various sizes of stock.

Self-Adjusting

- Openings are determined by the movement of the stock.
- Do not always provide maximum protection.
- Can decrease visibility of the point of operation.
- Any machine safeguard that stops a machine's cycle must have manual resetting. Manual resets are important and should not be overlooked.

Devices

Devices are general systems that involve several parts, including moving parts, that work together to protect the operator. There are several different types of devices.

Safety Trip Controls

Safety trip controls provide a quick means for de-activating machinery in emergency situations. Body bars, trip rods and safety trip wires require bodily contact to deactivate machinery.

Pressure-Sensitive Body Bar

Pressure-sensitive body bars are activated by bodily contact which could ultimately lead to entrance into the point of operation or other hazard point. Their placement is critical. A bar should be at waist, chest or eye level. A bar placed too close to the floor or above the operator's head reduces the chance of accidental contact and defeats the purpose of the guard.

Safety Trip-Wire Cables

Safety trip-wire cables must be readily available and should always be within easy reach of your usual working area. For full protection, you should be able to reach the cable with either hand.

Two-Hand Control

- Requires constant, simultaneous pressure by both hands in order to start the machine.
- Requires a part revolution clutch, brake and brake monitor if used on a power press.
- Keeps both hands out of the danger zone and on the control buttons while the machine operates.

Two-Hand Trip

- Requires simultaneous pressure from both hands to initially activate the machine.
- After activation, your hands can be removed from the controls.
- Trips must be placed far enough away to make it impossible for hands to slip into the point of operation

- Usually used with machines equipped with full-revolution clutches.

Presence-Sensing Devices

Presence-sensing devices combine with safety guards to protect you. The machine's cycle is stopped when you cross the light beam created by this device.

- It is recommended that a barrier guard be used should the light system fail.
- Maintenance must be thorough and regular.

Gates

- Function as a barrier to guard or prevent entry to the dangerous point of operation.
- Also function as a device that halts the machine cycle when not properly in place.

Troubleshooting Your Machines

Nature of the Work

Machine safeguarding is not an exact formula but an answer to specific needs. Machine work is risky business. Take a minute and think about the machine you work with.

- What are the materials with which your machine works?
- What does the machine do to the material?
- What is the by-product?
- What is the motion of the machine1y- does it rotate, move back and forth, or move up and clown?

If you think ahead to what your machine will do when activated, you can better avoid potential danger.

Location of the Operator

- Where are you standing when the machine is activated?
- What is the danger from potential nip points?
- Where are you in relation to the point of operation?
- Is there danger from other moving parts?

Location of the Machine

- Where are co-workers in relation to machinery?
- What is the probability of accidental contact?
- Is there a good chance of foreign materials being accidentally drawn into the machinery?

Feeding and Ejection Systems

- Are feeding and ejection systems automatic or semi-automatic?
- Can they be made automatic?
- Where are the potential nip points?

Review

Remember, machine accidents don't always happen to operators.

- As you walk past machinery in your shop or warehouse, be alert.
- A loose shirttail could be grabbed by a machine.

- Stumbling over something on the floor could be disastrous if you happen to trip near a machine in operation.
- If you are operating a machine, be sure the mechanisms are clear of people and objects
- Be sure you are not wearing any jewelry or loose clothing that could get snagged during the machine's operating cycle.

Summary

Evaluating each machine with these things in mind will tell you whether the machines you work with are adequately guarded. Machine safeguarding is the number-one priority of any machine shop.

Machine safeguarding works-so make sure it works for you.

Chapter 5

Electrical Safety

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Introduction

Electrocution is the second biggest killer of employees in general industry. To protect you, the Occupational Safety and Health Administration (OSHA) published rules for safe electrical work practices. Following these regulations can help you work safely.

Levels of Protection

There are three basic levels of protection to help you work safely around electricity:

- Engineering controls
- Safe work practices
- Personal protective equipment (PPE).

Engineering Controls

Whenever possible your employer provides engineering controls to eliminate shock hazards. Insulation is one such engineering control. A material with little or no conductive properties is used .to put a barrier between you and flowing current. Glass, rubber, mica and some plastics make good insulators.

To prevent you from contacting live wires or parts, junction boxes must not have holes in their covers. Unfortunately, let a little weather, hard use or age affect these engineering controls -and the threat of injury returns.

Safe Work Practices

Safe work practices are developed through training.

- Always inspect your tools before you work.
- Remember that insulated grips on electrical tools protect you only when the insulation is free from cracks, tears and worn spots.
- Rely only on factory manufactured insulation, because home-made insulation can expose you to deadly electrical current.
- Check power tools to see that double-insulated casings and third-wire power cord grounding work properly.
- Check to see that safety guards or shields are in place, switches have secure terminals and cords are not frayed or cut.

Inspect Portable Extension Cords.

- Be sure the cord is rated for the tool you're using and your work environment.
- Make sure the cord you are using is a three-wire cord with a working ground fault circuit interrupter (GFCI).
- Before your shut begins, check the cord for loose parts, deformed and missing pins, or damage to its outer jacket or insulation.
- Be sure the plug and receptacle are designed to be used together.
- Remember that switches, components and wiring won't stand up to rough handling.
- Never raise or lower equipment by its flexible cord because this could damage the insulation.

Read and Follow Symbols, Signs and Barriers.

- Stop bars and emergency cut-off switches are usually red.
- Orange sometimes marks dangerous exposed machine parts or electrical hazards.
- Yellow calls for caution.
- Green shows where to find safety items.

Work Safely Around Flammable Dust and Vapors.

- Air full of combustible dust, flammable fumes or excess oxygen can be ignited by a stray spark.
- Ventilation is one way to lower the concentration of atmospheric hazards in your work area.

Use Proper Lighting.

- If you can't see well enough to work safely, set up approved portable lighting.

Housekeeping.

- Keep tools clean and arranged conveniently because a little oily film or carbon deposit can conduct electrical current.
- Clean up spills immediately.
- Even sweat conducts electricity--so keep a towel or rag handy.
- Never work with electricity in wet weather.

Lockout/Tagout

Lockout/Tagout can save your life. Before working on circuits and equipment, follow your facility's procedures to the letter.

- **Locks** -Place a lock on each disconnecting means, such as a switch or circuit breaker, which could energize the line.
- **Tags** -If tagging alone is permitted, use an additional safety measure, such as removing fuses, blocking control switches or opening an extra disconnect device.
- Never remove a lock or tag applied by someone else. Some facilities require removal of locks and tags at the end of each shift with replacement locks and tags applied by oncoming employees.
- Treat conductors and parts of equipment that have not been locked out or tagged as if they are energized.
- Watch out for additional stored energy. Even when equipment is locked out, it's still possible that energy from an additional source can inflict deadly shock.
- Check to see that all power sources are controlled. Never try to find out if there's voltage left in a disconnected circuit by touching the equipment.
- Instead, read the manufacturer's service manual or updated diagrams for the particular system you are working on.
- Look for capacitors and other forms of stored energy. To discharge capacitors, a qualified worker can connect a

grounding wire from the capacitor to a known grounding source.

- Disconnect or cap auxiliary power sources, such as secondary electrical, steam, hydraulic or pneumatic systems. This includes checking-that all moving parts have stopped turning, relieving trapped pressure, blanking pipe flanges and blocking or supporting elevated equipment. Return all controls to the OFF or NEUTRAL position, and apply your lock and tag.
- Verify isolation. After you're sure that no people are exposed, operate the push button or other normal operating controls to make certain the equipment will not operate. Check to see that the main disconnect or circuit breaker cannot be moved to the ON position.
- A qualified worker can use a voltage meter to check for voltage.
- Press START buttons and other activating controls.
- Shut off machine controls.

Energizing Electrical Systems

When work is complete on an item of electrical equipment:

- Inspect the entire work area to be sure all tools, jumpers, grounds and other devices are removed.
- Warn co-workers to stay clear of the equipment being returned to service.
- Remove locks and tags. Then operate energy isolating devices to restore energy.
- Ensure that equipment is safe to operate. Make sure all guards are installed and that blocks, braces and grounds are removed.
- Count co-workers to be sure everyone is clear of equipment.
- Notify everyone affected that the system is being returned to normal operation before you re-energize the system.
- Remove locks and re-energize.
- A qualified person is specifically trained in the hazards of working on energized parts and equipment. Being qualified to work on one type of equipment does not necessarily mean you are qualified to work all equipment.
- Being qualified means you are allowed to work on energized systems.

Qualified Electrical Workers

Sometimes turning equipment off increases hazards such as interrupting life-support systems or deactivating emergency alarm systems or ventilators. Only qualified persons familiar with the operation of the equipment are allowed to work on it.

Working with Energized Systems

Whether you are qualified or simply competent, you should never work on unfamiliar equipment.

- Check all built-in safety features and don't rely blindly on internal safety devices such as fuses, circuit breakers or protective interlocks.
- When de-energizing is impossible for such procedures as troubleshooting or testing, a qualified worker can use a glow tester to check for power in a high-voltage line.

- Remember that Live-circuit work hazards are so serious that trained workers must strictly follow acceptable safe work procedures.

Work Safely with Test Equipment

Test equipment-from a simple voltmeter to a complicated circuit analyzer-is really just another tool for the qualified worker, and the same basic rules apply.

- Always choose the tester that is right for the job and use safe testing procedures.
- Never exceed equipment limitations and don't abuse testers. Rough handling damages switches and components which may cause faulty grounding.
- Inspect testers often. Check probes and leads for defects. Make sure they have insulated stops to keep your fingers from sliding onto leads.

Personal Protective Equipment

When engineering controls and safe work practices are in place you have one extra line of defense: personal protective equipment (PPE).

