

Safety Industry Manual



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Introduction

This basic safety and health manual for Ohio industry summarizes accident-prevention principles and techniques used successfully throughout the industry. While the application of these principles and techniques may vary according to the size and nature of your company's operations, the basic principles remain the same. Thus, you can use this reference manual year after year as a guide to managing your organization's safety processes.

This manual is not all-encompassing. It is not a compliance document. Safety and health programs must be individualized to meet the needs of each work place.

Safe and efficient operations invariably go hand-in-hand; both are products of good management. They result from the recognition and fulfillment of management and employee responsibilities. Everyone in the organization is a member of the team.

To learn more about safety services offered by BWC, log on to ohiobwc.com, or call 1-800-OHIOBWC to request a Safety Services Catalog.

However, safety isn't the only thing you can do to reduce your workers' compensation costs. You also can lower your costs by proactively managing your workers' compensation claims. This includes incident investigation, early reporting of injuries and working with your BWC employer services specialist and claims service specialist.

Please join BWC's Division of Safety & Hygiene and the Ohio Society of Safety Engineers in making occupational safety and health a way of life at your organization.

Safety and health responsibilities, and work practices

No business concern can expect to have good safety performance unless its president, chief executive officer or owner demonstrates through personal leadership and specific, regular activities that safety is a key value within the organization. The leaders also must communicate the need for all employees to understand the safety-related processes and procedures, and to actively participate in the organization's safety programs.

Experienced managers know occupational safety and health is good business. It is good business to establish and follow through on policies, procedures and practices that communicate to every member of the work force that safety and health is a primary responsibility, as are quality and cost-effectiveness.

Safety and health program, the term used to describe the whole of safety and health activities, is a combination of many policies, processes, procedures, actions and decisions. Concerted leadership and effective execution of each element of the overall program are essential to good safety and health performance. This performance pays off for the employer and employee. It improves production, increases efficiency, enhances employee morale, lowers workers' compensation costs and keeps employees on the job.

Each day the management of every business organization confronts a multitude of problems that require immediate attention. In the presence of such daily emergency problems, it is tempting to defer or overlook safety and health activities. When this occurs, it is likely that accidents and mistakes will increase significantly. As a result, unit compensation and claims-management costs, profitability and quality are adversely affected.

Company representatives throughout Ohio need to manage the safety processes within their organization. Management must realize it is critically important that it provides the leadership that ensures program effectiveness.

Employers must become familiar with the various laws that pertain to safety and health in their workplaces. These laws define the duties, actions and precautions all employers must take, as a minimum, to ensure the safety and health of their employees. For example, employers must comply with the federal Occupational Safety and Health Administration's (OSHA's) standards for general industry, (29 CFR Part 1904 and 1910) and construction (29 CFR Part 1926). State, regulations include the Ohio Administrative Code (OAC), and Specific Safety Requirements of The Ohio Bureau of Workers' Compensation Relating to Construction and to All Workshops and Factories, with supplemental codes relating to specific industries. In addition, companies must be familiar with other regulations and codes, such as the those of Environmental Protection Agency (EPA), and state fire and building codes.

Well-written safe work practices, long recognized as important in communicating expected safe behaviors and procedures:

- Provide guidelines for controlling potential hazards;
- Communicate your company's accident-prevention policies;
- Contribute useful information during training.

Every business, regardless of size, needs to develop safe work practices and communicate and publish them to the employees. It also may be necessary to develop safe work practices that apply only to specific company subdivisions

or departments, depending on the nature of work, hazards present or availability of control technology. However, safe work practices are a supplement to other management actions, such as good workplace design and integrating safety into all job functions. An overemphasis on rules and standards may limit a company's potential for achieving high-level safety performance.

When developing safe work practices, it is important to develop work practices that are reasonable and specific. A practice that you cannot enforce will potentially impair the effectiveness of other safe work practices. Equally significant, if you can effectively remove or control the hazard, you may also be able to eliminate the need for a safe work practice.

An excellent technique for developing safe work practices is to have those who are involved with company operations — supervisors and employees — help to develop their own safe work practices. People tend to buy in more when they are involved with the process. This participation also helps educate the participants on potential accident causes and methods of control or elimination.

Write safe work practices using easily understandable language and a positive approach. Whenever possible, state what to do, rather than what is prohibited. For example, say, "Use a

lifting device to move the ...," rather than "Don't lift the device without using a" Give new or transferred employees a copy of the general safe work practices and any department-specific safe practices they may need to understand and follow to do their job without injury or illness.

Training should be a continuing process. Supervisors should frequently review general and department-specific safe work practices with employees. Supervisors and employees performing maintenance or service work should be familiar with the safe work practices of all departments.

Give special attention to developing safe work practices for the operation of dangerous equipment where there are only a few skilled operators, or for work involving extremely hazardous conditions or environments. In such cases, effective education and training is extremely important, in addition to having the correct safe work practices in place. Although training is an essential part of any occupational safety and health program, it should not substitute for a policy of eliminating hazards in the workplace whenever possible.

Once you develop safe work practices, do not consider them being cast in stone. Review and revise them on an ongoing basis to keep them up-to-date and to retain their intended effectiveness. Accidents or illnesses also may reveal the need to manage the work environment differently.

Chapter 2

Accident investigation

Accident investigation is primarily a fact-finding procedure; use the facts revealed to prevent recurrences of similar accidents. Properly handled, accident investigations also can increase the safety and health awareness for employees, and build rapport between the supervisor and the injured or ill employee.

You reduce injuries and illnesses by eliminating hazardous situations. Although it may be difficult to eliminate all accidents, it is easier and much more cost-effective to eliminate and reduce hazards than it is to teach employees to accommodate hazards within the work environment.

Reducing hazards to the minimum is important. You can accomplish this through modifying equipment, installing guards, improving material handling procedures, and by substituting less hazardous processes and chemicals. Identifying accident causes and implementing corrective actions is the objective of an effective accident investigation. Examples of areas to probe include: unsafe or hazardous conditions, poor decisions or behaviors, a lack of accountability, poorly defined responsibilities, inadequate or nonexistent procedures.

Even minor injuries can reveal accident causes, which, if corrected, can prevent other more serious injuries. Therefore, investigate close calls, minor and non-disabling injuries and illnesses with the same vigor and thoroughness as serious injuries.

Fact-finding is the principal purpose of accident investigations. Identifying all pertinent factors (multiple causes) that allow incidents to occur is important. Well-done accident investigations help to prevent future accidents, create educational opportunities, show organizational concern and build trust with employees.

Immediately after an accident:

- Ensure any injured or ill employee receives medical care immediately;
- Start the accident-investigation process promptly;
- Maintain conditions at the accident scene, as much as possible;
- Involve the right people — supervisor, employee, witnesses and others;
- Form a fact-finding committee in the event of very serious accidents.

At a minimum, assemble the following information:

- Injured employee's name;
- Date and time of injury;
- Occupation and task being performed when injured;
- Shift;
- Department;
- Employee's address;
- Sex;
- Age or date of birth;
- Social Security number;
- Length of service with employer;
- Length of time on this job;
- Time shift started;
- Physician and hospital name;
- Type and extent of injury;
- Description of accident or illness scenario;
- Analysis of all causes contributing to the accident or illness;
- Recommended corrective actions along with responsible persons;
- Injured or ill employees' statements;
- Witnesses' statements;
- Name of person completing form and date.

Use accident-investigation information from all accidents to present a complete picture of how safety in the work environment is managed and what changes might be necessary. Then, develop appropriate justification for addressing the causes of accidents or illnesses and preventing future occurrences.

