Oregon OSHA

Hazard Identification and Control

An introduction to identifying, analyzing, and controlling hazards in the workplace

DEPARTMENT OF CONSUMER & BUSINESS SERVICES

Presented by the Public Education Section
Oregon OSHA
Department of Consumer and Business Services

Oregon OSHA
PUBLIC EDUCATION

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Oregon OSHA Public Education Mission:

We provide knowledge and tools to advance
self-sufficiency in workplace safety and health

Consultative Services:

- Offers no-cost on-site assistance to help Oregon employers recognize and correct safety and health problems

Enforcement:

- Inspects places of employment for occupational safety and health rule violations and investigates complaints and accidents

Public Education and Conferences:

- Presents educational opportunities to employers and employees on a variety of safety and health topics throughout the state

Standards and Technical Resources:

- Develops, interprets, and provides technical advice on safety and health standards
- Publishes booklets, pamphlets, and other materials to assist in the implementation of safety and health rules

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Information about this instructor guide and notes:

This guide and notes workbook is set up so that a copy of the workbook page is shown in the order that it appears in the workbook. You are HIGHLY encouraged to read the entire instructor manual, add your personalized notations of examples, additional information you might want to add, alternative ways you may want to present the material, etc.

You will also find it helpful to attend an OR-OSHA class on this topic offered by the OR-OSHA public education instructors. Another good preparation strategy is to complete (or at least download) OR-OSHA online courses.

Feel free to be creative in your presentations and personalize the material so that it fits your presentation style and preferences. Variety in your methods of presentation will improve learner attention and retention. Try not to use the same format for more than a 20 minute timeframe without changing to something at least slightly different. For example, lecture for 20 minutes, then have the class do an activity, then have facilitated group discussion, etc., etc.

Do not use these notes as your presentation outline to the extent that you are trying to present this material exactly the way you think the developer would. It will appear unnatural and rote unless you customize the presentation to fit YOU.

You are also encouraged to offer an opportunity for the class to critique your presentation either by using the evaluation sheet in the workbook, or some other method. Analyzing what people have to say about how the class went is your most valuable tool in helping you develop as a trainer. You are encouraged to provide us with your feedback on how these materials could be improved and let us know if you found them helpful.

Your efforts in helping your company develop self-sufficiency and internal resources in the important area of staff training are much appreciated.

Welcome !

Every year over 6,000 Americans die from workplace injuries. An estimated 50,000 people die from illnesses caused by workplace chemical exposures and 6,000,000 people suffer non-fatal workplace injuries. Injuries, alone cost the economy more than $110,000,000 a year.

Identifying and controlling workplace hazards involves many processes. It's more than simply "inspecting out hazards." Before we can effectively control hazardous conditions and unsafe behaviors, we need to be familiar with their characteristics and the necessary processes to make sure they are promptly identified and analyzed. The questions and exercises in this workshop will help us become more familiar with hazard control concepts and we'll discuss the many types of hazards that may exist in the workplace. We'll discuss the various elements of an effective hazard control program, the nature of hazards in the workplace, and finally we'll put everything we've learned together in a final exercise.

The purpose of this workshop is to give you the basic knowledge and skills to identify, analyze, and apply control strategies to eliminate or reduce hazardous conditions and unsafe practices in the workplace.

Workshop goals:

- Explore the elements of an effective hazard identification and control program.
- Discuss the steps in the hazard identification and control process.
- Complete the hazard identification and control worksheet.

Introductions

Housekeeping

Form Teams

What's inside?

Identifying Hazards

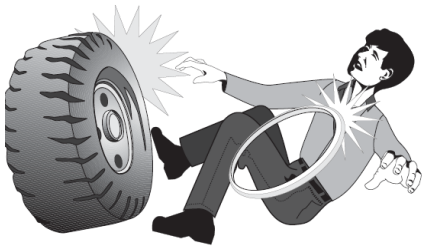
Controlling Hazards

Use these to emphasize the importance of identifying hazards.

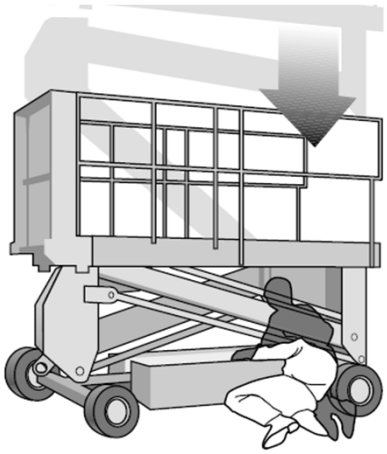
Why is this workshop important?

Let's take a look at some fatal accident reports from CDC*

FATAL. The employee was working on a truss section while standing in a basket platform attached to the front of a forklift. While the forklift was stationary, the basket was raised to approximately 14 feet above the pavement to allow the employee to work on upper sections of the truss. An additional part was needed to complete the assembly process, so the forklift operator moved the vehicle to where the additional part was located, with the employee still on the platform. The forklift had traveled several feet when the operator attempted to make a sharp left turn, which caused the forklift to lose stability and roll onto its side. The employee was slammed to the pavement in the basket platform and received severe head injuries. The employee died in a hospital, several days later.

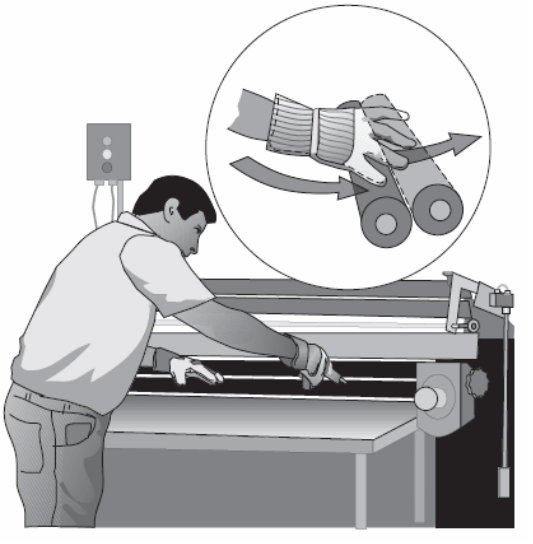


FATAL: At the time of the accident, the victim, a laborer for a sand and rock company, was repairing a split-rim tire to be mounted on a dump truck. He had just completed patching the 22.5 inch tubeless tire and placed a tube in the tire. He had mounted it on a 20 inch split-rim wheel. The victim was working on the ground outside of the protective cage. The air chuck configuration provided by the employer put the victim in the blast zone. As the victim attempted to inflate the tire the innertube exploded, causing the tire assembly to strike the victim in the head. The sound of the explosion brought other employees rushing to the scene. The victim was airlifted by Life Flight to the Oregon Health Sciences University Hospital where he died several days later of injuries related to this accident.



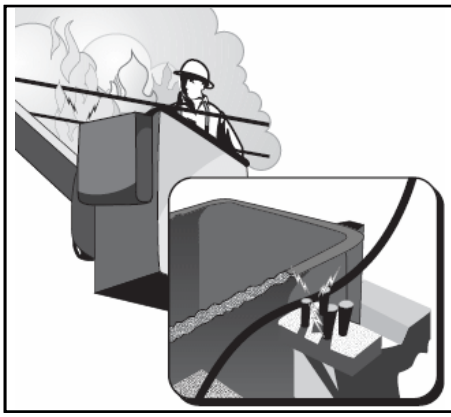
FATAL. The son of the owner of a commercial drywall
ruction company, an employee of the company, was
ing an aerial lift (Strato-Lift) for a job. The man had
ed two battery terminals. He had placed the aerial boom
lifted position and was reaching toward the battery
artment across the metal enclosure that houses the lift's
e controls when the boom descended and pinned him to
ntrol-panel area of the machine. The victim was
vered by his father. Emergency medical services were
oned, but they found the victim dead.

*More fatal accident reports may be obtained at http://www.cdc.gov/niosh/injury/traumamcface.html#state



INJURY: A worker was applying grease to spreader rollers with his gloved hands. He had turned on the machine to grease the moving parts. The spreader rollers, which are about a quarter-inch apart, caught his right hand glove and pulled his hand into the rollers up to his wrist. The worker was able to stop the rollers by striking the emergency bar above the rollers, but his right hand remained caught between the rollers. He yelled for nearby workers, who called rescue personnel. The victim's hand was not extricated from the rollers for 40 minutes. The maintenance supervisor assisted fire department responders by cutting loose the rollers that held the victim. He was taken to a hospital for treatment, which included surgery.

Fatal/Injury: On September 24, 1996, 53-year-old male elevator construction foreman (the victim) was killed and his helper, an elevator constructor (employed by another subcontractor) was injured, when the hydraulic elevator car they were working under fell on them. The two were adjusting the hydraulic cylinder when the car fell, trapping them in the elevator pit. Two wooden poles (4x4 by approximately twelve-feet long) used to keep the elevator from falling were placed leaning against the guide rails. The car was approximately fifteen inches above the poles, which they did not tie in place. The poles were knocked out of position when the car fell due to the sudden loss of hydraulic pressure and trapped the two workers under the car. The elevator apparently did not fall evenly to the bottom of the pit. This permitted the rescue team to enter the pit area and extract the injured. However, rescuers had to use air bags to help raise the car to remove the victim.



FATAL. While in the process of moving an aerial lift bucket into position, an insulated secondary service line became entangled between the outer edge of the bucket and the hydraulic tool circuit manifold. The insulation on the service line was damaged, resulting in electrical arcing. A hydraulic tool circuit fitting was burned through, which allowed hydraulic fluid to escape and ignite. Fire immediately engulfed the bucket, resulting in second- and third-degree burns to the operator's body, plus lung damage due to smoke inhalation.

IDENTIFYING HAZARDS

Hazard + Exposure ⇨ Accident

What do the rules for employers say?

Briefly discuss the rules.

ORS 654.010 Employers to furnish safe place of employment.

Every employer shall…

- furnish employment and a place of employment which are safe and healthful for employees therein, and…
- shall do every other thing reasonably necessary to protect the life, safety and health of such employees.

OAR 437, Div 001, Rule 0760 (7) Inspections.