- Select the proper equipment and check it periodically for good repair.
- If you need a ladder, use only a sturdy one made of wood or fiberglass. Aluminum ladders conduct electricity. Rubber feet or end caps give added protection since they are non-conductive and won't skid.
- Always wear a good pair of safety shoes with insulated soles and heels. Make sure clothing is comfortable, and wear buttoned shirt cuffs and no neckties or scarves.
- Remove all jewelry, rings and metal wristwatches. Gold and silver are excellent conductors and can make you part of a live circuit. A short circuit through jewelry could ruin sensitive electronic circuits.
- A standard electrician's tool belt is okay, but remember that metal rivets can conduct electricity. In tight spaces, take the tool belt off before starting work. Dangling tools can drop into operating equipment or across electrical connections.
- Use the proper PPE for the job. Personal protective equipment is designed and made of materials to protect you in many ways.
    - Non-conductive head protection can protect you when there is danger of head injury from electric shock or electrical burns.
    - Eye and face protection protects you from electric arcs or flashes and from flying objects when there is an electrical explosion.
- Inspect and protect your PPE before you use it and protect it from damage. One way to protect rubber insulating material is to use an outer leather covering.

Working with Overhead Lines

Although all energized circuits are electrical hazards, none has caused more deaths than overhead power lines. If you are a qualified worker, you may be required to work directly on energized overhead lines. For safety's sake:

- Observe clearance distances. If you are an unqualified worker, neither you nor anything you touch can get within 10 feet of an overhead line carrying up to 50 kilovolts GCV). When voltage to ground is 50 kilovolts or above, you must maintain 10 feet of clearance and add 4 inches for every 10KV over 50KV. For example:

Voltage	Clearance
50KV	10 feet
60KV	10 feet, 4 inches
70KV	10 feet, 8 inches

As a qualified worker you may work closer than 10 feet from these lines while you are either in an elevated position or on the ground. However, be sure to:

- Use hand-held working devices with approved insulating handles.
- Use gloves rated for the voltage involved.
- Be sure you're insulated from any conductive objects and energized parts.

Emergency Rescue

Know what to do to protect yourself and know how to aid a shock victim.

- Find out if the person you are helping is in contact with an energized circuit and then shut it down -before you approach the victim.
- If you are not sure whether the victim is clear of the energized source, assume that the person may shock you if you touch the person.
- If you have to move the victim off a live circuit, use something non-conductive such as a dry wooden chair, board, pole, plastic pipe or rope.

First Aid

Once you have safely separated a shock victim from an energized circuit, call or send for emergency medical help. Then decide what first aid you should give.

- Always quietly reassure and calm an injured person. If the victim is standing, have the person lie down. If the victim is not breathing, the lungs may have been paralyzed by the shock. If that is the case, apply CPR until qualified medical assistance arrives.
- If any bleeding occurs, you should stop it by applying direct pressure on the wound after first protecting yourself from bloodborne pathogens.
- Remember that traumatic shock may occur with electric shock, when vital bod y systems can shut down or function abnormally.

Traumatic Shock Treatment

The following are examples of what you may encounter when an electric shock victim's body is in traumatic shock and instructions for what you should do to help:

- The victim's muscles are usually weak, breathing is slow, heartbeat is slow and blood pressure is weak.
- Loosen the victim's clothing. If the person's skin is unnaturally warm, cool it by fanning. If the skin is cold and clammy, cover the victim with a jacket or a blanket.

- If the victim's face is pale, it means there is not enough blood flow to the head. Raise the person's feet higher than the head.
- If the victim's face is unusually red, there is too much blood flow to the head. Position the victim so that the victim's head is higher than the feet.

Remember: The first aid you provide may save a life. Review first-aid procedures often.

Summary

You have learned how to work safely with electricity and that it can strike the complacent and the unwary with unseen, fast and deadly results.

If you are not sure about safe procedures or conditions, don't do that job until you are sure. Remember, ignoring the potential dangers of electricity may cost you your life.

Work smart... and beware the bite!

Chapter 6

Fall Protection

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FALL PROTECTION: THE BENEFITS ARE UPLIFTING

Falls are the leading cause of fatalities in many industries and have resulted primarily from unprotected sides, wall openings, and side holes; improper scaffolding construction; unguarded protruding steel rebars; and misuse of portable ladders.

Although your employer has a duty to provide you with the proper fall protection equipment and training, it is your duty to use the equipment and training provided. You should note that all workers who are working on a walking-working surface four to six feet or more above a lower level, constructing a leading edge, or working in hoisting areas are required to have fall protection.

However, there is an exemption from providing fall protection if an employer can demonstrate that fall protection is infeasible or creates a greater hazard while performing leading edge work, precast concrete erection, or residential construction. There is also an exception to the trigger height requirement if you're involved in steel erection or working from a scaffold.

Fall protection examples

Workers must be protected from falling by the use of guardrail systems, safety net systems, personal fall arrest systems, and/or warning line system.

What are these systems?

- Guardrail system means a barrier erected to prevent employees from falling to lower levels.
- Safety net system means nets that extend outward from the outermost projection of the work surface and capable of absorbing an impact force.
- Personal fall arrest system means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.
- Warning line system means a barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of guardrail, body belt, or safety net systems to protect employees in the area.

OSHA says

OSHA required that fall protection be provided at elevations of four feet in general industry workplaces, five feet in shipyards, six feet in the construction industry and eight feet in longshoring operations. The regulations for protection against falls can be found throughout 29 CFR 1926 Construction, 29 CFR 1910 General Industry and 29 CFR 1915 Maritime Industry:

29 CFR 1926	**Name**
.450-.454	Scaffolding
.500-.503	Fall protection
.1050-.1060	Stairways and ladders
29 CFR 1910 Subpart F	Powered Platforms, Manlifts, and Vehicle Mounted Work Platforms
29 CFR 1915.7 Subpart E	Fall protection 5 feet above solid surface or distance above water

Fall protection

The fall protection standard has three elements:

- Situations at your worksite that require protection from falling and from falling objects (1926.501), (1910.66, 1910.67, 1910.68), (1915.71 and 1915.77).
- Different types of fall protection equipment and systems your employer can use to provide you protection. (1926.502), (1910.66), (1915.71).
- Training requirements (1926.503), (1910.22) and (1915.7).

General Requirements

Your employer is required to:

- Provide equipment and training to protect you from falling off, onto, or through working levels that are four to six feet or more above lower levels and to protect you from falling objects.
- Ensure that when your working area is elevated, it has the required strength and structural integrity to support you and your fellow workers.
- Make sure that body belts are not used as personal fall arrest equipment. However, they can be used as positioning devices. Also, only locking type snaphooks can be used in personal fall arrest equipment.

Equipment and Systems

Your employer must provide and install all required fall and falling object protection before you begin work. The three most common methods of providing fall protection are guardrails, safety nets, and personal fall arrest systems. These are referred to as primary systems.

Guardrails

A guardrail is a barrier put up to prevent falls to a lower level. Guardrails can be used to protect you from falls from unprotected sides and edges during leading edge construction work; through holes including skylights; from ramps, runways, or other walkways; into excavations that are not visible because of weed growth or other visual barriers; and into or onto dangerous equipment.

Some guardrail requirements are:

- The top of the top rail must be 39 to 45 inches high.
- Guardrails must be able to withstand, without failure, a 200-pound force applied within 2 inches of the top edge in any outward or downward direction at any point along the top edge. The top edge must not bend to a height less than 39 inches above the floor.
- Midrails must be capable of withstanding 150 pounds of inward or downward force.
- Steel or plastic banding cannot be used as top or midrails.
- If wire rope is used for top rails, it must be flagged at not more than six foot intervals with high-visibility material.
- Manila, plastic, or synthetic rope used for top or midrails must be inspected frequently for strength.

- When guardrails are used around holes, all unprotected sides and edges must be protected.

Safety nets

Safety nets are used as protection at unprotected sides, leading edges, work on bridges, overhead bricklaying, work on roofs, precast concrete work, residential construction, and wall openings.

Some of the requirements for using safety nets are:

- Installed nets as close as possible under where you are working, but never more than 30 feet away.
- Extend nets outward from the edge of your work area:

Vertical drop from your working surface	Minimum distance from the outer edge of the working area
Up to 5 feet	8 feet
More than 5 up to 10 feet	10 feet
More than 10 feet	13 feet

- After your safety net is installed, drop test or certify it before use. Also drop test or certify a net whenever it is relocated, repaired, and every six months if it is in one location that long.
- Inspect nets at least once a week for wear, damage, and other deterioration. Replace defective nets or components before use.
- Remove materials, scrap pieces, equipment, and tools that have fallen into the net as soon as possible and at least before the next work shift.

Personal fall arrest equipment (harnesses)

Personal fall arrest equipment arrests a fall, but doesn't prevent a fall when you are working around unprotected sides and edges, leading edge work, in hoist areas when loading or unloading materials, form and reinforcing steel work, overhead or below surface bricklaying, work on low- sloped or steep roofs, precast concrete work, residential construction, and wall openings.

In case you do fall, the fall protection equipment must be rigged to limit your fall to a free fall of not more than 6 feet, to a deceleration distance of no more than 3.5 feet, and to prevent you from contacting any lower level.

Some other requirements for personal fall arrest equipment are:

- A horizontal lifeline must be designed, installed, and used under the supervision of a qualified person.
- Lanyards and vertical lifelines must have a minimum breaking strength of 5,000 pounds.
- Only one worker can be attached to a vertical lifeline.
- Protect your lifeline from, and inspect your lifeline for, cuts or abrasions before and during work.
- Ropes and straps (webbing) used in body harnesses must be made from synthetic fibers.
- For a full body harness the attachment point must be located in the center of your back near your shoulder or above your head.

- Your employer must have a rescue plan and be able to rescue you promptly, or ensure you are capable of rescuing yourself.
- Inspect your fall arrest equipment prior to each use for wear, damage, and other deterioration. Do not use defective components.
- Do not attach your personal fall arrest equipment to:
  - Anchorages being used to support or suspend platforms.
  - Guardrails.
  - Hoists, except as specified in the rules.

Other fall protection systems

The fall protection rule lists other systems and equipment your employer can use in certain situations. Some of them are:

- Safety monitoring system - Used when working on low-slope roofs only. It must be used with a warning line system. The only exception is that a safety monitoring system can be used alone when the roof is 50 feet or less in width, as the OSHA rule determines width.
- Covers - Required for holes, including skylights.
- Warning lines - Must be used with another protective system such as guardrails, safety nets, personal fall arrest equipment, or safety monitoring procedures.
- Positioning devices- Used on the face of formwork or reinforcing steel structures and other situations where hands must be free to work.