Management review of accident-investigation reports ensures the development of all pertinent information and a course of remedial action. Accident-investigation reports are informative for upper-level executives. Access to accident-investigation reports keeps them informed, allows them to ask why the incident happened and lets them know the steps taken to prevent the incident from happening again. Provide copies of reports to those directly involved in making necessary corrective changes, such as maintenance staff.

Investigation reports may include photographs, drawings or other information to help clarify the facts of the accident. Include detailed statements from witnesses, as well as others who can provide information.

Experience shows the greatest deficiency in accident investigations is lack of follow-up action to correct the conditions and/or behaviors that led to the accident. A good accident-investigation report specifies corrective actions, identifies who will be responsible for taking action, and sets target dates for completion. Thereafter, the responsible member of management should follow up to ensure the completion of corrective action.

After completing the investigation and initiating corrective action, provide a summary of the accident sequence, causes and corrective measures to the employees working in the accident area. Also, provide this information to employees on similar operations. Assign this responsibility either to the supervisor or employee work team members. The purpose is threefold:

- To provide additional safety training;
- To make operational changes based on the facts involved in the accident;
- To let employees know that the company cares about their safety and health.

One final point — encourage employee suggestions concerning safety and health issues and ask them to participate in the accident-investigation process. Seek out opportunities for employee involvement.

Design and inspection of new and rebuilt equipment

It is important to consider potential safety and health hazards associated with new or rebuilt equipment before purchasing or modifying it. Making modifications after the equipment is put into use is usually more difficult and costly.

Becoming involved early in the purchasing or rebuilding process makes good safety and health sense because:

- Equipment installed without adequate safeguards may result in a serious injury before you add proper safeguards;
- Poorly designed equipment may result in added costs and could cause human suffering that is otherwise avoidable;
- The company could be in violation of OSHA regulations and the state's safety codes;
- The company could incur increased costs associated with workers' compensation.

It is prudent to have bid invitations and purchase orders that state clearly the equipment must incorporate all safeguards required by laws, codes and regulations. Discuss this matter thoroughly with the company purchasing agent and legal counsel. Clearly explain additional safeguards considered necessary by the employer on the invitation to bid and the purchase order.

Experience with similar equipment, accident records, and safety and health regulations provides guidance for requiring the appropriate integration of safeguards into new or rebuilt equipment. Management also should upgrade existing equipment to include safety features whenever repairing or modifying existing equipment.

Keep management personnel responsible for designing and contracting for new facilities informed of accidents following failures or deficiencies of equipment and of new developments in safety-engineering standards, including federal, state and municipal safety rules and regulations.

After installing new equipment or altering existing equipment, conduct an operational safety review prior to releasing the equipment for operation. A management representative responsible for overall safety at the plant, the maintenance or engineering supervisor responsible for the equipment, and the production supervisor and employee who will operate the equipment should conduct this review.

Correct all safety deficiencies before you permit workers to operate the equipment. Accident prevention through the elimination of equipment hazards or unnecessary exposures is much more cost effective than assuming employees will avoid the hazards; the safety of employees also is more certain.

Chapter 4

Safety and health meetings

The purpose of employee safety and health meetings is to discuss significant safety and health information needed to prevent occupational accidents or illnesses. These meetings are usually convened by the supervisor with all employees present.

Work unit meetings are not intended to become or replace operating safety committees. Effective safety meetings can help to develop understanding, create commitment and allow employees to participate in your organization's occupational safety and health process.

Using safety and health meetings also can assist in developing a sense of teamwork. Safety and health meetings provide the opportunity for employees and supervisors to engage in give-and-take discussions on a variety of safety and health topics. Providing how-to information and engaging in healthy dialogue about workplace safety and health issues helps workers perform their jobs safely and encourages teamwork. Effective meetings promote cooperation and reinforce important safety and health operating philosophies and practices.

Safety and health meetings are important in getting employees actively involved in the company's efforts to maintain a safe and healthful working environment. Safety meetings can involve requesting employee ideas about safety policies and procedures, setting up employee teams to develop safe work practices or encouraging employees to report unsafe procedures, processes and conditions. Supervisors also can ask workers for their ideas on how to solve specific problems. The supervisor's ability to develop and conduct interesting and rewarding meetings is only limited by his or her own creativity.

Effective safety and health meetings stimulate employees to think about safety and health concerns. It is best to have an established schedule of regular meetings. You can use discussion items and topics, such as those contained in the *Safety Leader's Discussion Guide* to plan meetings and as an outline for discussion. Develop plans before meetings with the intent to foster maximum employee participation, to cover issues thoroughly and to determine courses of action. But like most activities involving people, issues are likely to surface unexpectedly. For this reason, maintain a flexible approach if unexpected issues arise.

Successful meeting tips

- Schedule meetings on a regular basis, such as once a week, twice a month etc.
- Plan for 15 to 45 minute meetings, and keep the discussion on track.
- Review the talk in advance so it will be in your own words.
- Use the *Safety Leader's Discussion Guide* (available at no charge).
- Encourage employee participation. Ask questions and ask for suggestions.
- Seek out quiet areas away from noise and traffic. Make it easy to see and hear.
- Devote meetings exclusively to health and safety matters.
- Use visual aids that enhance, but don't replace the supervisor's oral presentation.
- Preview visual aids before the meeting, and prepare introductory remarks.
- Prepare and distribute a meeting summary to attendees and others, as appropriate, include:
 - The date and time;
 - Location;
 - Subjects covered;
 - Suggestions or comments from employees;
 - Action plans and responsibilities;
 - Questions to be answered at the next scheduled meeting;
 - Attendance roster, and name of the person conducting the meeting.
- If the safety discussion involves an accident or illness, focus the discussion on the facts surrounding the incident, the injury and the causes that allowed the incident to occur.
- Discussion of a failure to adhere to a safety procedure should cover why such behavior is wrong, the potential hazards and constructive discussion on how to correctly follow procedures.
- Discussion involving work being planned should include potential hazards, developing suggested engineering approaches to reduce risk, identifying safety equipment to be used and developing basic safe operating procedures. This is an excellent opportunity to involve the workers in the planning process.

It is important that all operating unit members know they are part of the occupational safety and health team. Recognizing that you count on each one to contribute to the success of the team can stimulate ideas and energies that will help strengthen each person's commitment to making the workplace as safe a possible. Achieving teamwork requires active cooperation and involvement on the part of both the employees and management.

Employee safety and health training

Safety and health training provides specific instructions to employees so they can perform their jobs in a safe and healthful manner. Safety and health training also is intended to impart knowledge so workers can identify workplace hazards and initiate changes themselves. Creating interest, commitment and awareness is the challenge those involved in training must successfully meet.

Orientation

Begin safety and health training during orientation, when a person is transferred to another department or when learning a new job. Cross-training can be extremely important for your safety and health when employees are temporarily transferred to other departments.

Each supervisor should have a procedure for educating workers in the department's safe work practices and for following up to ensure the education process was successful. While a good safety orientation program can help shape a new employee's perspective on job safety, supervisors often neglect to take advantage of this opportunity.

An effective technique often used during orientation involves following a check list containing specific items for discussion. Supervisors may find using a check list especially helpful.

Consistency and confidence in the training are beneficial in this or similar methods. A well-planned and well-executed safety orientation forms the foundation for each individual's future safety and health performance. Each supervisor should ensure new employees receive a copy of specific safe work practices and procedures. The supervisor also needs to ensure the new employee understands the safe work practices and procedures.

Steps to conducting effective job safety training

- Explain the objective of the safety training and the reason why the training is important to the employee. A person's interest in learning will increase if he or she understands why it's important and what's in it for him or her.