(a) All places of employment shall be inspected by a qualified person or persons as often as the type of operation or the character of the equipment requires. Defective equipment or unsafe conditions found by these inspections shall be replaced or repaired or remedied promptly.

(b) Wherever required in this safety code, a written and dated report, signed by the person or persons making the inspection, shall be kept.

What does "qualified" mean?

The person needs to have adequate knowledge and skills to detect and correct hazards. Whoever inspects needs to be properly trained and have experience.

What criteria should we use to determine the frequency of inspections?

The more change occurs and the more dangerous the hazards, the more frequent the inspections. The greater the risk (probability and severity of injury) the higher the frequency.

What does "remedied promptly" mean?

From the time the employer knows a hazard exists, the employer is to put into action a strategy for reducing or eliminating the hazard. Do not delay if feasible.

What does your inspection report look like?

If you found lots of hazards, it means the daily, weekly, monthly safety isn't being performed adequately by line employees, supervisors, etc.

(8) In addition to the above requirements, your safety committee must:

What do the rules for safety committees say?

OAR 437, Div 001, Rule 0765 (7) Hazard assessment and control.

(7) Your safety committee must establish procedures for conducting workplace safety and health inspections. Persons trained in hazard identification must conduct inspections as follows:

Where	Who	When
Primary fixed locations	Employer and employee representatives	Quarterly
Office environments	Employer and employee representatives	Quarterly
Auxiliary and satellite locations	Employer and employee representatives or a designated person	Quarterly
Mobile work locations, infrequently visited sites, and sites that do not lend themselves to quarterly inspections	Employer and employee representatives or a designated person	As often as the safety committee determines is necessary

(8) In addition to the above requirements, your safety committee must:
•Work with management to establish, amend or adopt accident investigation procedures that will identify and correct hazards.
•Have a system that allows employees an opportunity to report hazards and safety and health related suggestions.
•Establish procedures for reviewing inspection reports and for making recommendations to management.
•Evaluate all accident and incident investigations and make recommendations for ways to prevent similar events from occurring.
•Make safety committee meeting minutes available for all employees to review.
•Evaluate management's accountability system for safety and health, and recommend improvements. Examples include use of incentives, discipline, and evaluating success in controlling safety and health hazards.

The safety committee is required to:

Evaluate | Establish | Inspect | Recommend

Safety is freedom from danger, risks, or accidents that may result in injury, death, or property damage.

It takes a hazard and exposure to produce an accident.

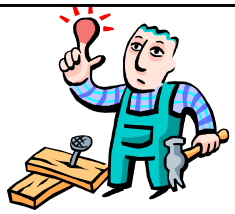
What is a hazard?

An unsafe condition **or** practice **that could cause an** injury **or** illness **to an employee.**

Can a person be a "walking" hazardous condition?

By being distracted in any way. The truth is a person only makes the situation worse by being distracted, tired, ill, intoxicated. Focus on correcting the hazard.

What is exposure?

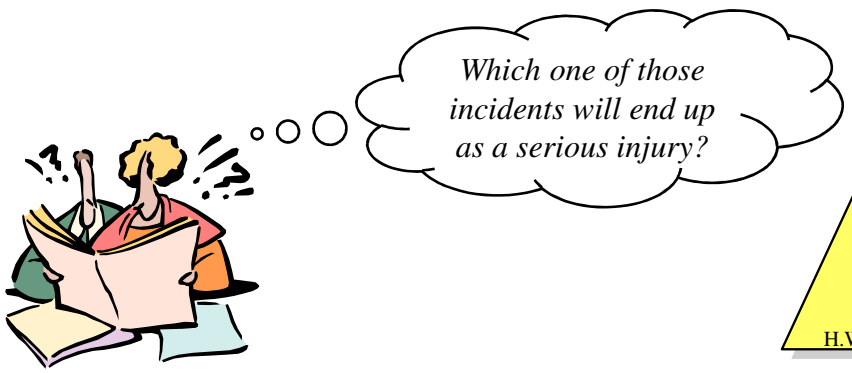


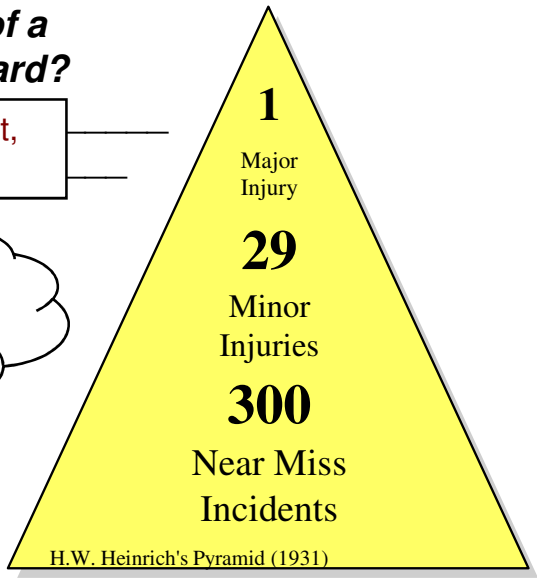
When someone is within the "danger zone."

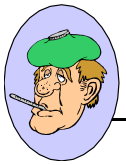
- Physical exposure. When the person is generally within arm's length.
- Environmental exposure. Due to noise, hazardous atmospheres, temperature extremes. These hazards could affect everyone in the facility.

How does your perception about the severity of a hazard change with daily exposure to that hazard?

The more we're exposed to a hazard without getting hurt, the more we trivialize the hazard.







What you see are merely the surface symptoms

Hazardous conditions and unsafe or inappropriate behaviors you see in the workplace are the observable symptoms or effects of deeper system root causes.

Surface symptoms:

- Are unique conditions or individual behaviors (you can point at a person or object)
- May exist or be performed by anyone, anytime, anywhere
- May directly cause or contribute to an incident or accident
- May be important clues revealing root causes

Where do injuries come from?

Unpreventable acts. Only 2 % of all workplace accidents are thought to be unpreventable. Heart attacks and other events that could not have been known by the employer are examples of unpreventable acts. Companies often try to place most of their injuries into this category. They justify these beliefs with such comments as: "He just lifted the box wrong and strained his back. What could we do?" Unfortunately, they are excuses for not looking into the "root cause" of the injury.

What procedures do we use to detect and correct hazardous conditions?

Inspection, observation, job hazard analysis, incident/accident analysis

System failure. Safety management system failures account for at least 98 % of all workplace accidents. System failures refer to inadequate design or performance of safety programs that provide training, resources, enforcement, and supervision.

Types of Hazards in the Workplace

1. Falls. Lt. Chissov fell 22,000 feet and survived. Others who were not so lucky have died falling on a slippery floor. It's not how far you fall, it's how you land! The most common types of accidents are **falls to the same surface**, and **falls to below**. The severity of injury from a fall depends on three factors:

1. velocity of an initial impact
2. magnitude of deceleration – due to hardness of the surface
3. orientation of the body on impact

Examples: ___ Briefly cover each hazard type and ask for examples in participants' workplaces. _____

2. Impact. Impacts resulting in **struck by** and **struck against** may cause serious accidents. The severity of injury from impacting objects depends on three factors:

1. velocity of the impact
2. characteristics of the object (size, hardness, shape etc.)
3. body part impacted

Examples: _____

3. Mechanical. If it's mechanical, and it moves, it's a hazard. There are as many hazards created by moving machine parts as there are types of machines. Mechanical hazards cause **caught-in**, **caught-on**, and **crush** accidents that can cut, crush, amputate, break bones, strain muscles, and even cause asphyxiation.

Mechanical Hazard Motions

1. Rotating 2. Reciprocating 3. Transverse

Mechanical Hazard Actions

1. Cutting 2. Shearing 3. Bending 4. Punching

Examples: _____

4. Vibration and Noise. Tools, equipment, and machinery that vibrate at a low frequency can injury a part of the body or the whole body. However, the most common sound-induced injury is due to high frequency vibration. Low frequency vibration hazards exist in two primary categories:

1. **Segmental Vibration**. Exposure to equipment that vibrates at various frequencies can affect different parts of the body. For instance, the hands are most sensitive to vibrations at 30-40 cycles per second. Internal organs can be affected by at vibrations as low as 4-10 cycles per second.
2. **Whole-Body Vibration**. Very low frequencies can affect the entire body. For instance, truck drivers experience continuous whole-body vibration as they travel. That's one reason truck driving is considered one of the most hazardous tasks for lower back injuries.

Examples: _____ Briefly cover each hazard type and ask for examples in participants' workplaces. _____

5. Toxics. Virtually all materials may be toxic to some extent. In the workplace, a material is toxic if a small quantity can cause an injurious effect, such as tissue damage, cancer, mutations. It's important to consider the routes of entry of toxic materials into the human body. There are four possible routes of entry:

1. **Inhalation.** Breathing in toxics is the most common and dangerous route.
2. **Ingestion.** Toxics enter through the gastrointestinal tract.
3. **Absorption.** Toxics pass through skin into the bloodstream.
4. **Injection.** Toxics may be injected into the body (needles, etc). The least common, yet most direct route of entry.

Examples: _____

6. Heat and Temperature. Overexposure to heat and temperature extremes may result in a range of injuries from burns to frostbite. Temperature indicates the level of heat present. The second law of thermodynamics states that heat will flow from an area of higher temperature to one of lower temperature. Heat is produced as a result of ; chemical reaction, combustion, electrical current, mechanical motion and metabolism. Heat is transferred by:

Convection. Heat is transferred by molecules moving through a fluid, gas or liquid.

Radiation. Occurs when a body's temperature is above absolute zero.

Conduction. Heat is transferred through a substance or between substances without physical movement of the substances itself.

Examples: ___ Briefly cover each hazard type and ask for examples in participants' workplaces.