Protection from falling objects

Falling objects are a major hazard around construction sites. You should wear your hard hat at all times when falling objects are a possibility.

Also protect your coworkers by one or a combination of the following methods:

- Toeboards along the edge of an overhead walking/working surface.
- Guardrails that have all openings small enough to prevent passage of potential falling objects.
- Proper storage methods during bricklaying, roofing, and related work.
- Canopies and barricades.

Steel erection

OSHA's steel erection standard has requirements for protecting workers from falls. Once workers are 15 feet above a lower level they must use adequate fall protection equipment. However, there are two exceptions to this rule: Connectors working at heights between 15 and 30 feet, and employees working in a controlled decking zone between 15 and 30 feet, do not need fall protection equipment when special provisions in the OSHA regulations are followed.

Training requirements

You must be trained by a competent person anytime you could be exposed to fall hazards. Training includes:

- Recognizing fall hazards at your worksite and how to minimize them.
- Correct procedures for erecting, maintaining, disassembling, and

inspecting the fall protection equipment and systems you will use.
- Proper use and operation of the fall protection systems.
- Your role in a safety monitoring system, if it is used.
- Limitations of the use of mechanical equipment when working on low-sloped roofs.
- An understanding of the OSHA fall protection rules.
- Your employer must:
- Retrain you when you don't understand something, when you move to a different workplace, or when new equipment is introduced.
- Prepare a written certification of your training.

Work at working safely

Contrary to popular belief, it is possible to prevent injury and death due to falls. No one should consider accidents to be a part of the cost of doing business. Rework and repair of people is much more difficult than it is with products and equipment. Therefore, use fall protection equipment correctly, protect it from jobsite hazards, and inspect it prior to each use. Doing this may save your life.

Chapter 7

Confined Space

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CONFINED SPACE ENTRY: GET IN AND OUT SAFELY

Each day thousands of workers are exposed to possible injury or death in what OSHA calls "confined or enclosed spaces." These spaces have a limited means of exit and are subject to the accumulation of toxic or flammable contaminants, or an oxygen-deficient atmosphere.

Confined space examples:

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.

OSHA says

In general industry, OSHA uses the term "permit-required confined space" to describe a confined space that has one or more of the following characteristics: hazardous atmosphere, engulfment hazard, entrapment or asphyxiation hazard, or any other recognized safety or health hazard such as unguarded machinery, exposed live wires, or heat stress (29CFR 1910.146).

Although OSHA construction standards are not neatly defined in one area, there are regulations governing entry into confined or enclosed spaces in an effort to protect employees. One way an employer can protect you from confined space hazards is to develop and implement a permit space program, which includes testing procedures, defined employee roles in the entry process, permit requirements, and rescue procedures. At the very least, you should know the basics.

What you should know

When it comes to confined spaces, OSHA expects your supervisor to instruct you on the following:

- Nature of the hazards involved,
- Necessary precautions to be taken,
- Recognition and avoidance of unsafe conditions,
- Use of required protective and emergency equipment, and
- Regulations that apply to work in dangerous or potentially dangerous area.

Confined or enclosed space hazards

There are many situations and hazards that can cause a confined space to become deadly. Vapors, gases, and mists can accumulate in confined spaces due to:

- Use of cleaning or bonding liquids,
- Certain work being done such as welding, or
- Environmental effects.

If you are unaware that these hazards exist, the result can be fires, explosions, or health issues.

Physical hazards

The largest number of deaths in confined spaces are caused by atmospheric problems. However, if trench cave-in deaths are included as confined space-related deaths, then physical hazards would be the largest group.

Physical hazards include:

- Hazardous energy - Activated electrical, mechanical, and hydraulic energy can cause injury in a confined space; therefore, it must be de-energized and locked out before you go to work in that space.
- Cave-in - When cave-ins are possible, OSHA's excavation rules must be followed.
- Drowning- Heavy rain or water from pipes can enter the space.
- Underground utilities - Lines containing steam, gases, or coolants should be shut off.
- Communication problems - Poor communication systems may delay rescue.
- Heat -Temperatures can build up quickly in a confined space and cause exhaustion or dizziness.
- Noise - Sound from equipment and workers reverberates in the space and can make it difficult to hear important directions or warnings.
- Entry and exit difficulties - Entry and exit openings can be limited by size or location.

Atmospheric hazards

Asphyxiation caused by atmospheric problems is the main hazard in confined spaces.

Oxygen deficiency

Most confined space accidents are related to atmospheric conditions inside the space and the failure to continuously monitor the air and ventilate as necessary. In general, the primary risk associated with confined spaces is oxygen deficiency.

Normal air contains 20.8 percent oxygen. The minimum safe level, an OSHA requirement, is 19.5 percent. OSHA also says that the maximum safe level is 23.5 percent. At 16 percent you will feel disoriented and between eight percent and 12 percent you will likely become unconscious. If the air has too much oxygen (over 23.5 percent) it is considered oxygen rich and becomes an explosion or fire hazard.

Oxygen is reduced in a space when it is replaced by another gas or used up. It can also be displaced by other gases such as argon, nitrogen, or methane. Oxygen can be consumed during combustion of flammable substances, as in welding, cutting, or brazing. A more subtle form of consumption of oxygen occurs during bacterial action, as in the fermentation process. Oxygen may also be consumed during slow chemical reactions such as the formation of rust.

Flammable air

Fire and explosion are serious dangers in a confined space. Fumes and vapors will ignite more quickly in the trapped air.

Flammable and combustible gases or vapors may be present from previous contents, tank coatings and preservatives, and welding operations. In locations where flammable vapors may be present, precautions must be taken to prevent ignition by eliminating or controlling the source of ignition or eliminating the flammable air before working. Sources of ignition may include smoking, cutting and welding, hot surfaces, and frictional heat.

Toxic air contaminants

Toxic air contaminants come from material previously stored in the confined space or as a result of the use of coatings, cleaning solvents, or preservatives. The work being performed in a confined space could also give off a toxic gas.

An example of this would be a welding operation that gives off carbon monoxide and oxides of nitrogen and ozone.

Unfortunately, you cannot see or smell most toxics, but they present two types of risk in a confined space: they can irritate your respiratory or nervous system; or some toxic chemicals can cut off your oxygen supply, get into your lungs, and asphyxiate you.

Working in confined spaces

If you are required to enter a confined space, make sure that you understand the following:

- What kinds of hazards you may run into and why those hazards are dangerous.
- The necessary precautions to take for each type of hazard.
- The use of any protective and/or emergency equipment and instruments required.

Before entering a confined space

Before entering a confined or enclosed space there are certain procedures you should follow to ensure the space is safe.

Make sure entry is permitted

Your employer may post danger signs to prevent unauthorized entry into a confined space. A sign reading "DANGER- PERMIT-REQUIRED CONFINED SPACE. DO NOT ENTER," or using other similar language should be taken seriously.

Understand your role

Entry into a confined space should not be accomplished alone. At the very minimum, an authorized entrant and an entry supervisor are needed.

An authorized entrant means an employee who is authorized by the employer to enter a permit space. An entry supervisor is responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry.

Make sure that you understand the duties of the role you are assigned.

Obtain an entry permit

Although this is not required by OSHA for construction, it is a good idea to obtain a written authorization (entry permit), signed by your supervisor, prior to entering a confined space. This would be an excellent time for you and your jobsite supervisor to discuss the necessary precautions for the job you are doing.

Control hazardous energy

Use lockout devices and tags to prevent accidental startup of equipment while you are working in the confined space. Cut off steam, water, gas, and power that enter the confined space. Use only safe, grounded, explosion-proof equipment and fans.

When you are working in a confined or enclosed space that has exposed energized parts, your employer must provide some type of protective

insulated shield to prevent contact with these parts.

Test the air

Your company should make it a practice to test the air every time you are required to go into a confined space. Adequate precautions must be taken to prevent your exposure to:

- Air containing less than 19.5 percent oxygen.
- A concentration of a flammable gas in excess of 20 percent of the lower flammable limit of the gas.
- Any other toxic hazardous air.

Your company should have special instruments for testing the levels of oxygen, combustibility, and toxicity in confined spaces.

Excavations over 4-feet deep where oxygen deficiency or other hazardous atmospheres exist or could reasonably be expected to exist must be tested.

Test the air prior to going into the confined space and on a regular basis during your stay for presence of sufficient oxygen and absence of hazardous levels of toxic or combustible gases. Once the space is opened, test the air from top to bottom. Some gases like propane and butane are heavy, and they will sink to the bottom of the space. Light gases like methane will rise to the top. So you need to be sure to check all levels.

After you are sure that the oxygen level is adequate and there is nothing combustible in the space, test for toxicity.

If you are assigned to enter a confined space, you or your authorized representative have the right to watch all air monitoring and see all monitoring results and written certifications that the space is safe to enter.

If tests indicate the space is unsafe to enter, notify your supervisor. Your company should post a sign that reads "DANGER- PERMIT-REQUIRED CONFINED SPACE. DO NOT ENTER," or use other equally effective means to inform you of the existence and location of and the danger posed by the confined space. The sign should remain in place until tests indicate you can safely enter the space.

When toxic substances are present for which no equipment to test the atmosphere is available, you must be permitted to enter the confined space only with the use of supplied air respiratory equipment and other appropriate personal protective equipment.

Use the proper equipment

When you enter a confined space through a manhole or other small opening you should have means to be quickly removed in case of an emergency. You should use a chest harness or a full body harness with retrieval line attached at the center of your back near the shoulders. Body belts used for retrieval can cause the person to get stuck in small exit openings.

Ensure proper ventilation

When you are welding, cutting, or heating in a confined space, ventilation must be provided to ensure oxygen levels are safe and toxic or flammable gas is not at a dangerous level.

When sufficient ventilation cannot be obtained without the ventilation equipment blocking your means of escape, you must be provided an air line respirator and trained to use it properly.

Use ventilating equipment where possible. Ventilation should maintain an Oxygen level between 19.5 percent and 23.5 percent. It also should keep toxic gases and vapors to within accepted levels prescribed by OSHA.