- Break down the total job or procedure into specific parts and identify each key step. You can use this breakdown as a detailed outline to help guide workers through a job or procedure. By understanding how safety integrates into each step of the job, workers learn to perform their work safely and correctly. Job safety analysis (JSA) training is a method you can use for this breakdown. (Refer to Chapter 8 on JSA).
- Demonstrate the proper way to do the job or procedure. Merely explaining how to do a particular task safely is usually insufficient. Do a step at a time, pausing to emphasize the key points before proceeding. Encourage the employee to ask questions at each stage, making sure he or she fully understands.
- Ask the person to perform the job or procedure, describing at each step, not only what he or she will do, but also why. By letting an employee recite and perform the job, you will learn if the person understands and can perform the task safely.
- Return periodically to see how the worker is doing and to see if he or she has any questions or problems. The follow-up process is an essential element, since early identification and correction of improper work procedures will help an employee develop safe and efficient work habits.

Supervisors should continue safety and health training on a regular basis. Regular training might include monthly safety and health meetings, regular personal safety contacts, safety training related to changes in work processes or procedures, or safety training related to the nature of the work and safety compliance, such as hazard communication, lockout/tagout, confined spaces, fire safety and emergency procedures.

To assist a supervisor with safety training, the Division of Safety & Hygiene offers a variety of training materials, formal training courses — in Columbus and across the state — and customized training services. Resources also include a comprehensive library, publications and videotape loan services. In addition to these services, the division's *Safety Leader's Discussion Guide* is an excellent resource for preparing monthly safety talks.

Chapter 6

Fitness for duty program

The goal of a fitness-for-duty program is to determine, on a regular basis, that employees are physically capable of executing their jobs and that their health concerning their job is being maintained.

An effective fitness-for-duty program reduces the risk of work-related injuries and illnesses, and may improve productivity and efficiency by helping employees maintain an awareness of their health status. It also develops a motivation to improve their level of health.

The components of the health evaluation will vary somewhat according to the nature of the individual's job and the specific reasons for the health exam. For example, employees who wear a respirator need to have a health exam that not only reviews their general health condition, but also focuses on the respiratory and cardiovascular systems.

All health evaluations include a medical history. This is an important part of the examination because it provides the physician with information that reveals an employee's health history and basic health state. This informa-

tion allows the physician to probe for specific information to obtain a deeper understanding of the employee's health status. Additionally, it is essential that the physician have a thorough understanding of the job functions and the physical requirements of the job to conduct a credible review of the individual's health status in relation to the job.

A variety of guidelines are available to guide physicians when conducting health examinations. OSHA outlines specific medical management requirements in many of its health standards, such as Bloodborne Pathogens, Asbestos and Respiratory Protection. The American College of Occupational and Environmental Medicine also provides excellent guidelines.

It is very helpful if you provide all job applicants health evaluations after they have been hired, but before starting their jobs. The health evaluation will serve as a baseline examination against which you can compare future information.

In addition, the health evaluation might reveal a potential problem previously undetected. The idea is not to place an employee into a job setting where a physical condition might help to precipitate an injury or illness. Instances where this could cause a problem include:

- Identification of a heart murmur or other cardiovascular condition when the employee's job involves heavy physical exertion on a regular basis;
- A spinal condition developed at birth that could predispose the worker to a severe back injury;
- A physical or psychological condition that makes wearing a full face piece respirator a high risk to the wearer.

When learning of such conditions, management must attempt to make reasonable accommodations so the worker can continue to be productively employed.

Health evaluations also may identify individuals who are unfit for the job due to use of mind-altering substances or excessive alcohol usage. Discussion of such findings is beyond the scope of this section. However, your company may use employee assistance programs (EAPs), or may elect to refer the individual to specialists who may be able to help the individual with the problem.

You can schedule health evaluations on an annual basis. Instances may include:

- Following extended absences due to illness or injury;
- Every two years for all operators of in-plant and over-the-road vehicles;
- When employees are potentially exposed to hazardous substances;
- After a possible bloodborne pathogen exposure;
- To determine if an employee can return to work;
- To place an employee in a modified-duty position;
- When identifying reasonable accommodations;
- Audiometric testing for workers in a hearing conservation program;
- When employees must wear respiratory protection devices.

Employees often view health evaluations as a benefit, especially if the company is willing to provide a copy of the health evaluation to their personal physician. For a variety of reasons, health evaluations add an important element to the accident-prevention process.

Treatment of sick or injured employees

Report all work-related injuries and illnesses, regardless of severity, to management immediately, and make sure employees receive prompt, competent first aid or medical care as necessary.

Depending upon the size of the company, health services can range from qualified volunteer first aid providers to a complete company-administered medical facility. In the case of first-aid providers, the company should ensure they are trained and certified in both first aid and CPR.

Whether a company uses first-aid volunteers, designated responders or a medical clinic, you should develop and implement a medical-emergency response plan. To implement a plan successfully, it is important that employees be familiar with the medical emergency plan. If possible, practice the plan on a routine basis, perhaps semiannually.

Have the medical emergency response plan contain:

- Emergency telephone numbers;
- Roles and responsibilities for those providing first aid;
- Identification of all types of medical emergencies;
- Training in the techniques to prevent the transmission of bloodborne pathogens;
- The emergency medical response process for each type of medical emergency (this should include identifying the treatment provider, such as the hospital, clinic, physician, and the method of transportation);
- How to report and document the medical incident and response.

Make first-aid supplies available to workers; a physician needs to approve these supplies, and you must inspect them on a monthly basis and replenish as necessary.

Training

The company must ensure those individuals who will provide emergency medical assistance are trained in providing first aid and in preventing the transmission of bloodborne pathogens. Conduct training at the time of employment and annually thereafter.

At a minimum, training should consist of the following:

- A copy and explanation of the bloodborne standard (29 CFR 1910.1030);
- The causes and symptoms of bloodborne diseases;
- Disease transmission modes;
- The company's exposure control plan and how to obtain a copy;
- The recognition of the tasks and activities that might cause exposure to infectious materials;
- The methods that will prevent or reduce exposures, including engineering controls, work practices or personal protective equipment (PPE);
- The use, location, removal, handling, decontamination and disposal of PPE;
- The reasons for selecting PPE;
- Information on hepatitis B vaccine;
- What to do in case of contact with blood or other potentially infectious materials;
- Post-exposure evaluation and follow-up actions required following exposure;
- Signs, labels and color-coding requirements.

Medical Treatment Request

Completed by supervisor	Date:	Dept. and location:	Supervisor:	Phone and extension:		
	Employee's name:					
	Social Security number:					
	Nature of clinic visit/description of incident:					
Completed by physician/occupational nurse	Diagnosis:					
	Describe treatment:					
	Physician to whom referred:		Hospital:			
	Follow-up treatment date/location:					
	<input type="radio"/> Able to return to work but with restrictions noted		<input type="radio"/> No duty until			
				Temporary		
Work restrictions — (Completed by physician/occupational nurse)	A. No temperature extremes		<input type="radio"/> Hot	<input type="radio"/> Cold	until	
	B. Work limited to		hours per day		until	
	C. No climbing (ladders, racks, etc.)		<input type="radio"/> Yes	<input type="radio"/> No	until	
	D. No operating moving machinery and/or vehicles at work				until	
	E. Walking and standing combined not to exceed				until	
	F. Stooping and/or twisting				until	
	1. Occasional		2. None permitted		until	
	G. Lifting				until	
	1. Weight:				until	
	2. Height:				until	
	A. To waist		B. To shoulder	C. Above shoulder		until
	3. Frequency:		percent of shift		until	
	H. Pushes or pulls				until	
	1. Limited to		pounds		until	
2. Limited to		percent of shift		until		
I. Chemicals to be avoided:						
J. Other						

Distribution: 1) Physician
2) Occupational nurse
3) Supervisor

This is to certify that I have conducted an examination of the above named employee and I submit herewith my findings and conclusions.