7. Flammability/Fire. Fire may cause burn injuries. In order for combustion to take place, the fuel and oxidizer (oxygen) must be present in gaseous form. Flammable materials include:

fuel	solvents	cleaning agents	lubricants	coatings
chemicals	refrigerants	insecticides	plastics	hydraulic fluid
vegetation	wood/paper	fabrics	metals	rubber products

Examples: _____

8. Explosives. The results of an explosion may range from minor injury to major catastrophe (Space Shuttle Challenger). Instantaneous release of gas, heat, noise, light and over-pressure creates a wave front that damages anything in its path. About 2 billion pounds of explosives are used by industry annually in construction, mining, quarrying, and seismographic work. Many types of explosions may occur:

chemicals	solids	gases
dusts	vapors	equipment

Examples: _____

9. Pressure Hazards. High and low pressure conditions in the workplace can result in injury. Standard atmospheric pressure is 14.7 pounds per square inch (psi). High-pressure gas distribution lines are considered high-pressure when operating at 2 psi or higher. The American Society of Mechanical Engineers (ASME) rate boilers which operate at more than 15 psi as high-pressure. The pressure in full cylinders of compressed air, oxygen, or carbon dioxide are over 2000 psi! Examples of pressure hazards include:

Ruptured cylinders. The thrust generated by gas flowing through a puncture or rupture of a cylinder can be 20 times greater than the weight of the cylinder and reach velocity of 50 feet per second in 1/10th of a second! The result: a missile.

Whipping hoses and lines. Compressed air and water hoses can kill when end fittings become loose. Such hoses and lines should be restrained by weighting with sand bags at short intervals, chained, clamped, etc. Never try to grab a whipping hose or line: turn off the controlling valve.

Water hammer. The effect caused by a sudden stop of liquid flow causing a shock wave (water hammer) that can cause a line rupture. Have you ever heard a pipe "clang"?

Using compressed air for cleaning tools

Compressed air used for cleaning. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psi. and then only with effective chip guarding and personal protective equipment. (29 CFR 1910.242(b))

Employers should not allow employees to use compressed air for cleaning themselves or their clothing. *Why?*

Air may be injected under the skin causing a possible embolism. Fabric may also become super-saturated with oxygen creating a serious fire hazard. Clothing can be totally engulfed in flame in an instant.

10. Electrical contact. Exposure to electrical current may cause injury or death. The voltage is not so important as the amount of current. It doesn't take much current to kill. There are five principle categories of electrical hazards:

Shock. Electrical shock is a sudden and accidental stimulation of the body's nervous system by an electrical current. Look for bare conductors, insulation failures, buildup of static electricity, and faulty electrical equipment.

Ignition of combustible (or explosive) material. Ignition is usually caused by a spark, arc, or corona effect (ionized gas allows a current between conductors).

Overheating. High current creates high heat that can result in fires, equipment burnout and burns to employees.

Electrical explosions. Rapid overheating of circuit breakers, transformers, and other equipment may result in an explosion.

Inadvertent activation of equipment. Unexpected startup of equipment and machinery can injure and kill. That's why we have lockout/tagout procedures.

Examples: _ Briefly cover each hazard type and ask for examples in participants' workplaces. _____

11. Ergonomics. Improper lifting, lowering, pushing, pulling, and twisting can cause strains and sprains. Ergonomics-related hazards are the most common source of injury in the workplace. About 45% of all claims are related to ergonomics! Ergonomics hazards exist in:

The **worker** – physical/mental capability, preexisting conditions, etc.

The **task** – work that includes high force, repetition, frequency and duration, and inappropriate posture, point of operation.

The **environment** – noise, temperature, humidity, color, etc.

Examples: _____

12. Biohazards. Exposure to plants, animals or their products that may be infectious, toxic or allergenic may cause illness and disease. People who work with animals, animal products or animal wasted have a greater risk of infection. Biohazard agents include:

Bacteria – simple, one-celled organisms that may or may not be harmful.

Viruses – organisms that depend on a host cell for development and reproduction.

Fungi – may be small or large (mushroom) parasitic organisms growing in a living or dead plant or animal matter.

Rickettsia – rod-shaped microorganisms that are smaller than bacteria and depend on a host for development and reproduction. Microorganisms Transmitted by fleas, ticks and lice.

Examples: _____

Briefly cover each hazard type and ask for examples in participants' workplaces.

13. Workplace Violence. Workplace violence is any violent act that occurs in the workplace and creates a hostile work environment that affects employees' physical or psychological well-being. A risk factor is a condition or circumstance that may increase the likelihood of violence occurring in a particular setting. Risk factors include:

- Employee contact with the public
- Exchanging money
- Selling/dispensing alcohol or drugs
- Delivering passengers, goods or services
- Mobile workplace (such as a taxicab or police cruiser)
- Exposure to unstable or volatile persons (such as in health care, social services)
- Employees working alone, late at night/early morning, or in small numbers
- Employees working in high-crime areas
- Employees guarding valuable property or possessions
- Employees working in community settings
- Employees deciding on benefits, or in some other way controlling a person's future, well-being, or freedom (such as a government agency)

Examples: _____

Hazards Cause Accidents: The Final Effect

Briefly cover each accident type and ask for examples in participants' workplaces.

Struck-by. A person is forcefully struck by an object. The force of contact is provided by the object.

Struck-against. A person forcefully strikes an object. The person provides the force or energy.

Contact-by. Contact by a substance or material that, by its very nature, is harmful and causes injury.

Contact-with. A person comes in contact with a harmful substance or material. The person initiates the contact.

Caught-on. A person or part of his/her clothing or equipment is caught on an object that is either moving or stationary.

Caught-in. A person or part of him/her is trapped, or otherwise caught in an opening or enclosure.

Caught-between. A person is crushed, pinched or otherwise caught between a moving and a stationary object, or between two moving objects.

Fall-To-surface. A person slips or trips and falls to the surface he/she is standing or walking on. A "top-ten" cause of injury.

Fall-To-below. A person slips or trips and falls to a level below the one he/she was walking or standing on.

Over-exertion. A person over-extends or strains himself/herself while performing work. A "top-ten" cause of injury.

Bodily reaction. Caused solely from stress imposed by free movement of the body. Sudden motions, bends, slips, trips, without falling. A common cause of injury.

Over-exposure. Over a period of time, a person is exposed to harmful energy (noise, heat), lack of energy (cold), or substances (toxic chemicals/atmospheres).

Four Strategies to Identify and Analyze Hazards

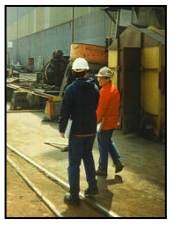
1. The Safety Inspection and Audit

Regular safety inspections and occasional audits are important in making sure the workplace remains free of hazards that could cause injury or illness.

- The ***inspection*** examines conditions in the workplace to identify hazards. This is what the safety committee typically performs each quarter.
- The ***audit*** evaluates the quality of program design and performance to better control hazards. This is what the safety committee needs to perform to ensure continuous improvement. We'll discuss this strategy in the *Controlling Hazards* section.

How to develop an effective inspection checklist

1. **Determine applicable state safety & health rules for the workplace.** Call the OR-OSHA technical services section (800) 922-2689 when you have questions about OR-OSHA rules. Also see our website: http://www.orosha.org.
2. **Review OR-OSHA rules and use those that apply to your workplace.** Become familiar with the rules that, if violated, would result in serious physical harm or fatality. Write questions that address hazards in OR-OSHA rules and serious hazards not covered by rules, if present. Guard against "tunnel vision."



Who's involved in the inspection process where you work?

Everyone should be involved.

How can you make the inspection process effective and useful?

By making sure adequate observation is conducted. Super-vision! Get employees involved by asking for input. Don't focus on a condition look beyond and see why the condition exists.

Sample Safety Inspection Checklist

Briefly discuss this sample checklist

Yes No NA **FLAMMABLE & COMBUSTIBLE MATERIALS CHECKLIST**

__ __ __ 1. Are combustible debris and waste materials stored in covered metal receptacles and removed from the work environment?

__ __ __ 2. Are proper storage methods used to minimize the risk of fire and spontaneous combustion?

__ __ __ 3. Are approved containers and tanks used for the storage and handling of flammable and combustible liquids?

__ __ __ 4. Are all connections on drums and combustible liquid piping tight?

__ __ __ 5. Are all flammable liquids kept in closed containers when not in use?

__ __ __ 6. Are bulk drums of flammable liquids grounded and bonded to containers during dispensing?

__ __ __ 7. Do storage rooms for flammable and combustible liquids have explosion-proof lights?

__ __ __ 8. Do storage rooms for flammable and combustible liquids have mechanical or gravity ventilation?

__ __ __ 9. Are safe practices followed when liquid petroleum gas is stored, handled, and used?

__ __ __ 10. Are all solvent wastes and flammable liquids kept in fire resistant, covered containers until they are removed from the work site?

__ __ __ 11. Are all extinguishers fully charged and in their designated places?

__ __ __ 12. Are extinguishers free from obstructions or blockage?

__ __ __ 13. Are “NO SMOKING” signs posted and enforced in areas where flammable or combustible materials are stored/used?

__ __ __ 14. Are all spills of flammable or combustible liquids cleaned up promptly?

Yes No NA **GENERAL WORK ENVIRONMENT CHECKLIST**

__ __ __ 1. Are all work sites clean and orderly?

__ __ __ 2. Are work surfaces kept dry or appropriate means taken to assure the surfaces are slip-resistant?

__ __ __ 3. Are all spilled materials or liquids cleaned up immediately?

__ __ __ 4. Is combustible debris and waste stored safely and removed from the work site promptly?

__ __ __ 5. Are covered metal waste cans used for oily and paint-soaked waste?

__ __ __ 6. Are the minimum number of toilets and washing facilities provided?

__ __ __ 7. Are all toilets and washing facilities clean and sanitary?

__ __ __ 8. Are all work areas adequately lighted?

2. Observation

It is important to overcome the inherent weakness in the walkaround inspection process by developing and using informal and formal observation procedures.

Informal Observation

Employees and managers can spot hazardous conditions and unsafe/inappropriate behaviors while they conduct their daily work tasks.

What is the proper response…

when an employee observes a hazardous condition or unsafe behavior?

Report the hazard. Warn the employee

when a safety committee member observes a hazardous condition or unsafe behavior?

Report the hazard. Warn the employee about the unsafe behavior. Conduct root cause analysis to see if the system is contributing the existence of the hazard or unsafe behavior.

Formal observation

Simple observation programs, plans and procedures can be successful tools for gathering and analyzing data to improve the safety management system. Employees are assigned to make observations and report results for statistical analysis.

What group is well-suited to conduct formal observation?

The safety committee.

What happens when the perception that discipline might occur as a result of formal observations?