Rescue procedures

When workers enter a confined space, at least one person should remain outside to summon help or offer assistance. Your company must have written emergency rescue procedures that require trained personnel to be available and stationed where they may reach victim(s) within a time frame appropriate for the hazards of the confined space.

The trained attendant should be knowledgeable in first aid and cardiopulmonary resuscitation (CPR). The attendant also must maintain constant communication with those inside the space either visually, by radio, or by field telephone. If a situation arises that requires emergency entry, the attendant should not enter until additional help arrives.

A rope tied around a worker's waist is not an acceptable rescue method. It does not allow a single attendant to pull an injured worker out of a space. Using a full body harness and lifeline is a better approach. It can be attached to a block and tackle that a single rescuer can operate.

Emergency rescue equipment such as a self-contained breathing apparatus (SCBA), a safety harness and line, or a basket stretcher, must be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. The equipment must be attended when in use.

Work at working safely

Sometimes the confined space you are entering will not appear to be hazardous. It may have been entered on the last shift with no problems, and may not show signs of being dangerous. At other times there may be indications of danger - the distinct odor of toxic gases, arcing of electrical equipment, or the presence of loose material. Recognition of these dangers is critical and must be a part of your company's safety program.

Chapter 8

Chemical Hazard Communication

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Chemicals in the Workplace

About 32 million workers work with and are potentially exposed to one or more chemical hazards. There are an estimated 650,000 existing chemical products, and hundreds of new ones being introduced annually. This poses a serious problem for exposed workers and their employers.

Chemical exposure may cause or contribute to many serious health effects such as heart ailments, central nervous system, kidney and lung damage, sterility, cancer, burns, and rashes. Some chemicals may also be safety hazards and have the potential to cause fires and explosions and other serious accidents.

Because of the seriousness of these safety and health problems, and because many employers and employees know little or nothing about them, the Occupational Safety and Health Administration (OSHA) issued the Hazard Communication Standard. The basic goal of the standard is to be sure employers and employees know about work hazards and how to protect themselves; this should help to reduce the incidence of chemical source illness and injuries.

The Hazard Communication Standard establishes uniform requirements to make sure that the hazards of all chemicals imported into, produced, or used in U.S. workplaces are evaluated, and that this hazard information is transmitted to affected employers and exposed employees.

Chemical manufacturers and importers must convey the hazard information known about a chemical to their downstream entities. This means that producers of chemicals have the primary responsibility for generating and disseminating information, whereas users of chemicals must obtain the information and transmit it to their own employees. In general, it works like this:

Chemical Manufacturers/ Importers	• Determine the hazards of each product.
Chemical Manufacturers/ Importers/ Distributors	• Communicate the hazard information and associated protective measures downstream to customers through labels and SDS's.
Employers	• Identify and list hazardous chemicals in their workplaces. • Obtain SDSs and labels for each hazardous chemical, if not provided by the manufacturer, importer, or distributor. • Develop and implement a written hazard communication program, including labels, SDSs, and employee training, on the list of chemicals, SDSs and label information. • Communicate hazard information to their employees through labels, SDSs, and formal training programs.

Hazard Evaluation

The quality of the hazard communication program depends on the adequacy and accuracy of the hazard assessment. Chemical manufacturers and importers are required to review available scientific evidence concerning the hazards of the chemicals they produce or

import, and to report the information they find to their employees and to employers who distribute or use their products. Downstream employers can rely on the evaluations performed by the chemical manufacturers or importers to establish the hazards of the chemicals they use.

The chemical manufacturers, importers, and any employers who choose to evaluate hazards are responsible for the quality of the hazard determinations they perform. Each chemical must be evaluated for its potential to cause adverse health effects and its potential to pose physical hazards such as flammability. (Definitions of hazards covered are included in the standard.) Chemicals that are listed in one of the following sources are to be considered hazardous in all cases:

- 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), and
- Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment, American Conference of Governmental Industrial Hygienists (ACGIH).

In addition, chemicals that have been evaluated and found to be a suspect or confirmed carcinogen in the following sources must be reported as such:

- National Toxicology Program (NTP). Annual Report on Carcinogens,
- International Agency for Research on Cancer (IARC), Monographs, and
- Regulated by OSHA as a carcinogen.

Hazard Communication

Employers must develop, implement, and maintain the workplace a written, comprehensive hazard communication program that includes provisions for container labeling, collection and availability of safety data sheets, and an employee training program. It also must contain a list of the hazardous chemicals in each work area, the means the employer will use to inform employees of the hazards of non-routine tasks (for example, the cleaning of reactor vessels), and the hazards associated with chemicals in unlabeled pipes. If the workplace has multiple employers on-site (for example, a construction site), the rule requires these employers to ensure that information regarding hazards and protective measures be made available to the other employers on-site, where appropriate.

The written program does not have to be lengthy or complicated, and some employers may be able to rely on existing hazard communication programs to comply with the above requirements. The written program must be available to employees, their designated representatives, the Assistant Secretary of Labor for Occupational Safety and Health, and the Director of the National Institute for Occupational Safety and Health (NIOSH):

Labels and Warnings

Container labels provide information to employees on specific hazardous chemical. While labels provide important information for anyone who handles, uses, stores, and transports hazardous chemicals, they are limited by design in the amount of information

they can provide. Safety Data Sheets (SDSs), which must accompany hazardous chemicals, are the more complete resource for details regarding hazardous chemicals.

Labels, as defined in the Hazard Communication Standard (HSC), are an appropriate group of written, printed or graphic informational elements concerning a hazardous chemical that are affixed to, printed on, or attached to the immediate container of a hazardous chemical, or to the outside packaging.

The HCS requires chemical manufacturers, importers, or distributors to ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked with the following information: product identifier; signal word; hazard statement(s); precautionary

Labels for a hazardous chemical must contain:

- Product identifier: how the hazardous chemical is identified. This can be (but is not limited to) the chemical name, code number or batch number. The manufacturer, importer or distributor can decide the appropriate product identifier. The same product identifier must be both on the label and in Section 1 of the SDS (Identification).
- Signal word: used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. There are only two signal words, "Danger" and "Warning." Within a specific hazard class, "Danger" is used for the more severe hazards and "Warning" is used for the less severe hazards. There will only be one signal word on the label no matter how many hazards a chemical may have. If one of the hazards warrants a "Danger" signal word and another warrants the signal word "Warning," then only "Danger" should appear on the label.
- Pictogram: OSHA's required pictograms must be in the shape of a square set at a point and include a black hazard symbol on a white background with a red frame sufficiently wide enough to be clearly visible. A square red frame set at a point without a hazard symbol is not a pictogram and is not permitted on the label. OSHA has designated eight pictograms under this standard for application to a hazard category.
- Hazard statement(s): describe the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard. For example: "Causes damage to kidneys through prolonged or repeated exposure when absorbed through the skin." All of the applicable hazard statements must appear on the label. Hazard statements may be combined where appropriate to reduce redundancies and improve readability. The hazard statements are specific to the hazard classification categories, and chemical users should always see the same statement for the same hazards, no matter what the chemical is or who produces it.
- Precautionary statement(s): means a phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical or improper storage or handling.

- Name, address and phone number of the chemical manufacturer, distributor, or importer

Exemptions to the requirement for in-plant individual container labels are as follows:

- Employers can post signs or placards that convey the hazard information if there are a number of stationary containers within a work area that have similar contents and hazards.
- Employers can substitute various types of standard operating procedures, process sheets, batch tickets, blend tickets, and similar written materials for container labels on stationary process equipment if they contain the same information and are readily available to employees in the work area.
- Employers are not required to label portable containers into which hazardous chemicals are transferred from labeled containers and that are intended only for the immediate use of the employee who makes the transfer.
- Employers are not required to label pipes or piping systems.

Safety Data Sheets

Chemical manufacturers and importers must develop a Safety Data Sheet (SDS) for each hazardous chemical they produce or import, and must provide the SDS automatically at the time of the initial shipment of a hazardous chemical to a downstream distributor or user. Distributors must also ensure that downstream employers are similarly provided an SDS.

Each SDS must be in English and include information regarding the specific chemical identity of the hazardous chemical(s) involved and the common names. In addition, information must be provided on the physical and chemical characteristics of the hazardous chemical; known acute and chronic health effects and related health information; exposure limits; whether the chemical is considered to be a carcinogen by NTP, IARC, or OSHA; precautionary measures; emergency and first-aid procedures; and the identification of the organization responsible for preparing the sheet.

Copies of the SDS for hazardous chemicals in a work site are to be readily accessible to employees in that area. As a source of detailed information on hazards, they must be located close to workers, and readily available to them during each work shift.

List of Hazardous Chemicals

Employers must prepare a list of all hazardous chemicals in the workplace. When the list is complete, it should be checked against the collected SDS's that the employer has been sent.

If there are hazardous chemicals used for which no SDS has been received, the employer must write to the supplier, manufacturer, or importer to obtain the missing SDS.

Employee Information and Training

Employers must establish a training and information program for employees exposed to hazardous chemicals in their work area at the time of initial assignment and whenever a new hazard is introduced into their work area.

Information

At a minimum, the discussion topics must include the following:

- The hazard communication standard and its requirements of the standard.
- The components of the hazard communication program in the employees' workplaces.
- Operations in work areas where hazardous chemicals are present.
- Where the employer will keep the written hazard evaluation procedures, communications program, lists of hazardous chemicals, and the required SDS forms.

Training

The employee training must be in a language that they can understand, consisting of the following elements:

- How the hazard communication program is implemented in that workplace, how to read and interpret information on labels and the SDS, and how employees can obtain and use the available hazard information.
- The hazards of the chemicals in the work area. (The hazards may be discussed by individual chemical or by hazard categories such as flammability.)
- Measures employees can take to protect themselves from the hazards.
- Specific procedures put into effect by the employer to provide protection such as engineering controls, work practices, and the use of personal protective equipment (PPE).
- Methods and observations-such as visual appearance or smell- workers can use to detect the presence of a hazardous chemical to which they may be exposed.
- Labels and labeling
- Safety Data Sheets

Trade Secrets

A "trade secret" is something that gives an employer an opportunity to obtain an advantage over competitors who do not know about the trade secret or who do not use it. For example, a trade secret may be a confidential device, pattern, information, or chemical make-up. Chemical industry trade secrets are generally formulas, process data, or a "specific chemical identity." The latter is the type of trade secret information referred to in the Hazard Communication Standard. The term includes the chemical name, the Chemical Abstracts Services (CAS) Registry Number, or any other specific information that reveals the precise designation. It does not include common names.