Date	Physician's/Occupational Nurse's Signature
------	--

If referral to a medical provider is necessary, you should use a form similar to the Medical Treatment Request. Use of such a form has shown to greatly improve communications and understanding between all parties (company, physician and employee) and has functioned as a valuable tool to facilitate the medical treatment process. When used with accident-investigation reports and other documentation, the Medical Treatment Request form records the **medical treatment process and augments the workers' compensation process.**

The supervisor initiates the form's usage and the employee can take it with him or her to the physician or clinic. Following treatment, the doctor or nurse completes the form and returns two copies to the company (one for the supervisor and one for the workers' compensation administrator). The employee can hand-carry these copies. In instances involving serious injury or illness, you may dispense at the time of the incident to avoid delay in obtaining treatment. After the situation is in control, you can then complete the form.

It is essential that all employees have a thorough understanding of the accepted procedure for reporting injuries and illnesses, and for obtaining appropriate care. Prompt care can frequently avoid medical complications that might result from apparently minor injuries.

Chapter 8

Personal protective equipment

Each company is responsible for furnishing a workplace free of recognized hazards that can cause serious harm to employees. OSHA's PPE standards require that employers assess their work places to identify any hazards requiring the use of PPE, with written certification to document the survey.

While eliminating hazards in the work environment is important, it may be impossible or infeasible to eliminate all hazards through engineering design, guarding or administrative controls. In such cases, PPE may be necessary.

Examples of the types of PPE covered in the OSHA PPE standards include:

- Face and eye protection — safety glasses, goggles and face shields;
- Head protection — hard hats and bump caps;
- Protective footwear — safety shoes, rubber boots and metatarsal guards;
- Hand protection — heat or chemical-resistant gloves.

OSHA's PPE standard does not include requirements for respiratory protection (refer to chapter 18), hearing protection (refer to chapter 19) or the construction industry; these areas are covered under other OSHA standards.

The type of PPE required in a given set of circumstances will depend on the specific hazards, the duration of exposure and the intensity of the exposure. It is important to select and have the employees use the proper type of PPE, to protect them from the identified hazard. To be effective, PPE must be readily available, sized correctly and designed for the use intended.

In addition, the proper care of PPE ensures against damaged or defective equipment, which increases the protection provided to employees.

PPE for head, feet, face and eyes must meet the requirements of standards of the American National Standards Institute(ANSI).

Training is an important part of any PPE program. Safety footwear, safety eyewear and hard hats may require only a 10-15 minute training session to explain the objectives, policy, responsibilities and procedures. On the other hand, PPE such as respiratory protection devices or hearing protection (both covered under separate OSHA standards) requires more extensive education and training.

Finally, document all safety and health training activities with the following information:

- Date and time;
- Subject and instructor;
- Outline or table of contents;
- Title of video or slides;
- Handouts;
- List of attendees (or sign-in sheet);
- Scores or grades from written exercises.

Training must include: when and what PPE is necessary; how to properly don, doff, adjust and wear PPE; and the limitations, proper care, maintenance, useful life and disposal of the PPE.

Employees must demonstrate an understanding of the requirements and ability to properly use PPE before you give permission to perform work requiring PPE. Inform your employees of PPE selection decisions and ensure they understand the decision logic used. Retrain when changes in the workplace or type of PPE used make previous training obsolete, or when there is lack of understanding or skill demonstrated by employee's misuse of assigned PPE.

Each company must have a written PPE program that accurately describes the safety equipment process.

Written programs should include:

- Objectives;
- Definitions;
- Policies;
- Responsibilities;
- Procedures.

Written programs must include:

- Written certification of hazard assessment;
- Employee training records.

A safety officer or coordinator should direct your company's hazard assessment and oversight of the PPE selection process. Supervisors or team leaders are responsible for ensuring that the correct PPE is available, is functional and is worn correctly. They should let employees know how to replace equipment and what to do if a problem arises with the equipment.

It is important not to overlook the training that each supervisor or team leader needs to function as an effective coach. Supervisors or team leaders in turn need to communicate to employees the importance of correctly using PPE — in formal training, in informal conversation and by example (i.e., wearing the equipment themselves).

References: OSHA 29 CFR 1910.132, 1910.133, 1910.135, 1910.136, and 1910.138

Chapter 9

Job safety analysis

For many years, the technique called JSA has been a simple but effective means of identifying hazards and potential unsafe procedures associated with a specific task or job.

You can use the analysis process to identify hazards and to educate workers in safe procedures. JSA techniques can be a very effective tool for supervisors. The JSA process effectively and efficiently analyzes the job or task and produces detailed information on task-specific accident risks, process improvements and control measures.

When considering where to use the JSA process, analyze first the tasks having the poorest accident experience or those with the greatest potential for injury. By establishing priorities, the JSA process focuses attention on areas that can have the greatest impact on accident prevention.

JSA provides a systematic means to take advantage of workers' previous experience and knowledge. It also increases employee involvement in establishing safety awareness while developing safe work practices.

Accomplishing these objectives requires that:

- Members of management understand the objectives and means of analyzing jobs element by element;
- The JSA process is recognized as an effective tool and incorporated into the regular accident-prevention and safety-management process;
- You develop and implement a correction process that responds to identified problems in a timely manner;
- Supervisors review the results and take action, if appropriate, on all JSAs completed in their work areas;
- Supervisors retain a copy of all approved safe job procedures developed by a JSA;
- You educate and train workers using the information developed through the JSA process;
- Supervisors regularly observe the workers and ensure they use safe work practices.

In practice, this means the person conducting the JSA must competently assess each job element and identify the potential hazards or risks. Assume, for example, that using a pressurized-water fire extinguisher is the task to analyze. (While this is not a work task, it is a well-understood process.) The process might look something like this.

- The first element involves removing the extinguisher from its wall bracket and identifying the potential hazards. Employees should perform the task, if possible, with the supervisor acting as a coach. The supervisor may need to help until the process proceeds smoothly.
- Identify each succeeding element (e.g., carrying the extinguisher to the fire) until you have broken down the entire job into its elements. Again, identify the potential hazards, such as the weight of the extinguisher, and slips, trips and falls.
- After the analysis is complete, list on the JSA form all possible methods or actions associated with each element that would eliminate, reduce or prevent an accident or illness. Agree on which accident-prevention techniques you will use. This is the job outline, step by step, and the associated safe work practices that you need to integrate into each step of the job. This completes the JSA process.

Chapter 23 discusses ergonomics. Often, a task analysis is used during an ergonomic safety and health assessment. The task analysis process uses a similar process as the JSA.

Job safety analysis	Job:	Date:
Title of worker who performs job:	Foreman or supervisor:	Analysis by:
Department:	Section:	Reviewed by:
Required and/or recommended personal protective equipment		
Sequence of basic job steps	Potential accidents or hazards	Recommended safe job procedures

Job safety analysis	Job:	Date:
Title of worker who performs job: Foreman or supervisor: Analysis by:		
Department:	Section:	Reviewed by:
Required and/or recommended personal protective equipment		
Sequence of basic job steps	Potential accidents or hazards	Recommended safe job procedures
<ol style="list-style-type: none"> 1. Remove fire extinguisher from wall bracket. 2. Carry it to fire. 3. Operate the unit to extinguish the fire. 4. Place used extinguisher near exit door of fire area to be picked up for servicing. 	<ol style="list-style-type: none"> 1. Heavy and awkward to handle 2. Weighs 29 pounds 3. Dropping unit 4 Arm strain 5. Back strain 6. Pinch hand on handle 7. Cut finger on pin 8. Shoot water into face 9. Empty extinguishers are easy to upset 10. If upset, they roll and cause tripping hazards 	<ol style="list-style-type: none"> 1. Get a firm grip with both hands before removing to prevent dropping the unit. 2. Lift properly and lower to walking position. 3. Be sure you can carry the unit; if you can't, get help. 4. Walk briskly to fire, being alert for slipping and tripping hazards. 5. Hold to support extinguisher while removing the safety pin. 6. Grip firmly to avoid dropping. 7. Be sure discharge is always directed at the fire area. 8. Place used extinguisher in approved location. 9. Complete any reports required by the company.