Most formal observation programs fail because management gets involved in making observations. The formal observation program is not effective because employees fear being observed and they get confused about the role supervisors are playing…are they merely observers, or cops? Best to keep formal observations the job of employees only.

3. The Job Hazard Analysis (JHA)

Althougn not required by OR-OSHA rules, the Job hazard analysis (also called a job safety analysis) is an excellent process that separates a job into its basic steps. Each step is then analyzed to identify actual and potential hazards. Once the hazards are known, safe job procedures are developed.

The JHA can be valuable in helping present on-the-job training (OJT). The JHA is also a opportunity for management to involve employees in developing safe work procedures.

SAMPLE JOB HAZARD ANALYSIS WORKSHEET

Job Description: Loading an empty trailer with pallets of product.

Basic Job Step	Hazards Present	Safe Job Procedure
1.Ensure that trailer is correctly spotted.	1. Worker could be caught between backing trailer and dock. Worker could fall from the dock.	1. Stay clear of the doorway while the trailer is being backed onto the dock. Keep others away from the area. Remove awareness chain or bar from the front of the dock door once the trailer is properly spotted.
2. Chock wheels; place jacks under trailer nose. .	2. Worker could fall on stairs going to dock well. Worker's head could be struck against trailer. Worker could slip on ice or snow.	2. If the truck driver has not chocked the wheels, go down tile ramp/stairs to the dock well and chock the wheels. Use caution when walking on snow or ice. Hold onto hand rails; use ice-melt chemical if needed. When placing the chock, avoid bumping the head on the underside of the trailer. Place jacks under the nose of the trailer. If the dock is equipped with an automatic trailer restraint, push the button to activate the device.

Why is it important to involve employees in the JHA process?

The more involved they are, the more ownership the feel. Employees use their "own" procedures when not being supervised.

4. The Incident/Accident Analysis

All non-injury incidents and injury accidents, no matter how minor should be analyzed to identify and control hazards.

- **Incident analysis** allows you to identify and control hazards before they cause an injury. It's always smart business to carefully analyze non-injury incidents.
- **Accident analysis** is an effective tool for uncovering hazards that either were missed earlier or have managed to slip out of the controls planned for them.

Both processes are most useful when done with the goal of discovering all of the underlying contributing root causes.

The two primary phases in the incident/accident analysis process

1. **Event analysis.** Analyze the event (near-miss, accident) to determine what happened. Identify the events that occurred prior to and including the injury event.
2. **Cause analysis.** Evaluate each event for direct and contributing surface causes. Surface causes are unique hazardous conditions and/or unsafe behaviors that may have directly caused or contributed to the incident or accident.

   Next, evaluate the root causes in the safety management system to determine if any failure in its design or performance may have contributed to the incident or accident. Ask if the system is failing to perform in one or more of these areas:

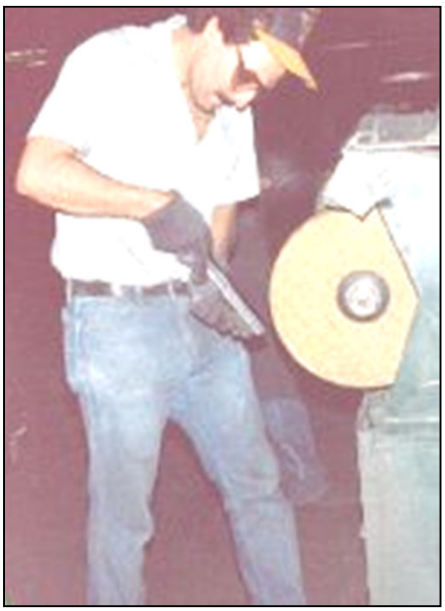
   - Training. Was training adequately designed, presented, and documented?
   - Resources. Were adequate physical resources and support provided?
   - Enforcement. Are safety policies and rules consistently enforced?
   - Supervision. Are supervisors identifying hazards before workers get hurt?
   - Leadership. Are supervisors and managers meeting obligations to workers?

Why is it so important to uncover root causes for incidents and accidents?

You can prevent future similar and dissimilar accidents from happening. Fixing a single root cause. Can prevent multiple incidents and accidents!

Exercise: What's wrong with these pictures?

Take a look at the photos below and discuss the actual or potential hazard you see. What kind of accident might result?.



What's the hazard?

_____

_____

What kind of accident might occur?

_____

_____

Discuss the hazards and the types of accidents that might occur. If you don't have the answers to these questions. Get into the rules and figure it out.

What's the hazard?

_____

_____

What kind of accident might occur?

_____

_____

What's the hazard?

_____

_____

What kind of accident might occur?

_____

_____

CONTROLLING HAZARDS

Hazard + Exposure ⇨ Accident

The Hierarchy of Controls

To most effectively improve the safety and health management system, we need to anticipate potential hazards before they exist. Absent that, we need to control existing hazards when they've been identified. According to ANSI/AIHA Z10.200* and best practices there are two primary control strategies are used:

1. Control the hazard
2. Control exposure to the hazard

Discuss the hierarchy. OR-OSHA's model is simple and logical.

1. Controlling hazards by engineering the workplace

To "furnish a safe and healthful workplace," means to design the workplace so that tools, equipment, machinery, materials, and the work environment are free (if feasible) from hazards that could cause injury or illness.

The most effective plan is to control the hazard because, after all, if you can get rid of the hazard, you don't have to control exposure to the hazard. We do this through sound engineering. There are two hazard control strategies:

- Eliminate the hazard
- Reduce the hazard

Only two primary strategies. Either you get rid of the hazard, or reduce exposure to the hazard.

If hazard control strategies are not as effective as they need to be, you we may need to also use exposure control strategies.

2. Controlling exposures by managing work and workers

To "furnish work that is safe and healthful," means to design procedures and practices so that employees are free (if feasible) from exposure to hazards that could cause injury or illness. There are also two exposure control strategies:

- Eliminate the exposure
- Reduce the exposure

Briefly discuss each of the engineering control strategies. Ask for examples at work.

Engineering Controls - Eliminate or reduce hazards

These controls focus on the source of the hazard itself, unlike other types of controls that generally focus on the employee exposed to the hazard. The idea is engineer the work environment and the job itself to eliminate or reduce the hazards. Engineering controls use the following strategies to eliminate or reduce hazards:

Substitution. Substitute something that is not hazardous or is less hazardous. Examples include:

- Replacing defective tools, hazardous equipment and machinery
- Substituting toxic substances with non-toxic or less-toxic substances

Design. If feasible, design or redesign the facility, equipment, or process to remove the hazard and/or substitute something that is not hazardous or is less hazardous. Examples include:

- Redesigning tools, equipment, machinery and materials
- Redesigning a chemical process to use less toxic chemicals
- Designing workstations to be more ergonomically correct

Enclosure. If removal is not feasible, enclose the hazard to prevent exposure in normal operations. Examples include:

- Complete enclosure of moving parts of machinery
- Complete containment of toxic liquids or gases
- Complete containment of noise, heat, or pressure-producing processes

Barriers. Where complete enclosure is not feasible, establish barriers to prevent access to the hazard.

- Machine guarding, including electronic barriers
- Baffles used as noise-absorbing barriers

Ventilation. or local ventilation to reduce exposure to the hazard in normal operations. Examples include:

- Ventilation hoods in paint booths and laboratories
- Force air ventilation in confined spaces

Management Controls – Eliminate or Reduce Exposure

Sometimes these strategies are called administrative or work-practice controls. We lump them all together into management controls.

Management controls eliminate or reduce exposure to hazards through strategies such as changing work habits, improving sanitation and hygiene practices, or making other changes in the way the employee performs the job. The focus is on managing what employees do. There are three basic management control strategies to eliminate or reduce exposure to hazards:

Practices. Some of these practices are very general in their applicability. They include housekeeping activities such as:

- Using personal protective equipment (PPE).
- Placing warning signs that inform and restrict access
- Removing tripping, blocking, and slipping hazards
- Removing accumulated toxic dust on surfaces
- Wetting down surfaces to keep toxic dust out of the air

Procedures. These procedures apply to specific jobs in the workplace. Use the JHA to help develop procedures.

- Permit-required confined space entry procedures
- Lockout/Tagout procedures
- Fork-lift safety inspection procedures

Schedules. Measures aimed at reducing employee exposure to hazard by changing work schedules. Such measures include:

- Lengthened rest breaks
- Additional relief workers
- Exercise breaks to vary body motions
- Rotation of workers through different jobs

Why are engineering controls considered superior to management controls?

Simple: If you can get rid of the hazard, you don't have to manage exposure!

Effective Maintenance Processes

What two general types of maintenance processes are needed?

1. **Preventive maintenance** to make sure equipment and machinery operates safely and smoothly.
2. **Corrective maintenance** to make sure equipment and machinery gets back into safe operation quickly.

Who's responsible to make sure equipment is in safe working condition?

The employer. Also the supervisor, manager, and employees in general.

Hazard Tracking Procedures

An essential part of any day-to-day safety and health effort is the correction of hazards that occur in spite of your overall prevention and control program. Documenting these corrections is equally important, particularly for larger sites.

Documentation is important because:

- It keeps management aware of the status of long-term correction items
- It provides a record of what occurred, should the hazard reappear at a later date
- It provides timely and accurate feedback

XYZ Hazard Tracking Log

Hazard Number	Description	Reported by	Date Reported	Correct by	Responsible Supervisor	Date Corrected
0501	Lathe #3, needs guard	Smith	9/9/05	9/15/05	Jones	9/14/05
0502	Dock needs warning stripes	Wilson	9/12/05	9/30/05	Jordan	

Team Exercise: Using the Hazard Analysis Worksheet

Examine these photos (or those supplied by the instructor) and use the worksheet on the next page to determine at least one hazard, possible root cause, corrective actions and possible system improvement.

Discuss the team exercise instructions.