The standard strikes a balance between the need to protect exposed employees and the employer's need to maintain the confidentiality of a bona fide trade secret. This is achieved by providing for limited disclosure to health professionals who are furnishing medical or other occupational health services to exposed employees, employees and their designated representatives, under specified conditions of need and confidentiality.

Medical Emergency

The chemical manufacturer, importer, or employer must immediately disclose the specific chemical identity of a hazardous chemical to a treating physician or nurse when the information is needed for proper emergency or first-aid treatment. As soon as circumstances permit, the chemical manufacturer, importer, or employer may obtain a written statement of need and a confidentiality agreement.

Under the contingency described here, the treating physician or nurse has the ultimate responsibility for determining that a medical emergency exists. At the time of the emergency, the professional judgment of the physician or nurse regarding the situation must form the basis for triggering the immediate disclosure requirement. Because the chemical manufacturer, importer, or employer can demand a written statement of need and a confidentiality agreement to be completed after the emergency is abated, further disclosure of the trade secret can be effectively controlled.

Non-emergency Situation

In non-emergency situations, chemical manufacturers, importers, or employers must disclose the withheld specific chemical identity to health professionals providing medical or other occupational health services to exposed employees, and to employees and their designated representatives, if certain conditions are met. In this context, "health professionals" include physicians, occupational health nurses, industrial hygienists, toxicologists, or epidemiologists.

The request for information must be in writing and must describe with reasonable detail the medical or occupational health need for the information. The request will be considered if the information will be used for one or more of the following activities:

- To assess the hazards of the chemicals to which employees will be exposed.
- To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels.
- To conduct pre-assignment or periodic medical surveillance of exposed employees.
- To provide medical treatment to exposed employees.
- To select or assess appropriate personal protective equipment for exposed employees.
- To design or assess engineering controls or other protective measures for exposed employees.
- To conduct studies to determine the health effects of exposure.

The health professional, employee, or designated representative must also specify why alternative information is insufficient. The request for information must explain in detail why disclosure of the specific chemical identity is essential, and include the procedures to be used to protect the confidentiality of the information. It must include an agreement not to use the information for any purpose other than the health need stated or to release it under any circumstances, except to OSHA.

The standard further describes in detail the steps that will be followed in the event that an employer decides not to disclose the specific chemical identity.

Chapter 9

Bloodborne Pathogens

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Introduction

Bloodborne diseases such as HIV, HBV and HCV make needlesticks and other exposures cause for concern if you work in healthcare.

The Occupational Safety and Health Administration (OSHA) has a standard that, if followed, is designed to protect you. It details ways that you and your employer can work together to substantially reduce your risk of contracting a bloodborne disease on the job. You are covered by the standard if it is reasonably anticipated that you could be exposed to bloodborne pathogens as a result of performing your job duties.

Bloodborne Diseases

Hepatitis B Virus

Hepatitis B virus (HBV) causes serious liver disease. About half of the people infected with hepatitis B have no symptoms. Those with symptoms may experience jaundice, fatigue, abdominal pain, loss of appetite, occasional nausea or vomiting. Most people infected with HBV recover and clear the infection. But about 10% become chronically infected. Each year, more than 5,000 people die from chronic liver disease and liver cancer linked to hepatitis B. As many as 200 of those who die are healthcare workers.

The hepatitis B virus poses a greater risk to healthcare workers than either the hepatitis C virus or HIV, since it is more easily transmitted. As yet, there is no sure cure for hepatitis B. Fortunately, the hepatitis B vaccine can prevent the disease.

Hepatitis C virus (HCV) causes a serious liver disease. This liver disease may cause symptoms similar to hepatitis B. However, there are important differences between hepatitis B and hepatitis C.

Hepatitis C Virus

While 85% of people infected with HCV have chronic infections, only about 10% of those infected with HBV are chronically infected. The Centers for Disease Control (CDC) reports about three million people in the United States are chronically infected with the hepatitis C virus while about 1.25 million are chronically infected with the hepatitis B virus. Further, many people infected with these two viruses have no symptoms at all: that includes about 50% of those infected with HBV and up to 75% of the people infected by HCV.

People chronically infected with hepatitis C may have no symptoms for up to 30 years, yet during that time the infection may be slowly damaging the liver. Hepatitis C is the leading indicator for liver transplants. Every year, up to 10,000 people die from hepatitis C related chronic liver disease. There is no vaccine to prevent hepatitis C. However, newly approved antiviral drugs have been effective in some people who have contracted the infection.

HIV

HIV attacks a person's immune system and causes it to break down. The clinical picture of HIV infection differs widely from person to person. A number of those infected remain apparently healthy for many years. The infected person becomes seriously ill when the immune system loses its ability to fight infections. Some infected people go on to develop AIDS.

As many as 900,000 people in the United States are infected with HIV, according to the CDC. The number of HIV-infected people who develop serious illness and who die from AIDS has decreased, thanks to the success of recent treatments. People with HIV now live longer and healthier lives. As yet, there is no preventive vaccine against HIV.

Transmission

Hepatitis B, hepatitis C and WV spread most easily through contact with blood. They also spread through contact with other potentially infectious materials, or OPIM, including semen and vaginal secretions, as well as any other body fluid or tissue containing visible blood.

OPIM also includes cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, and saliva in dental procedures. Non-intact skin or organs from living or dead humans and cell tissue or organ cultures and other biological matter from laboratory experiments are also included.

In our society, bloodborne viruses are most commonly transmitted through sharing needles to inject drugs or by having unprotected sexual intercourse with an infected person, or from mother to unborn child before or during birth.

Means of Transmission

- Bloodborne pathogens may enter your body and infect you through a variety of means, including:
- An accidental injury by a sharp object contaminated with infectious material. Sharps include:
    - Needles
    - Scalpels
    - Broken glass
    - Exposed ends of dental wires
    - Anything that can pierce, puncture or cut your skin.
- Open cuts, nicks and skin abrasions, even dermatitis and acne, as well as the mucous membranes of your mouth, eyes or nose
- Indirect transmission, such as touching a contaminated object or surface and transferring the infectious material to your mouth, eyes, nose or open skin.

According to the CDC, needlestick injuries cause 80% of exposures to healthcare workers. The Occupational Safety and Health Administration (OSHA) reports most needlestick injuries occur when disposing of needles, including cleaning up after a procedure, giving medications, drawing blood, recapping needles or handling trash and dirty linens.

Contaminated Surfaces

Contaminated environmental surfaces pose a risk for spreading HBV in certain settings, particularly hemodialysis units. HBV can survive on environmental surfaces dried and at room temperatures for at least one week. Surfaces and objects can be heavily contaminated by substances, such as serum or plasma, without visible signs.

Patients, Clients, Residents

You may not be able to tell for sure which patients carry a bloodborne pathogen by taking a medical history or by examination. Bloodborne diseases infect people of all ages, socioeconomic classes, from every state and territory and from rural areas as well as cities.

- Many people carry bloodborne infections without visible symptoms.
- Many people carry bloodborne infections without even knowing it.

Exposure Control Plan

The risks of bloodborne diseases in the workplace are quite serious. Yet you can learn effective ways of minimizing them. A good place to start is with your employer's written Exposure Control Plan. A copy should be available for you to consult at your workplace during your work shift. It will cover:

- Identification of employees covered by the standard
- Specific measures you and your facility must take to minimize your risk of exposure
- Procedures to follow if there is an exposure incident.

Engineering Controls

These are physical or mechanical systems your employer provides to eliminate hazards at their source. Some examples are:

- Needleless systems
- Protective devices for needles and sharps
- Sharps disposal containers.

Engineering control effectiveness usually depends on you.

Example: A sharps disposal container provides no protection if you recap needles by hand and toss them in a wastebasket.

Work Practice Controls

Handwashing

If infectious material gets on your hands, the sooner you wash it off, the less chance you have of becoming infected. Handwashing keeps you from transferring contamination from your hands to other areas of your body or other surfaces you may contact later. Wash your hands with non-abrasive soap and running water

- Every time you remove your gloves
- When skin or mucous membranes come in contact with blood, body fluids or OPIM.
- Between patients
- Where handwashing facilities are not available, such as an emergency medical van, use an antiseptic hand cleanser. Wash your hands with soap and running water as soon as you can.

When your hands are not visibly soiled, CDC approves cleaning your hands with an alcohol-based antiseptic. Recent CDC studies indicate that alcohol-based skin decontamination is more effective than soap and water for reducing multi-drug-resistant pathogens. Use a decontaminant with a concentration of 60 percent to 95 percent ethanol or isopropanol alcohol. Apply the recommended amount to one of your palms. Vigorously rub your hands together, spreading the solution thoroughly over both, particularly around nail beds and under jewelry.

Sharps Safety

You are at greatest risk of exposure to bloodborne pathogens when handling

contaminated sharps. More than half a million sharps-related injuries occur each year, according to OSHA. Studies show that sharps safety devices may significantly reduce your risk of injury during procedures such as joining IV lines, drawing blood, injecting medications and suturing during surgery.

Safety devices include needleless systems and engineered protective devices for needles and other sharps. You will be trained in the proper use of safety devices beforehand and are required to use them.

Your Exposure Control Plan details sharps safety rules you should follow. Here are some general guidelines.

- Use a safe-needle device or needleless system for withdrawal of body fluids, accessing a vein or artery, or administering medications or fluids and for other procedures requiring needle devices.
- Never shear, break, bend, or recap contaminated needles or sharps, except in cases when recapping is required by the procedure. Then, use a re-sheathing device.
- Never reuse disposable sharps.
- Do not pick up contaminated broken glass (also a sharp) with your hands. Instead, use a broom and dustpan, forceps or tongs.
- Discard contaminated sharps immediately after use in an appropriate, puncture-resistant, leak-proof container.
- Place sharps containers within easy reach and slightly below eye level. Do not allow containers to overfill. Never reach into a container of contaminated sharps.
- Report all sharps injuries as directed in your Exposure Control Plan.