Employee safety contacts

A key component of most effective company safety and health programs is a high level of employee involvement, including the management staff. Involvement may take a variety of forms such as educational meetings and discussions, group problem-solving sessions or focus groups, behavior observation programs, accident investigations, safety committees and more. Successful companies use combinations of these or other techniques to include their employees and to integrate the company's safety beliefs and values into day-to-day operations and activities. Another management technique that tends to foster high-level involvement and communication is an employee safety-contact program.

The purpose of employee safety contacts is twofold:

- To provide opportunities for safety and health coaching/guidance to employees;
- To enhance supervisor/employee communication and understanding.

Employee participation usually begins with a safety and health orientation program for new or transferred employees. Following the safety and health orientation, you can employ regularly scheduled meetings or discussions on operational safety and health issues to gain employee input on safety and health issues.

Employee involvement also includes safety and health training in a number of areas pertinent to the job, such as hazard recognition, emergency procedures, hazard communication and PPE. These activities are important for education, training and communication, but generally do not allow for frequent supervisory contact and discussion with employees regarding safety and health issues.

More frequent yet less formal contact with employees has shown to be an effective means of coaching and providing for employee involvement in the safety process.

This one-on-one safety and health communication provides the supervisor with an opportunity to seek employee opinion, clarify expectations and promote understanding and commitment. The organization also benefits.

Productivity and performance improve the most when work is organized so that employees have the training, opportunity and authority to participate in decision making; when they have assurances they will not be punished for expressing unpopular ideas; and when they realize they will not lose their jobs as a result of contributing their knowledge to improve safety and productivity.

Regular safety contacts demonstrate the supervisor's concern and commitment to both the employee and the company. Making safety contacts a part of each supervisor's performance requirements is easy and benefits both the supervisor and the company. The process is easy to manage and requires little, if any, additional training. With the safety contact approach, supervisors set aside five to 15 minutes to discuss safety and health with each employee on a regular basis — weekly, biweekly or at a minimum, monthly.

Discussions can range from training needs to hazard identification, protective equipment to process improvement, workstation redesign to risk assessment. If supervisors involve employees and respond to their questions and concerns in a timely and respectful manner, and if employees feel they have input into decisions that affect them, then a sense of trust and personal ownership begins to develop. Work environments in which both the supervisor and employee feel mutually responsible for safety and health result in improved performance with less lost time due to occupational accident or illness.

The employee safety contact/observation record is an example of one method of recording pertinent information you can use to document the meetings supervisors have with their employees. Other recording systems in use involve pocket cards on which you can record each contact or discussion for tracking purposes

Employee Safety Contact/Observation Record

Supervisor's name: _____ Employee's name: _____ Department: _____

Date	Job or assignment	Type and subject of contact	Comments

Safety observations

Safety observations are excellent tools for the supervisor to identify behaviors, practices or conditions that might place employees at risk and lead to injury or illness. It is often said that safety is just common sense or that safety is intuitively obvious. Yet companies continue to struggle with rising worker's compensation costs and workplace environments that cause unnecessary injuries and illnesses.

Supervisors are burdened with a multitude of operational responsibilities. They might view observing for unsafe behaviors, conditions or practices as one of the more time-consuming responsibility. The fact remains: workplace safety and health is a key supervisory and management responsibility. There is a technique, however, that doesn't add significant amounts of time, yet is effective at preventing accidents. The technique many supervisors have found effective involves supervisor safety observations.

Safety observations are quick, concentrated looks at the work site, 30-45 seconds, to focus just on the safety of operations. You can incorporate conducting safety observations three or four times each day into the normal daily management routine. It adds little cost and effort, but the gains in safety performance can be enormous. A supervisor simply decides to stop to observe strictly for safety behaviors, conditions and practices three to four times each day.

The objectives of a systematic observation process are:

- To observe workers in their work areas;
- To analyze their work performance;
- To correct and prevent unsafe behaviors, conditions or practices;
- To take steps to prevent repeated occurrences.

The supervisor should observe for these kinds of behaviors:

- People reacting to the supervisor's presence by quickly adjusting PPE, changing positions or stopping the job;
- Workers using the correct PPE that it is maintained and is appropriate for the hazards;
- Employees using the proper tools correctly and maintaining them in safe condition;
- Workers following established safe work practices or identifying practices that need updating, or where safe practices need developed and implemented;
- People in positions where they could strike against, be caught in, under or between, or be struck by equipment; contact temperature extremes or electrical current; be affected by hazardous substance inhalation or absorption; or encounter ergonomic problems of overexertion or repetitive motions.

After observing unsafe behavior, take action to stop improper practices or behaviors, and take measures to prevent reoccurrence. Key to the success of the observation process is what supervisors do when they make observations. If a worker is using the correct behavior or practice, then the supervisor must personally recognize and positively reinforce that behavior. If, on the other hand, the supervisor observes an unsafe behavior, it is important that he or she take immediate action to stop the process or practice, help the worker understand the correct method and why the need for a different behavior, and then follow up to see if changes have been made.

Action must be immediate, but to maximize effectiveness, discussions should remain positive and constructive. This is not the time for fault-finding.

Supervisory safety performance

Effective organizational safety performance depends on a variety of factors. Company values and beliefs play a significant role in establishing the culture of the organization. In turn, if the organizational culture supports the belief that identifying and managing risk through effective safety approaches, the likelihood increases for development and use of effective safety processes to prevent injuries and illnesses.

Senior management's leadership and actions will generally indicate the level of importance the organization places on managing the safety process and accident prevention.

That level of importance greatly determines the safety culture and whether or not the company views accident prevention as a priority for maintaining profitability and preserving valuable human resources.

Supervisory performance is driven by many factors. Generally, if individual supervisor's performance measures include safety, as well as quality and production measures, then it is likely that supervisors will devote time and resources to the safety process. Moreover, if the supervisor's manager also believes that actively managing the accident-prevention process is important, then the potential for excellent results in supervisory safety performance will be high. Important also is the availability of resources, such as, education and training opportunities, qualified maintenance staff, safe and effective workplace design and PPE.

These resources help to enhance the supervisor's effectiveness in integrating safety performance into day-to-day functions.

Including safety as a key factor on supervisors' and managers' performance appraisals sends a clear message that the organization believes managing risk, and preventing accidents and illnesses in the work environment is important.

The adage, "What gets measured, gets done," certainly is accurate in this area. To ensure supervisors perform specific safety-related activities regularly, identify and agree on the activities for which you will hold the supervisor accountable. The supervisor's immediate manager helps the supervisor identify the safety activities and functions to be accomplished in the future. The supervisor and the manager should mutually agree on what activities the supervisor will undertake during the next performance period.

Whether the organization uses a management by objectives approach or a prescribed approach, it is important that both the manager and the supervisor agree on what activities the supervisor will use in fostering safety in the work environment.