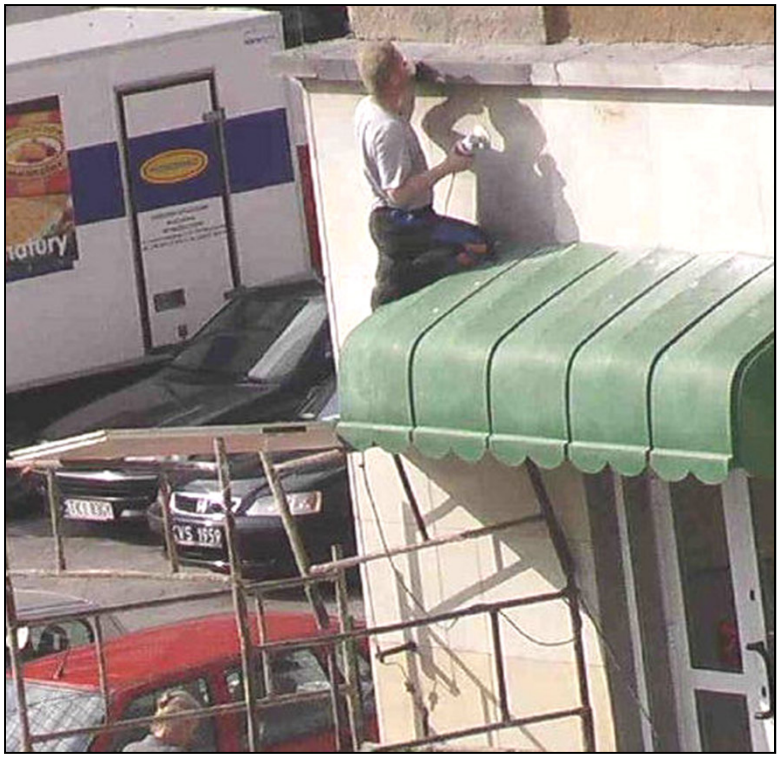
Photo 1

This newly-married young man is welding on a gas tank under this pickup truck. This procedure has been used many times before without incident.

Photo 2

This father of four is using a gas-driven cutting tool on a large water pipe. It may be hard to see, but there are also fumes being produced by the tool.

Photo 3



This worker is working with an electrical sanding tool on top of a scaffold to complete some stonework above his head while the supervisor watches from below.

Photo 4

This father and son team is carefully positioning the ladder and getting ready to clean the windows from this second-floor ledge.

Hazard Analysis Worksheet

Describe the Hazard(s):

Hazardous condition(s) - _____

_____

_____

You may want to help the class complete the worksheet the first time they analyze a photo. If the class is large enough, have groups then complete the worksheet for other photos.

Unsafe/Inappropriate behavior(s) - _____

_____

_____

_____

Possible Accident Type(s): _____

_____

_____

Recommended Corrective Action(s): Engineering controls. Ideas that correct tools, equipment, machinery, materials, facilities, environment through redesign, substitution, replacement, barriers, ventilation, enclosure.

_____

_____

_____

_____

Recommended System Improvement(s): Management controls: Ideas that improve safety programs, policies, plans, processes, procedures, practices, rules, reports, and forms, and improve the ability of management to provide adequate resources, supervision, consequence and training.

_____

_____

_____

_____

Hazard Analysis Worksheet

Describe the Hazard(s):

Hazardous condition(s) - _____

_____

_____

Unsafe/Inappropriate behavior(s) - _____

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Possible Accident Type(s): _____

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_____

Hazard Analysis Worksheet

Describe the Hazard(s):

Hazardous condition(s) - _____

_____

_____

Unsafe/Inappropriate behavior(s) - _____

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_____

Possible Accident Type(s): _____

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_____

_____

_____

_____

Before you run…let's review

1. According to the text, these must be present to have an accident:
   a. person and condition
   b. condition and behavior
   c. hazard and exposure
   d. exposure and behavior

2. What percentage of accidents in the workplace are unpreventable? 2

3. Which of the following describes a symptom pointing to a possible root cause?
   a. a defective ladder
   b. no lockout/tagout procedures in place
   c. a missing training plan
   d. supervisors are ignoring safety rules

4. Which of the following is considered a root cause or system weakness?
   a. an unguarded saw
   b. a missing Material Safety Data Sheet (MSDS)
   c. the PPE training program does not contain practicing spill procedures
   d. a maintenance worker fails to wear eye protection while cleaning a spill

5. The *primary* objective of an incident/accident analysis is to fix the:
   a blame
   b. hazard
   c. system
   d. cause

6. Working within arms length of an unguarded saw would be considered:
   a. physical exposure
   b. environmental exposure
   c. employee exposure
   d. machine exposure

7. Which of the following is considered an engineering control?
   a. telling the employee to use common sense
   b. installing a machine guard
   c. conducting retraining
   d. wearing earplugs

8. Which of the following is considered an effective management control?
   a. replacing a defective ladder
   b. requiring employees to follow safe procedures
   c. turning down the radio
   d. placing the computer monitor on a phone book

9. This hazard type is responsible for about 45% of all injury claims in Oregon:
   a. hazard communications
   b. falls
   c. ergonomics
   d. violence

10. Why are engineering controls so important?

If you can get rid of the _____Hazard_____, you don't have to manage _____Exposure_____

REFERENCE MATERIALS

EFFECTIVE WORKPLACE INSPECTIONS

Canadian Centre for Occupational Health and Safety

Why are workplace inspections important?

Workplace inspections help prevent injuries and illnesses. Through critical examination of the workplace, inspections identify and record hazards for corrective action. Joint occupational health and safety committees plan, conduct, report and monitor inspections. Regular workplace inspections are an important part of the overall occupational health and safety program.

What is the purpose of inspections?

As an essential part of a health and safety program, committee members examine the workplace to:

- listen to the concerns of workers and supervisors
- gain further understanding of jobs and tasks
- identify existing and potential hazards
- determine underlying causes of hazards
- monitor hazard controls (personal protective equipment, engineering controls, policies, procedures)
- recommend corrective action

How do you plan for inspections?

Every inspection must examine who, what, where, when and how. Pay particular attention to items most likely to develop unsafe or unhealthy conditions because of stress, wear, impact, vibration, heat, corrosion, chemical reaction or misuse. Inspect the entire workplace area each time. Include areas where no work is done regularly, such as parking lots, rest areas, office storage areas and locker rooms.

Various inspection teams can have separate responsibilities. This can be done in two ways

1. Each team inspects a separate area such as yards, warehouses, maintenance, offices, and production lines.
2. Each team checks a separate class of items such as tools, buildings, utilities, materials, and mobile equipment.

The type of survey used results in reports based on areas in the workplace or on categories of hazards. Alternating from month to month may be advisable.

Workplace Elements

Look at all workplace elements - the environment, the equipment and the process. The environment includes such hazards as noise, vibration, lighting, temperature, and ventilation. Equipment includes materials, tools and apparatus for producing a product or a service. The process involves how the worker interacts with the other elements in a series of tasks or operations.

What types of hazards do we look for in a workplace?

Types of workplace hazards include:

- Safety hazards; e.g., inadequate machine guards, unsafe workplace conditions, unsafe work practices.
- Biological hazards caused by organisms such as viruses, bacteria, fungi and parasites.
- Chemical hazards caused by a solid, liquid, vapour, gas, dust, fume or mist.
- Ergonomic hazards caused by anatomical, physiological, and psychological demands on the worker, such as repetitive and forceful movements, vibration, temperature extremes, and awkward postures arising from improper work methods and improperly designed workstations, tools, and equipment.
- Physical hazards caused by noise, vibration, energy, weather, heat, cold, electricity, radiation and pressure.

What type of information do I need to complete an inspection report?

Diagram of Area. Use drawings of plant layout, or floor plans to help you draw a diagram. Divide the workplace into areas based on the process. Visualize the activities in the workplace and identify the location of machinery, equipment and materials. Show the movement of material and workers, and the location of air ducts, aisles, stairways, alarms and fire exits. Use several simple diagrams if the area is large. Concentrate on particular types of hazards in the area. If chemicals are the main concern, make sure the diagram emphasizes chemicals. Do the same for all other hazards, such as noise and lighting. Explain the contents of the diagram in a legend. Describe the steps of each operation. Obtain worker and supervisor comments on the diagram-they know the area better than anyone else.

Equipment Inventory. Know what type of machinery or equipment is present. Review technical safety data sheets, or manufacturers' safety manuals. Read work area records to become familiar with the injury and illness potential of the equipment.

Chemical Inventory. Determine which chemicals are used in the workplace and whether material safety data sheets are available. Find out whether actual and potential sources of chemical exposure are properly controlled. Make sure that all workers have received training in handling chemicals. Check that all chemicals are labeled with pertinent information (such as handling, storage, and waste disposal) according to Workplace Hazardous Materials Information System (WHMIS) requirements.

Checklists. A checklist helps to clarify inspection responsibilities, controls inspection activities and provides a report of inspection activities. Checklists permit easy on-the-spot recording of findings and comments but be careful. Do not allow the inspection team to become so intent on noting the details listed that it misses other hazardous conditions. Use checklists only as a basic tool. Refer to the related documents for sample checklists that you can use as a guide to develop a checklist for your workplace.

Reports. Inspection records are important. Past inspection records show what has been identified. They also show what an inspection team concentrated on and what areas it did not inspect. The inspection report can draw attention to possible hazards. However, do not simply repeat or copy previous inspections. Use the inspection report to determine whether previous recommendations were implemented.

Are there other types of inspection reports that may be useful?

The following describes three other types of inspection reports:

- **Ongoing.** Supervisors and workers continually conduct ongoing inspections as part of their job responsibilities. Such inspections identify hazardous conditions and either correct them immediately or report them for corrective action. The frequency of these inspections varies with the amount and conditions of equipment use. Daily checks by users assure that the equipment meets minimum acceptable safety requirements.

- **Pre-operation.** Pre-operation checks involve inspections of new or modified equipment or processes. Often these are done after workplace shutdowns.

- **Periodic.** Periodic inspections are regular, planned inspections of the critical components of equipment or systems that have a high potential for causing serious injury or illness. The inspections are often part of preventive maintenance procedures or hazard control programs. The law specifies that qualified persons periodically inspect some types of equipment, such as elevators, boilers, pressure vessels, and fire extinguishers, at regular intervals.

Should committee members have special qualifications?

Committee members should have:

- knowledge of previous injuries and illnesses in the workplace
- familiarity with the hazards and with the standards, regulations, PPE, and procedures that apply to the area
- ability and skills to assess situations requiring corrective action
- training in inspection, and in handling personnel and situations
- knowledge of the organization's operations, work flow, systems and products
- proper attitudes and influence to bring about improvements

Should inspections follow a schedule?