Document sharps exposure incidents including date, time and type of sharp used; effectiveness of any safety device used; and how the injury could have been prevented, if possible. This information, entered into the Sharps Injury Log, is used to judge the effectiveness of current sharps safety devices.

Personal Hygiene

Additional self-protective controls should be followed to protect you:

- When performing procedures involving blood or other potentially infectious materials, minimize splashing, spraying, spattering and generation of droplets. Example: Before removing a rubber stopper from specimen tube, cover it with gauze to reduce the chance of splatter.
- Do not eat, drink, smoke, apply cosmetics or lip balms, or handle contact lenses where you may
- Be exposed to blood or other potentially
- Infectious materials.
- Avoid petroleum-based lubricants that may eat through latex gloves. Follow your facility policy on use of hand lotion.
- Never mouth pipette or suction blood or other potentially infectious materials.
- Don't keep food and drinks in refrigerators, freezers, cabinets or on shelves, countertops or bench tops

where blood or other potentially infectious materials may be present.

Personal Protective Equipment

Equipment that protects you from contact with potentially infectious materials may include gloves, masks, gowns, aprons, lab coats, faceshields, protective eyewear, mouthpieces, resuscitation bags or other ventilation devices.

Under normal work conditions, protective equipment must not allow potentially infectious materials to contact your work clothes, undergarments, skin or mucous membranes. The type of protective equipment appropriate for a given task depends on the degree of exposure you anticipate.

Hazard: Potential exposure to eyes, nose and mouth. **Protection**: Mask and eye protection or face shield.

Hazard: Potential clothing or skin exposure. **Protection**: Gown, gloves, apron and other protective body clothing.

Hazard: Encountering large amounts of blood during autopsy or surgery. **Protection**: Gloves, gown, surgical cap or hood, and shoe covers or boots.

If your job requires you to be exposed to bloodborne pathogens, your employer will at no cost to you:

- Provide appropriate protective equipment.
- Clean, launder, repair; replace or dispose of protective equipment.

General Rules on PPE

- You and your employer must follow these rules to ensure that your protective equipment does its job.
- You must be trained to use equipment properly.
- Protective equipment must be appropriate for the task.
- You must use appropriate protective equipment each time you perform a task.
- Your equipment must be free of physical flaws that could compromise safety.
- Your gloves must fit properly.
- Remove equipment penetrated by blood or other potentially infectious materials, as soon as possible.

Before leaving the work area, remove all protective equipment and place it in the designated area or container for washing, decontamination, or disposal.

Resuscitation Devices

Avoid unprotected mouth-to-mouth resuscitation. Mechanical emergency respiratory devices and pocket masks are types of personal protective equipment designed to isolate you from contact with a victim's body fluids during resuscitation.

Gloves

Gloves are the most widely used form of personal protective equipment. They act as a primary barrier between your hands and bloodborne pathogens. Single-use disposable gloves that are low-protein and powder-free are used for medical, dental or laboratory

procedures. Heavy duty utility gloves maybe used for housekeeping duties.

Here's how to use them:

- You must wear gloves when you anticipate hand contact with body fluids, excretions and secretions, mucous membranes or non-intact skin.
- If you are allergic to disposable gloves, your employer will provide a suitable alternative.
- Since gloves can be torn or punctured, bandage any cuts before being gloved.
- Replace single-use disposable gloves, such as surgical or examination gloves, as soon as possible if contaminated, torn, punctured or damaged in anyway. Never wash or decontaminate for reuse.
- Utility gloves may be decontaminated and reused unless they are cracked, peeling, torn or punctured or if damaged in any way.

Glove removal

You must follow a safe procedure for glove removal, being careful that no substances from the soiled gloves contact your hands.

- With both hands gloved, peel one glove off from the top to bottom and hold it in the gloved hand.
- With the exposed hand, peel the second glove from the inside, tucking the first glove inside the second.
- Dispose of the entire bundle properly.
- Remove gloves when they become contaminated or damaged or before you leave the work area.
- Wash hands thoroughly.

Good Housekeeping

Good housekeeping protects every healthcare worker — and it is every worker's responsibility.

Example: A contaminated sharp carelessly discarded in a patient's bedding can jab housekeeping or laundry personnel who must handle the bedding.

General Housekeeping

Your facility's exposure control plan lists housekeeping specifics. Here are general rules for housekeeping staff:

- Clean and decontaminate at the end of each workshift. Clean all equipment and environmental working surfaces as soon as possible after contact with potentially infectious materials.
- Replace protective coverings such as aluminum foil or plastic wrap on equipment or surfaces at the end of the workshift, or immediately after the surface is contaminated.
- Do not pick up broken glass, which may be contaminated, with gloved or bare hands. Use tongs, forceps, or a brush and a dust pan.
- Place infectious wastes in labeled or color-coded, leak-proof containers that are closable. Do not allow containers to over-fill.
- Handle contaminated laundry as little as possible and with minimal agitation. Place soiled laundry in labeled or color-coded, leak-proof bags or containers without sorting or rinsing.
- Read the Label

- These warning signs protect you from bloodborne hazards:
- Bags or containers bearing the biohazard sign tell you when the containers hold blood or other potentially infectious materials. Warning labels are also used to designate contaminated equipment.
- A fluorescent orange-red biohazard sign on a door indicates that HIV, HBV or HCV research or production takes place within. The sign lists special requirements for entering the facility.

Hepatitis B Vaccine

According to OSHA, immunization against the hepatitis B virus has proven very effective. In 1985, 12,000 healthcare workers were infected with HBV on the job. By 1995, after immunizations were promoted, only 800 healthcare workers were infected at work, and that's currently true.

Today's vaccines are safe and very effective at protecting you from getting hepatitis B infection if the series is completed.

Playing It Safe

Additional facts you should know:

- If you are exposed, immediately wash or flush skin or mucous membranes with water. Then report the incident immediately to your supervisor.
- If you consent, your employer will provide you with a confidential medical evaluation, including blood tests, any available post-exposure preventive treatment and follow-up counseling.
- Remember to document and report any sharps injury as directed in your Exposure Control Plan.
- The Bloodborne Pathogens Standard contains special requirements for those who work in HIV, HCV and HBV research labs and production facilities.

Rise to the Challenge

It is possible to protect yourself from bloodborne pathogens on the job by knowing the facts and taking proper precautions. Working together with your employer, you can do it. As a healthcare worker, you can be confident in your ability to safely care for the well-being of others and yourself.

Chapter 10

Fire Extinguishers

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Introduction

When fire breaks out, you have only seconds to respond - and in those few seconds, you have got to act quickly and effectively, remain calm and know your options. Often, the safest option will be evacuation and a call for help, but there are times when you can stop the fire, using the right kind of fire extinguisher.

Fire seems like a simple thing, but it's actually a complex chemical reaction requiring four things before it can happen. Knowing those four things is essential to being able to fight a fire; if you can manage to get rid of any one of those four things, the fire goes out.

First, a fire needs oxygen:

- Air, ventilation
- If a fire can't breathe, it dies
- Cut off oxygen and it goes out.

Second, fire needs fuel:

- Anything that burns - solid, gas or liquid
- Wood, paper, gasoline, butane gas
- Get rid of fuel and you get rid of fire.

Third, fire needs heat:

- There can be plenty of fuel and air but no fire without heat
- If you cool a fire, you can kill it.

Fourth, a fire needs a chain reaction:

- Heat, oxygen and fuel in the right amounts
- The chemical reaction generates the fire
- Interrupt that chain reaction by removing any or all of the other three elements and the fire can't sustain itself.

Putting Out Fires

Removing the fuel would put a stop to things, but it may not be easy to do - after all, it's the fuel that's actually burning. Sometimes when there are flammable vapors, special fire-fighting foams can control those vapors and essentially take away the fire's fuel.

Decreasing or eliminating the fire's access to oxygen is a bit easier. This is sometimes called "smothering" the fire, and it can be done by physically blocking the fire from the oxygen or blocking it chemically, such as with carbon dioxide (C02).

Cooling the fire works. It's what squirting water on a fire does. Water cools the fuel enough to stop the chain reaction. If the fire is very large or very hot, cooling it requires a lot of water. If you use too little water, the heat of the f ire simply evaporates water into steam and the fire continues burning.

Some chemicals such as Halon interrupt the chain reaction, causing the flames to die. Other chemicals are under development as replacements for Halon, which is no longer manufactured.

Classes of Fires

Not all fires are the same. Different types of fires use different fuels or different sources of heat. You have to know what type of fire you're up against so that you can choose the best way to stop it.

There are four types of fire, separated into classes.

Class "A" is fueled by ordinary solid combustibles such as:

- Wood
- Paper
- Cloth

Water puts it out.

Class "B" is fueled by liquids or gases such as:

- Gasoline
- Kerosene
- Propane
- Grease

Water may not work on this kind of fire.

Class "C" is sometimes called an electrical fire that starts in:

- Appliances
- Switches
- Panel boxes
- Power tools

Water is a bad idea for a Class C fire, where electricity is involved.

Class "D" fires involve combustible metal, such as:

- Magnesium
- Sodium
- Titanium
- Potassium.

Class "D" fires burn at a very high temperature and react violently with water. Water won't fight this type of fire; it will help the fire fight you.

Class "K" fires are fueled by cooking oils such as animal oils and fats.

Which Fire Extinguisher to Use

Knowing the type of fire helps you decide which extinguisher to use. Ever y fire extinguisher shows the class of fire it was designed for clearly on its face plate. If an extinguisher can be used for more than one type of fire, the face plate lists all classes for which that extinguisher is safe.

For instance, an extinguisher that sprays water will be rated only for Class A fires. If it uses foam, it will probably be rated for class "A" or "B." Dry chemical extinguishers are good for Class "B" and "C" fires and dry powder extinguishers work on Class "D" fires.

Each of these substances do different things to break up the chain reaction:

- Water cools the fuel.
- Foam can cool as well as cut off oxygen, and it covers flammable liquids without spreading them.
- Dry powders absorb heat and are used only on Class "D" fires.
- Carbon dioxide can be good for taking away the oxygen, but it doesn’t cool, so it's used on l y on Class "B" and "C" fires.
- Class "K" extinguishers can contain dry or wet agents.