Measurable activities supervisors can use include, but are not limited to:

- Conducting win/win safety meetings quarterly with each staff member;
- Involving staff in area safety audits regularly;
- Identifying and correcting hazards and poor practices;
- Orienting new or transferred staff on safe work practices and procedures;
- Educating the staff in safety and health matters;
- Involving staff in safety programs or using labor/management safety committees;
- Investigating accidents or near accidents promptly and taking corrective actions;
- Using JSA techniques;
- Resolving major safety-related issues, such as projects or redesign work;
- Conducting tool box safety education meetings;
- Conducting safe behavior observations daily to identify/correct unsafe behavior, or to recognize safe behavior;
- Using safety perception surveys to identify areas for improvement;
- Using positive reinforcement techniques to develop and maintain safe behaviors;
- Using safety tipping techniques when assigning job tasks;
- Participating in safety education courses or seminars on specific topics.

Conduct performance evaluations for supervisors at least annually. However, a better process would involve quarterly progress discussions with the manager and using the fourth quarterly evaluation as the annual performance review. In this way, surprises should be minimal, progress steady and results positive.

Supervisors and managers must be accountable for all aspects of their operation, including safety and health. Safety is a line-management function and cannot be delegated to a staff person. You can characterize the safety director's role as a technical resource who provides support to management and workers. Staff safety people are not responsible for other department's safety performance, no more than they are responsible for the payroll function.

Six keys to success

1. Senior management must provide leadership through active and visible participation in the safety process and programs. Senior leaders must model and foster safe behaviors.
2. Middle management must perform some safety-related activities and be responsible for guiding supervisory safety performance.
3. Supervisors must actively participate in, and lead the safety process by conducting specific safety-related activities regularly.
4. Workers must participate in the safety process and in problem solving and decision making. Communications must flow up, as well as down, the organization.
5. Management and the workers must perceive the safety process as being positive. Recognizing good safety performance at all levels is crucial.
6. You must provide safety training for both supervisors and workers. This should include training for new and transferred workers.

Achieving excellence in accident prevention is not plain common sense, nor is getting there intuitively obvious. It is a difficult journey. Success requires diligence and effort, but the payoffs can be extraordinary. It takes time. Lack of progress should not be discouraging.

The safety culture and the culture of the organization will usually evolve together. All members of the management team should strive for continuous incremental improvement in safety and health.

Chapter 13

Machine guarding

Pinch points that are unguarded can cause serious injuries. Pinch, nip or shear point means the point or points at which it is possible to be caught between the moving parts of a machine, or between the material and the moving part or parts of a machine.

You can identify machine hazards by asking three questions:

- Can an individual be caught in, on or between two objects?
- Can an individual be struck by an object?
- Can an individual strike against a hazardous object?

Effective guarding can eliminate many of these hazards. When possible, purchase machinery with guards installed by the manufacturer. Guard points of operation on machines at all times. Point-of-operation guarding is usually required on mechanical-owner transmission components on machines, shears, power presses, milling machines and jointers. You also should guard other equipment — portable power tools, lawn mowers and grinders — exposing workers to potential injuries.

Methods of guarding include:

- Light curtains;
- Air clutches with palm buttons;
- Steel mesh under conveyors and over fan blades;
- Guardrails;
- Lawn mower covers;
- Flexible guards, such as the movable guard on a power saw;
- Presence-sensing mats, such as those used in robot areas;
- Mechanical barriers.

Cranes and mobile industrial equipment

The use of cranes and other mobile industrial equipment involves significant potential hazards. Special emphasis is necessary to prevent injuries. Cranes and hoists involve special hazards primarily because of the danger of dropping a load. Equip all cranes and hoists with an automatic hoist safety stop — generally called a limit switch — to prevent the lift from striking the supporting structure and shearing off the hoist cables.

Require operators to test the limit switch each day before starting work to ensure it is functioning properly. Limit switches are safety stops, and operator should never use them to stop the hoisting operation. Regular operating controls are provided for that purpose.

Whenever possible, equip crane and hoist hooks with safety latches to ensure the cable or chain will not become disengaged from the hook when the load is temporarily rested on a support, or if roll out or a shock load occurs.

Operators should examine carefully each day before using slings, chains, spreaders, rings and other auxiliary crane and hoist equipment. Wire-rope slings should receive special attention; manufactured slings are recommended. Rust, dirt and kinks can seriously weaken and shorten the safe and useful life of wire rope. For this reason, do not allow wire-rope slings to remain on the ground. Place them on wall hooks or racks when not in use. Conduct an annual inspection for all lifting devices, including slings, chains and hooks. It is important to maintain comprehensive records of all inspection results.

Schedule a complete inspection for hoist ropes, sheave wheels, brakes, control switches, axles, safety stops, running rails and supports for all cranes each month. Correct immediately all defects.

Operate overhead cranes on the basis of clear hand signals only. Lateral travel, hoisting and lowering of loads should never proceed without a signal from the person on the ground.

Thereafter, the crane operator should proceed only after seeing that the area where the load is to be carried is clear. Never carry loads over personnel. Post approved hand signals in the crane cab and at conspicuous locations on the ground or floor level.

Equip mobile equipment used in industrial plants, such as trucks and tow tractors, with visual and/or audible warning devices. Operators should have a good field of vision for every direction of travel. Equip the gasoline-powered equipment with tanks that have explosion-proof fittings. Rigidly observe load capacity charts and add no unauthorized counter-weights to increase capacities. Limit attachments to those approved by the manufacturer.

Inspect all mobile equipment prior to each shift to check steering, brakes and proper functioning of safety devices. Provide all such equipment with ignition locks. Remove keys if the equipment is not in use. This prevents operation by untrained and unauthorized personnel. Operators should receive formal training in equipment operation and safety. Document this training.

To ensure you inspect all cranes, hoists and mobile industrial equipment on a regular basis, a formalized inspection program is most effective. Reports submitted after each inspection should indicate the equipment inspected and the results of the inspection. Institute immediate follow-up action to ensure that any defects are promptly corrected.

For further detailed information consult:
OSHA General Industry Standards, 29 CFR, 1910.176 - 1910.184
OSHA Construction Industry Standards, 29 CFR, 1926.550 and 1926.600
Ohio Administrative Code, All Workshops and Factories, Chapter 4121:1-5
Ohio Administrative Code, Construction, Chapter 4121:1-3.

Overhead Crane & Hoist Safety Inspection Record

Manufacturer:	Model:	Serial No:	Reach:	Capacity:	Location:	
Component unit or part	Inspection code	Problem	Satisfactory	Adjust	Repair	Corrective action notes
Bridge						
Brake	D					
Walkways	M					
Guard railings	M					
Guards M						
Motor	P					
Bumpers	M					
Wheels P						
Frame	P					
Fire (car) extinguisher	D					
Capacity marked	D					
Rail sweeps	P					
Trolley						
Motor P						
Brake	D					
Wheels	P					
Bumpers	M					
Guards	M					
Frame P						
Hoist						
Motor D						
Motor brake	D					
Mechanical load brake	D					
Overload clutch	M					
Couplings	P					
Gears, shafts and bearings	P					
Rope drum	M					
Guards	M					
Limit switch	D					
Sheaves	M					
Chain drive sprockets	M					
Cable in drum grooves	M					
Capacity marked	D					
Hooks						
Deformations or cracks	D					
Throat opening - 15%	D					
Proof test	P					

Components unit or part	Inspection code	Problem	Satisfactory	Adjust	Repair	Corrective action notes
Hoisting cable						
Broken wires	D					
Crushed rope	M					
Stretched rope	M					
Twisted rope	M					
Kinked rope	M					
Excessive wear	M					
2 wraps left of drum	P					
Block assembly						
Sheaves	D					
Bolts	D					
Guard	D					
Push button or control station						
Push buttons	D					
Control box	D					
Wiring	M					
Controllers	M					
Return spring	M					
Master switch	M					
Legible marking	D					
Other items						
Rails	P					
Stairways	P					
Walkways	P					
Guard railing	P					
Ladders	P					
Rail stops	M					
Electrical apparatus	P					
General condition	M					
Warning device	D					
Idle crane inspection	D					
Remarks 1. Inspection code intervals: D — daily M — monthly P — periodically - one-to-12 month intervals, or as specifically recommended by the manufacturer						
Date of safety inspection	Signature of inspector					

Hand and portable power tools

Hand tools

Hand and portable power tools are frequently used at home and on the job. Using them correctly will prevent needless injuries. Tools are intended to help the worker by making the job easier and the effort more efficient.