Nobody can accurately estimate how long each inspection will take. The time required depends on what is found, how many questions are asked, and how large and complex the work area is. Inspections are ineffective when the given time allows for only a hasty look.

The purpose of an overall schedule is to keep the workplace free of hazards. The schedule should state:

- when to inspect each area or item within the workplace
- who carries out the inspection
- what degree of detail to inspect each area or item

To decide how many inspections are necessary, how long they should last and how often they are needed, consider:

- number and size of different work operations
- type of equipment and work processes--those that are hazardous or potentially hazardous may require more regular inspections
- number of shifts--the activity of every shift may vary
- new processes or machinery

It is often recommended to conduct inspections as often as committee meetings. Do not conduct an inspection immediately before a committee meeting but try to separate inspections and meetings by at least one week. This time allows for small items to be fixed and gives the committee an opportunity to focus on issues requiring further action.

How are inspections actually done?

Discuss the planned inspection route before undertaking the inspection. Review where inspection team members are going and what they are looking for. For example, during the inspection, "huddle" before going into noisy areas. This eliminates the need for arm waving, shouting and other unsatisfactory methods of communication.

The committee cannot inspect as a whole. Each member should have a clipboard or note pad, and checklists for the area or items to be inspected. They also should be allowed to proceed at their own pace.

For inspections, wear personal protective equipment (PPE) where required. If you do not have PPE and cannot get any, do not enter the area. List this as a deficiency during the inspection. Re-inspect the area when PPE is provided.

Engineers, maintenance personnel and other specialists should be available to provide information on special equipment or processes. The health and safety committee may invite industrial hygienists, union health and safety specialists, or workplace managers to join the committee inspection team to help them in examining certain aspects of a work area.

Supervisor Involvement. Supervisors are responsible for taking action to prevent accident and injury. Supervisors have an advantage in safety inspections because of familiarity with workers, equipment and environment. This familiarity is also a disadvantage because it can interfere with a supervisor's objectivity. Before inspecting a department or area, the committee should contact the supervisor in charge but the supervisor should not act as a tour guide. The inspection team must remain independent and make uninfluenced observations.

If the supervisor of the area does not accompany the inspection team, consult the supervisor before leaving the area. Discuss each recommendation with the supervisor. Report items that the supervisor can immediately correct. Note these on the report as corrected. This keeps the records clear and serves as a reminder to check the condition during the next inspection.

Although a supervisor may interpret reporting as a criticism, committee members cannot fail to report hazards. Retain objectivity and maintain an attitude that is firm, friendly, and fair.

Observation. Look for deviations from accepted work practices. Use statements such as, "a worker was observed operating a machine without a guard." Do not use information derived from inspections for disciplinary measures.

Some common poor work practices include:

- using machinery or tools without authority
- operating at unsafe speeds or in other violation of safe work practice
- removing guards or other safety devices, or rendering them ineffective
- using defective tools or equipment or using tools or equipment in unsafe ways
- using hands or body instead of tools or push sticks
- overloading, crowding, or failing to balance materials or handling materials in other unsafe ways, including improper lifting
- repairing or adjusting equipment that is in motion, under pressure, or electrically charged
- failing to use or maintain, or improperly using, personal protective equipment or safety devices
- creating unsafe, unsanitary, or unhealthy conditions by improper personal hygiene, by using compressed air for cleaning clothes, by poor housekeeping, or by smoking in unauthorized areas
- standing or working under suspended loads, scaffolds, shafts, or open hatches

Inspection Principles

When conducting inspections, follow these basic principles:

- Draw attention to the presence of any immediate danger--other items can await the final report.
- Shut down and "lock out" any hazardous items that cannot be brought to a safe operating standard until repaired.
- Do not operate equipment. Ask the operator for a demonstration. If the operator of any piece of equipment does not know what dangers may be present, this is cause for concern. Never ignore any item because you do not have knowledge to make an accurate judgement of safety.
- Look up, down, around and inside. Be methodical and thorough. Do not spoil the inspection with a "once-over-lightly" approach.
- Clearly describe each hazard and its exact location in your rough notes. Allow "on-the-spot" recording of all findings before they are forgotten. Record what you have or have not examined in case the inspection is interrupted.
- Ask questions, but do not unnecessarily disrupt work activities. This may interfere with efficient assessment of the job function and may also create a potentially hazardous situation.

- Consider the static (stop position) and dynamic (in motion) conditions of the item you are inspecting. If a machine is shut down, consider postponing the inspection until it is functioning again.
- Discuss as a group, "Can any problem, hazard or accident generate from this situation when looking at the equipment, the process or the environment?" Determine what corrections or controls are appropriate.
- Do not try to detect all hazards simply by relying on your senses or by looking at them during the inspection. You may have to monitor equipment to measure the levels of exposure to chemicals, noise, radiation or biological agents.
- Take a photograph if you are unable to clearly describe or sketch a particular situation. Instant developing photographs are especially useful.

What should the final report have in it?

To make a report, first copy all unfinished items from the previous report on the new report. Then write down the observed unsafe condition and recommended methods of control. Enter the department or area inspected, the date and the inspection team's names and titles on top of the page. Number each item consecutively, followed by a hazard classification of items according to the chosen scheme. State exactly what has been detected and accurately identify its location. Instead of stating "machine unguarded," state "guard missing on upper pulley #6 lathe in North Building."

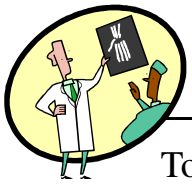
Assign a priority level to the hazards observed to indicate the urgency of the corrective action required. For example:

A = Major--requires immediate action
B = Serious--requires short-term action
C = Minor--requires long-term action

Make management aware of the problems in a concise, factual way. Management should be able to understand and evaluate the problems, assign priorities and quickly reach decisions. Take immediate action as needed. When permanent correction takes time, take any temporary measures you can, such as roping off the area, tagging out equipment or posting warning signs.

After each listed hazard, specify the recommended corrective action and establish a definite correction date. Each inspection team member should review for accuracy, clarity and thoroughness.

Source: http://www.ccohs.ca/oshanswers/prevention/effectiv.html, Effective Safety Inspections, Canadian Centre for Occupational Health and Safety (CCOHS), 1997-2005, Reproduced with the permission of CCOHS, 2005.



Diagnose and Treat the Underlying Root Causes!

To eliminate the visible surface symptoms or effects, we need to accurately diagnose and treat the underlying root causes for 95% of all workplace accidents: the inadequate design and performance of the safety management system.

System Design Weaknesses - Inadequate planning and development (Failure to plan the work).

Characteristics:

- Missing or inadequate policies, plans, programs, processes, procedures
- Missing or inadequate resources - money, time, people, materials, etc.
- The *deep* root causes for most accidents

Effects:

- Cause system performance failures

System Performance Weaknesses - Failure to accomplish action plans (Failure to work the plan).

Characteristics:

- Failure to effectively accomplish safety policies, plans, processes, procedures or practices
- Failure to provide training, resources, enforcement, supervision, and leadership

Effects:

- Cause common hazardous conditions and/or unsafe behaviors
- Cause repeated unique hazardous conditions and/or unsafe behaviors

2007 Average Cost For Disabling Claims By Event or Exposure
(Partial List)

Total Claims: 24,331

Average Cost: $18,710

Event or Exposure Leading to Injury (Partial list)	CLAIMS CLOSED	AVERAGE COST($)
1. Lifting objects	2079	
2. Bodily reaction, other	3126	16,780
3. Repetitive motion	2410	21,980
4. Fall to floor, walkway	2304	17,800
5. Overexertion	6015	19,130
6. Pulling, pushing objects	892	
7. Caught in equipment or objects	993	16,830
8. Struck by falling object	932	17,490
9. Loss of balance	714	19,070
10. Struck against stationary object	995	11,150
11. Holding, carrying, wielding objects	528	
12. Struck by swinging/slipping object	512	10,210
13. Struck by, other	557	14,050
14. Highway accidents, collisions	698	22,410
15. Fall from ladder	496	29,500
16. Fall onto, against objects	421	17,410
17. Fall to lower level, all other	1668	29,700
18. Fall from non-moving vehicle	287	32,650
19. Fall down stair or step	287	19,040
20. Struck by flying object	264	14,410
21. Assault or violent act by person	377	16,970
22. Struck against moving object	159	
23. Struck by vehicle	175	29,760
24. Contact with hot object	174	4,530
25. Non-highway accident	161	21,590
26. Exposure to noise	94	15,210
27. Jump to lower level	131	
28. Fall from floor, dock, ground level	92	17,860
29. Contact with skin, tissue	95	7,661
30. Fall to same level, other	30	17,780
31. Fall from roof	85	43,490
32. Bodily reaction, exertion, other	11	49,310
33. Fall from scaffold	58	37,790
34. Vibration		
35. Explosion	30	23,480

Ergonomic injuries: (sprains, strains, & tears) still total 46.7% of all accepted disabling claims!

You may request a complete list from the Research and Analysis Section, Information Management Division, Department of Consumer and Business Services. http://www.cbs.state.or.us/imd/orosha.html

More about OR-OSHA policy on employee exposure and hazard abatement

Proximity to the Hazard. The analyst should fully document exposure for every apparent incident/accident and the proximity of workers to the point of danger of the operation.

Observed Exposure. Employee exposure is established if anyone witnesses, observes, or monitors exposure of an employee to the hazardous or suspected hazardous condition. Where a standard requires engineering or management controls (including work practice or scheduling controls), employee exposure exists regardless of the use of personal protective equipment.

Unobserved Exposure. Where employee exposure was not observed, witnessed, or monitored by another employee or manager, employee exposure is established if it is determined through witness statements or other evidence that exposure to a hazardous condition occurred, continues to occur, or could recur.

In fatality/catastrophe (or other "accident") investigations, employee exposure is established if the investigator determines, through written statements or other evidence, that exposure to a hazardous condition occurred at the time of the accident.

In other circumstances where the investigator determines that exposure to hazardous conditions has occurred in the past, such exposure may serve as the basis for a violation when employee exposure has occurred in the previous six months.