How to Use Extinguishers

All extinguishers have simple instructions on them. Read them before a fire starts. Use the PASS procedure:

- Pull and twist the pin.
- Aim the extinguisher's hose or nozzle at the bottom of the fire.
- Squeeze the trigger.
- Sweep it slowly back and forth, covering the entire fire with the extinguishing substance.

Never block your exit while fighting a fire, and if it looks like the fire is winning, leave the area, closing doors behind you to help keep the fire from spreading. Once you're safe, call the fire department, and let the pros handle the job. If you think you've put the fire out, make sure you're right! Firefighters know where a fire may have traveled. Let them check it out. Remember fires often re-ignite after they seem to be dead.

Conclusion

If you know where your extinguishers are and how and when to use them, you'll be an excellent first line of defense. You could well be the difference between a fire that dies and a fire that kills.

Chapter 11

Emergency Action Plan

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Introduction

History teaches us that some events can change our world forever. These horrific events can cause our hearts to break and flood our eyes with tears:

- An accident
- A fire
- A storm
- An explosion
- An assassination
- A distant war

In modern history we've experienced a time of innocence corrupted by an act of violence or a cowardly act of terrorism. Events like these change everything. Afterward, it requires a new way of thinking and a new way of acting.

Emergencies in the workplace could mean chaos and chaos is hazardous. Your employer develops a comprehensive emergency plan to override chaos with organization.

Emergency Action Plan

Your facility's Emergency Action Plan spells out:

- Evacuation
- Assembly and check-in
- Drills and practice
- Personal responsibility and watchfulness.

You're a key part of the plan because you're the eyes and the ears, the one who must stay alert and be ready to act in a split second, no matter what happens around you.

And now, we have a federal framework to help us coordinate response efforts with community, state and sometimes federal emergency responders. The National Response Framework (NRF) focuses on preparedness and requires a higher level of readiness. That's where you come in.

Many Different Emergencies

Emergencies come in many different types and sizes.

There are natural disasters like:

- Earthquakes
- Tornadoes
- Hurricanes
- Thunderstorms.

Then there are industrial emergencies like:

- Fires
- Explosions
- Chemical spills
- Power failures
- Industrial injuries and medical problems
- Violence and terrorism
- Riots
- Kidnappings
- Poisonings
- Sabotage

The Written Plan

OSHA, the Occupational Safety and Health Administration, requires employers to have a written emergency action plan that contains specific elements. Your employer must anticipate - and plan for - the different kinds of emergencies that could occur. That's why no two emergency plans are alike. It's also why no

plan can cover every possible event, and why your employer counts on you to spot problems before they become emergencies.

Central to every emergency plan is the organization. An emergency response coordinator or Incident Commander is responsible for:

- Assessing the situation
- Directing efforts like evacuation
- Ensuring that outside emergency services such as medical aid and local fire services are called if needed
- Directing the shutdown of plant operations when necessary.

To comply with the National Incident Management System (NIMS) your facility develops a consistent, flexible and adjustable framework to ensure all emergency responders work together effectively. You may be working side-by-side with responders from outside your facility or even outside your jurisdiction or state.

The NIMS requires an Incident Command structure that includes the Incident Commander, General staff (Safety, Public Information and Liaison) and 4 sections: Operations, Planning, Logistics and Administration/ Finance.

Your specific tasks and responsibilities are delegated by the Incident Commander or a team leader.

Your facility's written Emergency Plan is at your disposal. It is your responsibility to learn your duties and follow the procedures to the best of your ability. Your employer reviews the EAP with you when you're hired, periodically and when the plan changes.

You'll learn about:

- Evacuation
- Check-in
- Rescue procedures
- How to report an emergency
- How to activate and recognize the alarm or warning system
- Your assigned tasks and responsibilities.

Evacuation

Being able to calmly and quickly evacuate a building or area is one of your most important responsibilities. Your facility conducts training and drills so you can practice evacuation procedures. But when the alarm sounds, it's up to you to put your knowledge to work.

- Know the floor plan and area layout in every department where you work.
- Learn primary and secondary exits from each location.
- Learn where you should meet once you get outside or to the refuge area.

Emergency Alarm

To be prepared for an emergency, know how to sound an alarm if you are the first one to spot it. You also must know how to repor1the emergency and describe its location.

The sound of an emergency alarm means one thing: evacuate the building or shelter in place.

- Don't stop to gather your belongings.
- Don't put your work away.

- Don't stop to find out if it's a false alarm.
- Unless you have special duties in an emergency, an emergency alarm means leave the area immediately.

You may be asked to:

- Shut down equipment before you leave.
- Assist employees who need help.
- Carry first aid kits.
- Close doors.
- Use fire extinguishers.

Perform these duties only if your personal safety is not immediately threatened. If you are in danger, evacuate before you do anything else. One of your most important tools in an emergency is good judgment. Carry it with you at all times and be ready to use it.

Check-in

After you evacuate, report immediately to the assigned assembly location. Be aware that this location may change depending on the emergency. If collapse or contamination are possible, you may need to move far from the facility. Your team leaders will tell you where to go. Once you arrive, stay there until you are released.

At the assembly point, emergency coordinators and safety officers figure out who is safe and who is missing. What happens here determines whether rescuers rush into the building and risk their lives. You can help by speaking up.

- Is someone home sick today?
- Who is missing?
- Do you know where they are?

Employees who pay attention to their surroundings and co-workers can keep an emergency from becoming a tragedy.

Communications Center

In an emergency, people may be injured. Communications may be down. Water or chemicals may make movement difficult. The goal of the Emergency Action Plan is to make sense of this chaotic situation. At such times, an incident command post serves as a central point of contact and communication. It's the place to find information about the company, employees and status of the emergency. It's also the place to provide information that you may know or discover.

From the command post, the Incident Commander coordinates local response crews, fire, police, medical personnel and in-house communications. More and more companies are learning that ordinary communication systems are, at best, minimally effective during disasters. Two-way radios and cell pl1ones can provide vital links when other systems fail. If you have a cell phone with you, remember it's a valuable tool for getting information to emergency personnel. Be ready to share it if it's needed.

Emergency Supplies

In some areas, the emergency plan may include provisions for employees to shelter in place. This could happen if your facility is cut off because of an earthquake, flood or if a chemical release makes outdoor evacuation unsafe. In these cases, companies store enough food,

water, blankets and medical supplies to be self-sustaining for several days.

Check your plan to see whether it includes provisions for situations when employees cannot leave. If so, be sure to tell your family that you could be stuck at work in such an emergency and that you will be safe.

Rescue

In an emergency everyone wants to help an injured co-worker or someone having trouble getting out. Help only if you can do it safely. The emergency plan provides for this kind of situation by selecting and training rescuers.

If you see someone in need of help:

- Notify your team leader or incident commander.
- Guide the person to a safe place.
- Report the location to rescuers.
- Allow trained rescuers do the rescuing.

Medical Services

Some emergency plans also provide for medical care for injured employees. This is most likely if there are no medical facilities nearby. In these situations, trained employees group the injured by the seriousness of their injuries and provide first aid and other care until medical personnel arrive. Medical provisions also may include follow-up care by doctors or other specialists. You may be asked to:

- Take tests to determine exposure to chemicals, pathogens or other hazards
- Take medications to prevent or cure an illness or injury.

It's important to follow these medical precautions. Not all emergencies can be extinguished by the fire department. Some take modern medicine and detective work.

Practice

In an emergency your training and drilling really kick in. Practice helps prevent panic and confusion as what you drilled comes out in calm action.

- Take drills seriously.
- Act as if they signal a real emergency.
- The more automatically you react to an emergency alarm, the more likely you'll override chaos in a real emergency.

Some facilities stage mock disasters or dry runs. These provide onsite experience for:

- Emergency leaders
- Core team members
- Employees
- Outside organizations such as firefigl1ters, police and hazmat teams.

Take part in practice sessions whenever possible. Volunteer for special duties. Take your training seriously. In a real emergency, most facilities need many people trained to do the same job. This covers absences, fatalities and serious injuries, and is a lot like the redundant safety systems used to protect you during your day-to-day tasks.

People, Places and Things

The most important part of every emergency action plan is the people. Today, not every emergency gives off smoke or fumes. And not every emergency can be taken care of by heroic

firefighters and police. That's why every emergency plan is better when you become your facility's eyes and ears.

People

- Be alert for strangers or unfamiliar people.
- Report people without proper identification.
- Offer to escort visitors who look lost.

Places

- Know the areas where you work.
- Watch for things that look different.
- Report situations that seem unusual.

Things

Watch for boxes or packages that are:

- Left in an unusual place
- Oily, dirty, oddly shaped or squashed
- Suspect because of protruding wires or strange smells.

Check mail and report anything unusual:

- Mail that is different from what you usually see
- Mail with no return address
- Mail with a misspelled or incorrect address.

If you find a suspicious item:

- Don't touch it.
- Cover it carefully or isolate it.
- Report it immediately.

Review

Your employer prepares for an emergency by developing a comprehensive emergency plan. The plan covers alarm systems, evacuation procedures, assembly and check-in, and drills and practice as well as coordination with outside responders. Whether the plan succeeds depends on you, because you are the eyes and the ears of the plan. You are the one that must stay alert and be ready to act in a split second.

When the alarm sounds, stay calm and keep a level head. Perform assigned tasks and evacuate in a smooth and orderly fashion. Once outside, report to your assigned assembly point and share any information you learned on your way out.

Chapter 12

Emergency Response

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EMERGENCY RESPONSE: DEALING WITH SITE INCIDENTS

Despite all efforts to provide a safe and healthy work environment, accidents can and do happen on a jobsite. Whether it's personal injury, fire, severe weather, a chemical spill, or other types of emergencies, preparing in advance to handle an unplanned event is critical to safety. For many companies, an effective safety and health program includes an Emergency Action Plan (EAP), which establishes procedures employees must take during and after an emergency evacuation.

Emergency examples

What constitutes an emergency? An emergency is any unplanned event that can cause death or significant injury to employees, customers, or the public, or that can shut down a jobsite, disrupt operations, cause physical or environmental damage, or threaten the company's financial standing or public image. These events can result from natural, weather-related, man-made, or technological threats.