To use hand tools safely, they must be:

- Designed for the job;
- In good condition;
- Used properly.

Workers who do not use the right tool, do not keep tools in good condition or who use tools improperly are less effective and risk serious injury. Common types of hand tools include: striking tools, turning tools, metal-cutting tools, wood-cutting tools, screwdrivers, pliers, knives and crowbars.

Striking tools — carpenter's hammers, machinist's hammers, mallets and sledges

Clean and repair striking tools, if necessary, before they are stored. Before using striking tools, make sure the faces are free from oil or other material that can cause them to glance off the object being struck.

Dress the heads to remove mushroomed or battered edges. Handles must fit tightly into the heads of striking tools. Use the correct hammer to strike hardened steel surfaces, so steel fragments will not break off and injure workers. Wear appropriate safety eye protection devices when using striking tools.

Turning tools — or wrenches

Wrench types include open-end, box, socket, torque, adjustable, spanner and Allen. It is important to select the proper wrench for the work to be done. Make sure wrench jaws are clean and oil-free to prevent slipping. Be especially careful when using adjustable wrenches — they are often called knuckle busters because they can slip if not adjusted to fit the work surface snugly.

Metal-cutting tools — snips and shears, bolt-cutters, hacksaws, chisels and files

Sharpen, oil and adjust snips and shears to make cutting easier and to produce surfaces free of burrs. When using bolt-cutters, make sure fingers are clear of the jaws and hinges. Take precautions to prevent bolt heads or other metal fragments from striking co-workers.

Use hacksaws to cut metal that is too heavy for snips or bolt-cutters. A significant risk associated with hacksaw use is injury to the hands if the blade breaks. To avoid severe hand injuries and broken blades, apply only enough pressure to keep the blade in firm contact with the work piece.

Exerting excessive force causes the blade to overheat and bind. Likewise, cut on a straight line to avoid twisting the saw blade. Lastly, periodically check the blades to ensure tightness within the saw frame.

Use chisels for chipping or cutting metals and other materials. Make sure the head of the chisel is not mushroomed. Dress damaged heads by removing all excess metal. As a general rule, hold the chisel so the hand muscles hold the shaft firmly but not with a death grip. If the hammer accidentally hits the hand it will permit the hand to slide down the chisel, lessening the effect of the blow. This technique is not always possible, but when used, it can be effective. Wear safety eye protection when using any chisel.

Keep files sharp by keeping them wrapped in paper or cloth to protect the teeth. Clean files by using file cards and keep them free of oil and other types of moisture. To prevent hand injuries, use files with handles and employ the proper technique, i.e., the cutting stroke smooth and away from the body.

Wood-cutting hand tools — hand saws, planes and wood chisels

Keep hand saws sharp and free of rust to prevent them from binding or jumping and causing injuries. Keep planes sharp and properly adjusted so they cut smoothly without requiring excessive force. When storing planes, adjust the blades above the bottom of the planes to prevent contact with the blade. Keep wood-cutting chisels sharp, and make sure both hands are behind the cutting edges at all times. Never cut toward yourself when using a chisel, and use chisels only for their intended purpose.

Screwdrivers — slotted, Philips, torx and hex

Use screwdrivers to insert and remove screws, not as pry bars, scrapers, chisels or punches. When using a screwdriver, it is important to use the proper size so that the blade fits the screw head tightly. This prevents the screw slot from burring, which could lead to serious lacerations. Additional safety tips: keep screwdrivers away from electrical circuits to avoid shock, and use a vice or other holding device, rather than hold work in your hand, to prevent serious punctures.

Pliers and knives

Do not use pliers to cut hard wire unless they are specifically manufactured for this purpose. Always cut at right angles. Do not use pliers as hammers. Wear safety eye protection when using pliers to cut wire.

Knives can be extremely dangerous. Use cutting instruments only for their intended purpose. Size, blade design and handle configuration are important considerations when choosing safe and effective cutting instruments. Cutting blades must remain sharp to avoid excessive forces, which can cause the blade to be thrust out past the workpiece after the cut is made. Always cut away from your body. Store knives with the blade closed or sheathed to prevent accidental contact. Treat knives with care, always protecting the sharp cutting edges.

Portable power tools

Portable power tools also present accident hazards. With power tools, however, the magnitude of an accident is often significantly increased. A lack of training, improper technique, failure to wear PPE or poor maintenance practices cause nearly all power tool accidents. There are several general safety measures to observe when operating or maintaining portable power tools.

General safe work practices

First, use power tools only after becoming thoroughly familiar with their controls, safety requirements and operating procedures. When in doubt, re-read the operating instructions or get information from your supervisor. Inspect all tools before use to see they are clean and in good repair. Before connecting a power tool to the power source, it is essential you turn off the switch on the tool. Ensure all safety guards are installed. Wear safety eye, face, hand or other protective equipment. Disconnect the power source from the tool (electrical, hydraulic, pneumatic or mechanical) before adjusting, oiling or changing accessories.

You must ground every electrical portable power tool by a third safety-ground pin on the plug or be designed with double-insulation. Double-insulated tools have a two-prong plug and a double-insulated plastic housing. Ensure the integrity of the electrical connection at the plug or motor is intact. Repair wires pulled loose or frayed insulation before use. We recommend not to splice electrical cords. It is better to replace the cord. When operating electrical tools in wet locations, ground-fault circuit interruption is necessary to prevent accidental shock.

When operating portable power tools, pay undivided attention to their operation. Check power sources to portable power tools to ensure electrical cords and air hoses are in good repair.

Select tools with the following characteristics:

- Handles long enough to distribute pressure across the entire palm, rather than in one small area;
- Designed to provide the required force for the job;
- Tools that have varied weights, sizes and handle design to accommodate worker differences;
- A handle orientation that allows the wrist to remain straight;
- Tools that minimize hand and arm vibration;
- Tools that minimize repetitive motions and awkward positions.

In addition, provide gloves designed for the function and that reduce the hazards. Provide sizes to ensure a proper fit. Excessive force applied while using hand tools may result from using poorly fitted gloves.

One final issue involves horseplay. Horseplay accounts for a significant number of injuries associated with tools. Although tools are relatively simple instruments and ones with which we are very familiar, they can still be instruments that cause injury, even death, if one is not careful. By retaining a healthy respect for the tools we use, knowing how to use them well and only using them for their intended use, we can prevent many injuries.

Utility identification

Identifying utilities ensures controls, piping outlets and pipe lines are marked legibly and uniformly according to established codes within a given location. Ensure color codes are available to employees. Identify utilities and outlets for equipment serviced, types of service (gas, oil, electricity, communications, water, sewer), voltage, pressure and contents.

Employers use color, direction of flow and other means of identification extensively for safety purposes. While never intended as a substitute for good safety procedures, mechanical safeguards, color codes and labels can reduce the likelihood of exposure, fire and inadvertent mixing or venting. Employees have caused many accidents by opening or closing the wrong switch or valve because the outlet or control was not properly identified.