Potential Exposure. The possibility that an employee could be exposed to a hazardous condition exists when the employee can be shown to have access to the hazard. Potential employee exposure could include one or more of the following:

- When a hazard has existed and could recur because of work patterns, circumstances, or anticipated work requirements and it is reasonably predictable that employee exposure could occur.
- When a safety or health hazard would pose a danger to employees simply by employee presence in the area and it is reasonably predictable that an employee could come into the area during the course of the work, to rest or to eat at the jobsite, or to enter or to exit from the assigned workplace.
- When a safety or health hazard is associated with the use of unsafe machinery or equipment or arises from the presence of hazardous materials and it is reasonably predictable that an employee could use the equipment or be exposed to the hazardous materials in the course of work.

Hazard vs Abatement. OR-OSHA does not mandate a particular hazard abatement measure, but only requires an employer to render the workplace free of certain hazards by any feasible and effective means which the employer wishes to utilize. For example:

- Employees doing sanding operations may be exposed to the hazard of fire caused by sparking in the presence of magnesium dust. One of the abatement methods may be training and supervision. The "hazard" is the exposure to the potential of a fire; it is not the lack of training and supervision.
- In a hazardous situation involving high pressure gas where the employer has failed to train employees properly, has not installed the proper high pressure equipment, and has improperly installed the equipment that is in place, there are three abatement measures which the employer failed to take; there is only one hazard (viz., exposure to the hazard of explosion due to the presence of high pressure gas) and hence only one general duty clause citation.

Foreseeable Hazards. The hazard for which OR-OSHA issues a citation must be reasonably foreseeable. All the factors which could cause a hazard need not be present in the same place at the same time in order to prove foreseeability of the hazard; e.g., an explosion need not be imminent. Fore example:

- If combustible gas and oxygen are present in sufficient quantities in a confined area to cause an explosion if ignited but no ignition source is present or could be present, no OR-OSHA violation would exist. If an ignition source is available at the workplace and the employer has not taken sufficient safety precautions to preclude its use in the confined area, then a foreseeable hazard may exist.

It is necessary to establish the reasonable foreseeability of the general workplace hazard, rather than the particular hazard which led to the accident. For example:

- A titanium dust fire may have spread from one room to another only because an open can of gasoline was in the second room. An employee who usually worked in both rooms was burned in the second room from the gasoline. The presence of gasoline in the second room may be a rare occurrence. It is not necessary to prove that a fire in both rooms was reasonably foreseeable. It is necessary only to prove that the fire hazard, in this case due to the presence of titanium dust, was reasonably foreseeable.

Recognized Hazards. Recognition of a hazard can be established on the basis of industry recognition, employer recognition, or "common sense" recognition. The use of common sense as the basis for establishing recognition shall be limited to special circumstances.

- **Industry Recognition.** A hazard is recognized if the employer's industry recognizes it. Recognition by an industry, other than the industry to which the employer belongs, is generally insufficient to prove industry recognition. Although evidence of recognition by the employer's specific branch within an industry is preferred, evidence that the employer's industry recognizes the hazard may be sufficient.
- **Employer Recognition.** A recognized hazard can be established by evidence of actual employer knowledge. Evidence of such recognition may consist of written or oral statements made by the employer or other management or supervisory personnel during or before the OSHA inspection, or instances where employees have clearly called the hazard to the employer’s attention.
- **Common Sense Recognition**. If industry or employer recognition of the hazard cannot be established, recognition can still be established if it is concluded that any reasonable person would have recognized the hazard. This argument is used by OSHA only in flagrant cases.

Sample Safety Inspection Report

I. Background

Inspection Date 9/05 Dept. Warehouse

Inspector(s) B. Wood (Management rep.) R. Smith (Employee rep.)

Inspection Type Quarterly Safety Committee

II. Findings

A. **Hazardous Conditions**

1. Platform storage area does not have guardrails.

a. Root cause(s). Missing guardrails were previously identified but not budgeted for correction. Indicates inadequate policy and procedures to respond to hazards. Note: Since management has prior knowledge of this hazard and has elected not to take action, this hazard may be classified as a willful violation by OR-OSHA and subject to an increased penalty.

b. Possible Accident(s) and Associated Cost(s):

(1 Struck by falling object. Average direct accident cost for this accident is $9,851. Estimated indirect cost $36,000. Total estimated cost if accident occurs is $45,851.

(2 Fall from elevated platform. Average direct accident cost for this accident it $15,668. Estimated indirect cost $60,000. Total estimated cost if accident occurs is $75,668.

c. Exposure, Probability and Severity:

(1 Exposure. Twelve employees work in the area throughout an 8-hour shift. Five employees routinely work on the platform. Approximately 30 employees walk through the hazard area each day.

(2 Probability. It is likely that one of the above accidents will occur within the next year. There was a near miss six months ago when an employee was nearly hit by a falling container.

(3 Severity. Most likely: Serious physical harm. Worst case: Fatality.

B. **Hazardous Work Practices:**

1. Workers are using improper lifting techniques:

a. Root Cause(s). Equipment to assist employees in lifting is not present. Through interviews and records reviews it has been determined that workers are not being properly trained in safe lifting techniques. Indicates an inadequate training program addressing ergonomics hazards.

b. Possible Accident(s): Overexertion - Lifting. Average cost = $9,956. Estimated indirect cost = $40,000. Total = $49,956.

c. Exposure, Probability and Severity.

(1 Exposure. All employee in the warehouse are expected to lift heavy containers throughout all 8-hour work shifts.

(2 Probability. It is highly likely that one or more employees will experience a back strain or sprain in the next year. OSHA 200 Log/801 Reports indicate we experience five such accidents annually (1995-1999).

(3 Severity. Most likely: Serious physical harm. Worst case: Serious physical harm.

Section III. Recommendations.

A. **Hazardous Conditions:**

1. Missing guardrails.

a. Engineering controls. Install guardrail system in compliance with OR-OSHA safety and health rules. Investment: $1,5000-$2,300. Recommended correction date: Immediately.

b. Work practice/Administrative controls. Instruct employees not to work on platform unless absolutely necessary until guardrails are installed. Investment: $500. Recommended action date: Immediately.

c. Personal Protective Equipment. Fall restraint system should be used by workers on platform until guardrails are installed. Investment: $400. Recommended action date: Immediately.

d. System improvements. (Weaknesses/recommendations in the safety system may be determined most effectively by the safety coordinator/committee) Improve inspection procedures to include management review of inspection reports. Establish policy/procedures to ensure reasonable response times to recommendations. Investment: $1000

B. **Hazardous Work Practices:**

1. Unsafe lifting techniques.

a. Engineering controls. Purchase equipment to lift heavy containers. Cost: $12,000. Recommended action date: 1/1/98.

b. Work practice/Administrative controls.

(1 Train all employees on safe lifting techniques and use of personal protective equipment. Investment: $1,000. Recommended action date: Immediately.

(2 Train management on accountability system. Ensure warehouse supervisors properly monitor lifting techniques, provide feedback to employees, and enforce safety rule on lifting for repeated violations. Investment: $1000. Recommended action date: Immediately.

c. Personal protective equipment. N/A.

d. System improvements. Establish policies and procedures to ensure adequate safety training in a timely manner. Improve/reinforce accountability policy. Ensure all employees review and certify understanding of new rule. Investment: $3000. Recommended action date: Immediately.

Section IV. Conclusion:

A. Total potential direct and indirect accident costs : $171,000 (Does not include possible OSHA penalties)

B. Total investment: $24,700

C. Estimated five-year ROI = 692%

C. Commendable: Observations during the inspection indicated that safe use of forklifts was excellent. All isles were clear and housekeeping in general was excellent.

_____ _____

Inspector Inspector

Section V. Action Plan [Completed by decision maker]

A. Hazardous conditions:

1. Missing guardrail.

a. Interim measures. [Responsible individual] will ensure current guardrail is reinforced immediately.

b. Long-term corrective actions. [Responsible individual] new guardrail is purchased and installed by [Correction date].

B. Unsafe work practices and procedures:

1. Improper lifting

a. Interim measures. [Responsible individual] will ensure affected workers and their supervisors receive proper lifting techniques training by [Date]. Supervisors will increase supervision, provide immediate feedback, and report observations to the safety coordinator.

b. Long-term corrective actions. [Responsible individual] will ensure a pneumatic lift device is purchased and installed by [Correction date].

C. System improvements.

1. [Responsible individual] will ensure the safety inspection plan is revised to include review by top management and a schedule is developed for written response to written recommendations. Action to be completed by [Correction date].

2. [Responsible individual] will ensure proper lifting techniques training is included in new employee orientation and affected employee and supervisor training plans by no later than [Correction date].

_____ _____

[Decision Maker] Date

Section V. After Action Report [Completed by safety coordinator]

A. Hazardous conditions:

1. Missing guardrail.

a. Interim measures. Guardrail reinforced. Corrected on [Date]. Item closed

b. Long-term corrective action. New guardrail installed on [Date]. Item closed.

B. Unsafe work practices and procedures:

1. Improper lifting

a. Interim measures. Affected employees/supervisor training is complete. Item closed. Increased supervision and feedback, observations are being reported. Item Open.

b. Long-term corrective action. A pneumatic lift device is purchased and installed. Item closed.

C. System improvements.

1. The safety inspection plan is revised to include review by top management and a schedule is developed for written response to written recommendations. Item closed.

2. Proper lifting techniques training is included in new employee orientation and affected employee and supervisor training plans. Item closed.

_____ _____

Safety Coordinator Date

Hazard Analysis Worksheet

Describe the Hazard(s):

Hazardous condition(s) - _____

_____

_____

Unsafe/Inappropriate behavior(s) - _____

_____

_____

_____

_____

_____

_____

_____

_____

Possible Accident Type(s): _____

_____

_____

Risk: Justify the estimated risk using the criteria below.

Exposure: (circle one) **High** **Moderate** **Low** What is the frequency and duration of physical/environmental exposure?

Probability: (circle one) **Certain** **Highly Likely** **Likely** **Unlikely** What is the likelihood of an accident occurring when exposed?

Severity: (circle one) **Minor Injury** **Serious Injury** **Fatality** How serious will the injury or illness be when exposed?