OSHA says

OSHA has issued a number of regulations covering emergency planning and training for all industries in an effort to keep you safe. These include:

29 CFR 1926	Name
.24	Fire protection and prevention
.35	Employee emergency action plans
.64	Process safety mgmt. of highly hazardous chemicals
.65	Hazardous Waste Operations and Emergency Response
150-155	Fire protection and prevention
29 CFR 1910	**General Industry**
.36	Design/construction requirements for exit routes
.37	Maintenance, safeguards, operational features for exit routes
.151	Medial services/first aid
.157	Portable fire extinguishers
.165	Employee alarm systems
29 CFR 1915	Shipyard
29 CFR 1917	Marine Terminals
.30	Emergency Action Plans
20 CFR 1918	Longshoring
.100	Emergency Action Plans

An employer only needs to have an emergency action plan when a particular OSHA standard requires it. OSHA doesn't require a formal action plan for tornadoes, earthquakes, or other severe weather conditions. However, many employers choose to develop one because it provides guidelines on what actions employees must take if an emergency should occur.

Elements of an Emergency Action Plan

If required, your company's EAP must include the following elements:

- Best way to report fires and other emergencies,
- How the alarm system sounds for different emergencies,
- Emergency escape procedures and routes to take,
- Procedures for workers who stay behind to operate critical equipment or

perform functions before they evacuate,
- Headcount procedures after an evacuation is complete,
- Rescue and medical duties for designated employees, and
- Names or job titles of persons or departments to be contacted for further information regarding duties under the plan.

The plans must be kept at each worksite and made available to all employees. If your company has 10 or fewer employees, the EAPs do not have to be written. Instead, your supervisor can give them to you verbally.

Training for emergencies

Training must be given to you:

- When first starting your job,
- Whenever your job responsibilities change, and
- Whenever the EAPs are first developed or changed.

Your employer will designate and train certain employees to have additional responsibilities to facilitate a safe and orderly evacuation.

Specific Emergency Action Plans

Process safety management

If your company is involved in maintenance or repair, major renovation, or specialty work in a facility where exposure to highly hazardous chemicals (such as a petrochemical plant) is possible, an EAP is required. Your employer is responsible for training you on the known potential hazards at that specific site and the EAP you should follow.

Fire protection/prevention

Because the best defense against a fire is to prevent it from starting, your employer must have a plan for fire protection and prevention at the jobsite. Being aware of the hazards and causes of fires can help you prevent them and protect yourself. Also, you need to know what to do if a fire starts.

Fire is a reaction characterized by the light and heat of combustion. It has four basic components: fuel, heat or an ignition source, oxygen, and a chain reaction (the process of combustion). To burn, a fire needs enough oxygen to sustain combustion, enough heat to raise the combustible material to its ignition temperature, and some sort of fuel to feed the chain reaction.

Although many materials stored at a jobsite are not flammable, other materials commonly found there are potential fuels. These include wood products such as lumber, flammable liquids such as gasoline and propane, and a variety of chemicals.

It doesn't take very long for a combustible environment to turn into a fire. A few minutes can make the difference between a life or death situation. Knowing how to recognize conditions that can lead to a fire can help in preventing one from starting.

Fire hazards

There are two major jobsite fire hazards you should be aware of - flammable and combustible liquids and heating devices.

Flammable and combustible liquids. Flammable liquids give off ignitable vapors. The combination of these vapors with ignition sources such as a hand tool that sparks or a cutting torch at construction sites is a serious threat. Store and use flammable and combustible liquids properly.

Only use approved containers and portable tanks for storing and handling flammable and combustible liquids. The container must be red, and if the flammable liquid has a flashpoint at or below 80°F, it must have a yellow band or the name of the dangerous liquid stenciled in yellow.

Heating devices. Many fires have started because heating devices were used improperly or in the wrong conditions or environments. In addition, some temporary heating devices have fume and direct burn hazards associated with them. Because of these fire hazards, you should:

- Use adequate ventilation to reduce your exposure to dangerous fumes;
- Keep the heater sufficiently clear of combustible material including wood floors;
- Position heaters on stable, level surfaces;
- Not use solid-fuel salamanders; and
- Make sure that oil-fired heaters have a primary safety control to stop the flow of fuel in the event of flame failure.

Fire response

Because of the deadly danger of fire, you should know how to size up a fire and how to respond in a fire emergency. If you are faced with a fire emergency, it's important to protect yourself and other employees.

Fire extinguishers

Only properly trained employees should use fire extinguishers. If you use an extinguisher, be sure to use one that is designed for that type of fire. Using the wrong extinguishing agent on a fire may increase the intensity of the fire.

The National Fire Protection Association (NFPA) has classified fire into four general types based on the combustible materials involved and the kind of extinguisher needed to put them out.

The four fire classifications are A, B, C, and D. Each classification has a special symbol and color identification. Look at your fire extinguishers - classifications should be found on their labels as follows:

Class	Materials Burning	Extinguishing Agent	Symbol
A	Wood, Paper, Rubber, Plastics	Water, Dry Chemicals	Δ
B	Flammable Liquids, Gases, Greases	Carbon Dioxide, Dry Chemicals	□
C	Electrical Equipment, Wiring, Fuse Boxes, Circuit Breakers, Machinery	Carbon Dioxide, Dry Chemicals	O
D	Combustible Metals	Special Techniques, do not use common extinguishers	☆

There is also a **Class K** extinguisher that is used for kitchen fires.

If the fire can be contained or extinguished, a properly trained person should follow the "PASS" method of extinguisher use. This method includes holding the extinguisher upright, and:

- Pulling the pin, standing back 8 or 10 feet,
- Aiming the extinguisher at the base of the fire,
- Squeezing the handle, and
- Sweeping at the base of the fire with the extinguishing agent.

If you aim high at the flames, you won't put out the fire. Remember, too, that most extinguishers have a very limited operation time, only 8-10 seconds, so you have to act fast and spray correctly at the base of the fire, not at smoke or flames.

Hazardous Waste Operations and Emergency Response (HAZWOPER)

Reality is that you could be exposed to chemical spills or hazardous waste wherever you work. During excavation operations many companies have been surprised by what they have uncovered. Sometimes excavation sites can become deadly.

Under HAZWOPER, your employer can either participate in the handling of emergencies involving hazardous waste or chemical spills, or immediately evacuate workers and call in trained HazMat teams. Under no circumstances does OSHA permit personnel to respond to a chemical spill or hazardous waste cleanup without appropriate training.

How can HAZWOPER involve you?

Very specific training requirements come with preparing for accidental chemical releases. OSHA has set up a formal training schedule for emergency responders under HAZWOPER regulations, with training levels ranging from awareness training for first response to technical training for those with responsibility for solving problems associated with spill cleanup.

What should you do in case of a spill?

Whether it's a solid or a liquid spill, remember that you can be exposed to toxic dust or vapor without even knowing it. If you are properly trained, act with care and speed. However, if you have not received training, do not respond to a chemical spill. Instead, follow your company's EAP for reporting hazardous spills and evacuating.

While it is vital to avoid panic, it is equally vital to get people out of harm's way as quickly as possible. Assess site hazards and act only when you do not endanger yourself. You want to help your fellow employees, but you won't do that if you become a victim yourself.

Some of the things you can do before help arrives are:

- Determine the potential hazards by looking at the material safety data sheet,
- Know about spill equipment and safety personnel,
- Know the exits and escape routes,
- Know the location of fire extinguishers, and
- Know first aid or where to get first aid equipment.

Act responsibly in chemical spill emergencies

Safety becomes extremely important when hazardous chemicals are spilled. A mistake here can be deadly. Use the buddy system, whether you're part of the emergency response team or not. Don't ever enter a chemical emergency situation alone.

Different chemicals will require different levels of protective clothing or other precautions. Don't touch any spills without protection. Avoid the contaminated clothing of injured persons. Certainly, if the chemicals involved aren't hazardous, respond immediately within your abilities.

Perform only those emergency response tasks for which you possess adequate training. Check the area for potential hazards such as electrical cords or wires near the spill or obstacles in the path of the emergency response team. Check for injuries and notify emergency medical personnel.

Decontaminate victims, if possible. Cooperate with emergency personnel when they arrive. Pass on any information you've gathered.

Evacuation

The first indication that there is a fire or other emergency is often the sound or sight of an alarm. Employee alarm systems are designed to provide a warning for necessary emergency action, as called for in your company's emergency action plan, or for your safe escape from the worksite. Your company's plan spells out your role. Find out what you are expected to do in case of a fire or other emergency.

Your company may conduct fire drills. During these drills, learn where exits are and how to evacuate the affected area. Practice getting to your designated headcount area as quickly, orderly, and safely as possible.

For most people, when they hear a fire alarm or other emergency warning sound, they make their way to the nearest exit and meet at a pre-designated spot. If the exits are blocked or cluttered, exiting can be difficult or even dangerous. Therefore, keep emergency exits clear for easy access. When a fire occurs, seconds count. Know where the exits are and how to get to them safely.

Exits should be marked with a readily visible sign, with no other signs or distracting objects near them. If you cannot immediately see an exit, you should be able to see readily visible signs directing you to it. Doors, passages, or stairways that are not exits should be identified with a sign reading "Not an Exit" or similar designation.

Emergency follow-up

Following an emergency, OSHA must be notified if the incident resulted in any fatalities or if three or more persons were hospitalized. If a chemical spill is significant, the National Response Center must be notified as well.

The final activity following any emergency is to review and evaluate all aspects of what happened and what may happen as a result. Because an account must be made of the incident and it must be accurate, authentic, and complete, be prepared to cooperate. The events of the incident should be recorded in chronological order with each entry signed.

Work at working safely

Take these precautions before an emergency:

- Determine the potential hazards in any emergency situation before acting,
- Keep work areas clean and clutter free,
- Know where to find and how to use emergency equipment and safety personnel,
- Know the location of fire extinguishers,
- Know first aid or where to get supplies (only give first aid if you are qualified),
- Know the locations of exits and escape routes, and
- Be familiar with your company's emergency action plan