Overall Risk: (circle one) **Extreme** **High** **Moderate** **Low**

Sample Personal Protective Equipment (PPE) Walkthrough Survey and Certification

Department _____ Task _____ Date _____

Assess each task for hazards using the following criteria: (1 ***Type of injury or illness*** possible; (2 ***Probability*** - unlikely, likely, highly likely; and (3 ***Severity*** - death, serious injury/illness, not serious injury/illness.

1. ***Sources of motion*** - machinery, processes, tools, materials, people etc. _____
_____
Required PPE: _____

2. ***Sources of high temperatures*** - that could cause burns, ignition, injury to eyes, etc. _____
_____
Required PPE: _____

3. ***Sources of chemical exposure*** - splash, vapor, spray, immersion, etc. _____
_____
Required PPE: _____

4. ***Sources of harmful atmospheres*** - dust, fumes, gasses, mists, vapors, fibers, etc. _____
_____
Required PPE: _____

5. ***Sources of light radiation*** - welding, brazing, cutting, furnaces, heat treating, high intensity lights, etc. _____
_____
Required PPE: _____

6. ***Sources of falling objects*** - materials, equipment, tools, etc. _____
_____
Required PPE: _____

7. ***Sources of sharp objects*** - which could pierce the skin - feet, hands, face etc. _____
_____
Required PPE: _____

8. ***Sources of rolling or pinching that could crush*** - hands, feet. _____
_____
Required PPE: _____

9. ***Layout of workplace and location of co-workers*** - adequate space for task. _____
_____
Required PPE: _____

10. ***Sources of contact with electricity*** - wires, grounding, _____
_____
Required PPE: _____

I certify that I have conducted a workplace survey on the above task to assess the need for personal protective equipment. The personal protective equipment noted above will be required while performing this task.

_____ _____

Signature Date

GENERAL SAFETY PRACTICES

BODY MECHANICS

1. Use proper muscle groups and distribute the workload.
2. Both hands are used to pick up heavier objects.
3. Lifting heavy objects alone is avoided. Help is requested.
4. Pushing is preferred to pulling.
5. Leg muscles are used to lift heavy objects rather than back muscles.
6. Bending and unnecessary twisting of the body for any length of time is avoided.
7. Work is done at the proper level.
8. Two people carry long pieces of materials.
9. Do not lift heavy loads above shoulder level.

PERSONAL PROTECTION

1. Confine long hair so that it is not exposed to machinery and does not interfere with vision.
2. Require the wearing of safety goggles, glasses, or other eye protection when there is a danger of eye injury.
3. Provide respirators for use where harmful dusts or fumes exist (see WISHA rules). ** Respirator use requires appropriate certification, fit testing, and supervision to insure that there is proper fit, training, and inspection are all taking place.
4. Determine the physical defects and limitations of all students so that they will not be assigned tasks detrimental to their health or physical condition.
5. Prohibit the wearing of loose clothing in the laboratory and shop areas.
6. Require students to remove rings and other jewelry while working in the laboratory and shop areas.
7. Where noise levels are excessive over long periods of time, ear protection should be worn.
8. Protective apparel, including safety shoes, aprons, shields, and gloves, are worn properly as required by the nature of the task.
9. Provisions are made for cleaning and sterilizing respirators, masks, and goggles.
10. Head protection is worn in all areas where there is danger of falling and/or flying objects.

FACILITY CONDITION

1. Aisles, machines, benches, and other equipment are arranged to conform to good safety practices.
2. Stairways, aisles, and floors are maintained, clean, dry, and unobstructed with no protruding objects.
3. Walls, windows, and ceilings are clean, maintained in good repair, and free of protrusions.
4. Illumination is safe, sufficient, and well placed.
5. Ventilation and temperature controls are proper for conditions.
6. Fire extinguishers and other necessary fire equipment are properly selected, adequately supplied, properly located, inspected, and periodically recharged as required.
7. Exits are properly identified and illuminated.
8. Lockers and drawers are clean, free of hazards, and doors kept closed.
9. Personnel know the procedures for notification of fire and evaluation of premises.
10. Laboratories and workplaces are free from excessive dust, smoke, and airborne toxic materials.
11. Utility lines and shutoffs are properly identified.
12. Stairways, floor openings, and overhead storage areas are properly guarded with rails and toe boards and have the proper clearances.

HOUSEKEEPING PRACTICES

1. Provide for the storage and daily removal of all sawdust, metal cuttings, rags, and other waste materials.
2. Provide properly marked boxes, bins, or containers for various kinds of scrap stock and rags.
3. Utilize sturdy racks and bins for material storage, arranged to keep material from falling on students and to avoid injuries from protruding objects.
4. Employ a standard procedure to keep floors free of oil, water, and foreign material.
5. Provide for the cleaning of equipment and facilities after each use.
6. Provide regular custodial service in addition to end of class cleanup.
7. Prohibit the use of compressed air to clean clothing, equipment, and work areas.
8. Keep walkways and work areas free of all obstructions.
9. Floor surfaces must be maintained in a “nonskid” condition.
10. Tools and materials are stored orderly and safely.
11. File cabinets and other tall cabinets are required to be anchored.

EQUIPMENT

1. All equipment should be operated in accordance with specifications as stated in the owner's manual.
2. Machines and apparatus are arranged so that operators are protected from hazards of other machines or passing individuals.
3. Point of operation zones are properly identified and guarded.
4. Permanent enclosure guards properly protect pulleys, gears, and belts.
5. Guards are removed only for repair purposes and then replaced immediately.
6. Equipment control switches for each machine are easily available to the operator.
7. Machines are turned off when the instructor is out of the room and/or if the machine is unattended.
8. Proper cleaning equipment is used (avoid air for cleaning purposes).
9. Nonskid areas are maintained around dangerous equipment.
10. A preventive maintenance program is established for all equipment.
11. Machines are guarded to comply with WISHA code.
12. Cutting tools are kept sharp, clean, and in safe working order.
13. All hoisting devices are maintained in a safe operating condition and specified load ratings are easily identified.
14. Machines that are defective or being repaired are clearly marked and made inoperable by locking out the machine power switch.
15. Machines and apparatus are marked with proper color code.
16. Equipment cords and adapters are maintained in a safe working condition.
17. Adjustment and repair of any machine is restricted to experienced persons.
18. Ladders are maintained and stored properly.
19. Machines designated for fixed location are securely anchored.

RECORDKEEPING

1. Always keep an adequate record of accidents and report it through proper channels in your district.
2. An analysis of accidents is made for the purpose of corrective action.

HAND TOOLS

1. Instruct students to select the right tools for each job.
2. Establish regular tool inspection procedures to ensure tools are maintained in safe condition.
3. Instruct students in the correct use of tools for each job.
4. Provide proper storage facilities.
5. Do not lay tools on operating machinery or equipment.
6. Keep tools out of aisles and working spaces where they may become tripping hazards.
7. Do not put sharp objects or tools in pockets. This could result in cuts or being stabbed.

The Safety Audit

The safety audit evaluates design and performance

This process looks at indicators to more accurately determine if the safety management system is adequately designed and effectively performing to identify and control the hazards found during the safety inspection. Indicators evaluated include:

1. **Knowledge, attitudes.** Analyze what employees are thinking by conducting a survey. Full knowledge, positive attitudes, high trust and low fear indicate effectiveness.
2. **Behaviors, actions.** Observe both employee and manager behaviors. Consistent appropriate behavior and adherence to safety and health rules, indicate effectiveness.
3. **Standards.** Analyze system inputs - policies, plans, programs, budgets, processes, procedures, appraisals, job descriptions, rules. Informative/directive, clear, concise, communicated inputs indicate probable effectiveness.
4. **Results.** Analyze accident trends, MOD rates, etc. Continually improving results indicate effectiveness.

The audit is an evaluation

An evaluation requires some kind of judgment about quality. Therefore, a simple yes/no response commonly used in the safety inspection procedure is not adequate. The audit requires a rating of some kind. Below is a sample rating system that can be used with an audit.

5- Fully Met. Analysis indicates the condition, behavior, or action described in this statement is fully met and effectively applied.

3- Mostly Met. Analysis indicates the condition, behavior, or action described in this statement is adequate, but there is still room for improvement.

1- Partially Met. Analysis indicates the condition, behavior, or action described in this statement is partially met. Application is most likely too inadequate to be effective.

0- Not Present. Analysis indicates the standard, behavior, or action described in this statement does not exist or occur.

Sample Safety Audit

Program Element – Hazard Identification and Control

1. ____ An annual baseline hazard assessment has been conducted.
2. ____ Effective management controls are in place, as needed.
3. ____ Safety and health rules are written and clearly communicated.
4. ____ Employees are adequately trained on all safe work practices.
5. ____ Personal protective equipment is effectively used as needed.
6. ____ Effective preventive and corrective maintenance is performed.
7. ____ Emergency equipment is well maintained.
8. ____ Engineered hazard controls are well maintained.
9. ____ Supervisors, managers and the safety committee conduct inspections.
10. ____ The organization is prepared for emergency situations.
11. ____ The organization has an effective plan for providing competent emergency medical care to employees and others present on the site.
12. ____ An early-return-to-work program is in place at the facility.

Safety Committee - Hazard assessment and control.

1. ____ Is the safety committee assisting in evaluating the employer's safety and health program?
2. ____ Are established procedures that identify safety and health hazards in place?
3. ____ Are workplace inspections by the safety committee conducted at least quarterly?
4. ____ Does the safety committee use the results of the inspection to make recommendations?
5. ____ Does the inspection team include employer and employee representatives?
6. ____ Does the inspection report locate and identity of the hazards and make recommendations?

Key to Workshop Quiz

1. According to the text, these must be present to have an accident: c
2. According to a SAIF Corporation study, the hazardous conditions account for ______ % and unsafe behaviors _____ % of all workplace accidents. 3, 95
3. Which of the following describes a symptom pointing to possible root cause? a
4. Which of the following is considered a root cause or system weakness? c
5. The primary objective of an incident/accident analysis is to fix the: system
6. According to the text, working within arms length of an unguarded saw would be considered: a
7. Which of the following is considered an engineering control? b
8. Which of the following is considered an effective management control? b
9. This hazard type is responsible for about 45% of all injury claims in Oregon: c
10. Why are engineering controls so important? hazards, exposure

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