Standard color codes include:

Red — Fire protection equipment, danger, emergency stops on machinery;

Yellow — Hazards that may result in an accident, such as from slipping, falling and striking; flammable-liquid storage cabinets; band on red safety cans; and on containers for explosive, corrosive or unstable materials; or materials-handling equipment, such as fork trucks and cranes;

Green — Location of first-aid and safety equipment;

Black and white or yellow — Combination of checks or stripes used for housekeeping or traffic markings;

Orange — Dangerous parts of machinery or energized equipment, such as exposed edges of cutting devices and the inside of movable guards and enclosure doors, and transmission guards;

Blue — Information signs and bulletin boards not safety related;

Black on yellow — Radiation hazard.

Piping may carry harmless, valuable or hazardous contents and, therefore, is desirable to identify each different piping system. The commonly used colors for classifying pipelines are:

Red — Fire protection (water, CO₂, foam);

Yellow — Dangerous (flammable, explosive, toxic, high temperature or pressure, radioactive);

Green — Safe (liquid);

Bright blue — Protective materials (inert gases).

Underground utilities

The Ohio Utilities Protections Service (OUPS) provides a service for protecting underground facilities. OUPS, a one-call system (1-800-362-2764), provides a communication link between the excavator and owner of the buried utility. Prior to opening an excavation, you must make an effort to determine whether you will encounter underground utilities and, if so, where these underground installations are located. A utility company having a buried service will locate the service and temporarily mark the type and location of the utility with color on the dirt or concrete surface.

Underground utilities color codes are:

Yellow — Gas or oil;

Red — Electricity;

Orange — Communications;

Blue — Water;

Green — Sewer.

Using color codes for the various types of services has proven to be an effective method for preventing mishaps and possible injury. When you use color codes sources of supply may be readily identified even though identification tags have been removed or damaged.

In addition to color coding, you can effectively use various types of metal, plastic and treated paper tags and signs to clearly indicate specific information pertaining to the utility. Directional signs for closing and opening valves are important. Have readily accessible and identify electric switch boxes as to voltage and equipment controlled.

Utility identification systems have prevented accidental injury. Yet it is essential to remember that you must teach workers to use the color-code schemes; otherwise, an effective accident-prevention tool will not be effectively used. In addition, the use of marking systems actually improves operational performance by reducing the time and frustration required to locate and identify utilities. During emergencies, use of color codes and marking systems can be extremely valuable in mitigating the potential overall severity associated with the emergency.

OSHA's hazard communication standard

The purpose of OSHA's hazard communication rule 1910.1200 (1926.59 for construction) is to ensure employers make their employees aware of and protected from hazardous substances at work. It requires employers to evaluate the presence and potential hazards of chemicals employees may be exposed to in their workplaces. You must pass this information on to employees through employee training, material safety data sheets (MSDSs) and labels on containers or other identifying means.

To meet the basic requirements of the standard, employers should start by compiling a master list of chemicals used in the facility. OSHA defines a hazardous chemical as any chemical that is a physical or health hazard.

You may generate the list by using a variety of informational sources, including:

- Conducting a walk-through survey of the facility to inventory every chemical substance present; not cleaning or other supplies used by the company in a consumer manner, with their limited use;
- Using purchasing department documents, such as invoices and receiving reports;
- Using industrial hygiene reports giving byproducts and intermediate products generated;
- Using information on building materials used, transformers and other fixed problem areas.

Once you make the master, insist upon getting MSDSs from the manufacturer for each chemical used. If the manufacturer declares the substance is nonhazardous, keep the reply to document your effort. If the chemical is manufactured in your facility, you must develop your own MSDS.

MSDS

A MSDS is a description on paper of a single substance or mixture of substances. It is essential you assist workers who do not speak or read English in their understanding of MSDSs.

The MSDS of a single substance is required to give such routine information as:

- Names — both chemical and common;
- Physical and chemical characteristics, including odor and appearance;

- Physical and health hazards;
- Primary routes of entry into the body;
- Recommended and required exposure limits;
- Control measures known;
- Lists of hazardous substances it appears on;
- Measures necessary to protect against it during use and cleanup;
- First-aid measures to use in case of accidental exposure;
- Name, address and telephone number of the responsible MSDS preparer or distributor, and the date when prepared;
- New information about hazards or protection within three months of its appearance.

MSDS of a mixture tested as a whole also must include the chemical and common name(s) of an ingredient amounting to 1 percent or more when it constitutes a health hazard, but just 0.1 percent for a carcinogen. A mixture containing 1 percent or more of a hazardous chemical or 0.1 percent or more of a carcinogen is considered hazardous. A mixture also is considered hazardous if any component can release a concentration exceeding the OSHA permissible exposure limits or current threshold limit values into the air.

Place a copy of each MSDS in a central file and another one in the area of use where employees have ready access to it at all times. Review the MSDS to determine whether the substances in your workplace qualify as physical hazards or health hazards.

Guidelines that can help in determining whether a substance is hazardous are:

- OSHA's general industry standards, 29 CFR Part 1910.1000, Subpart Z, toxic and hazardous substances (Table Z-1 and Z-2);
- Threshold limit values for chemical substances and physical agents in the work environment;
- National Toxicology Program's Annual Report on Carcinogens (latest edition);
- International Agency for Research on Cancer Monographs (latest edition).

Labeling

In addition to the MSDS identifying hazardous substances, the hazard communication standard requires the hazardous contents of containers to be identified in materials printed in English. Again, workers who do not read or write English should receive further instruction. You may identify the contents by labeling the containers or other means, such as signs, placards, process sheets and batch tickets, as long as employees have ready access to them.

Whatever the printed means used for identifying the substance, the information required on it is:

- The hazardous substance's chemical and common names;
- The type of hazard — physical, health or explosive;
- Target organs;
- The manufacturer or responsible party's name and address.

You do not need to mark portable containers for transferring the substance from labeled containers if the worker making the transfer on that work shift will only use the contents.

Written hazard communication plan

The hazard communication standard requires employers to outline the management of their hazardous materials program in their hazard communication plans. The plan should detail methods to use in handling MSDSs, labeling and employee training, and the title of the official responsible for these tasks. The written program must be available to employees, their designated representatives, the assistant secretary for OSHA and the director of the National Institute for Occupational Safety and Health (NIOSH).

Training

When training employees, employers must cover their exposure, risk and protection from substances at work.

You can cover some information on a general comprehensive level. You must make workers aware of the hazard communication standard and its provisions. Equally important is their training in the company's hazard communication plan. Instruction in what information is contained on labels and MSDSs also is necessary.

You must also give specific training. You must train employees to identify and protect themselves against the hazardous chemicals they are exposed to. You must tell them where you keep the MSDSs and labeling documents in their areas and the location of the HCS program.

BWC recommends employers keep a written record of the training they have given employees. Employers should keep sign-up sheets at meetings, including the date and subject covered.

Multi-employer work sites

Employers who use or store hazardous chemicals at workplaces in such a way that the employees of other employers may be exposed will ensure that hazard communication programs developed and implemented include the following:

- Methods the employer will use to provide other employer(s) on-site access to MSDSs sheets;
- Methods the employer will use to inform other employer(s) of any precautionary measures that need to be taken to protect employees;
- Methods the employer will use to inform other employer(s) of the labeling system.

The employer will also need to include methods he or she will use in the written program, with who will be responsible for its implementation.

Respiratory protection

Processes or work procedures may result in employee overexposure to toxic chemicals. This may include for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials. Respirator use is necessary to help reduce these exposures, only if engineering controls are not technically or economically feasible. OSHA's respiratory protection standard for general industry (29 CFR 1910.134) lists practices and minimal requirements for an acceptable respirator program.

I. Employer responsibility

1. In any workplace where respirators are necessary to protect the health of the employee or whenever the employer requires respirators, the employer will establish and implement a written respiratory protection program with work site-specific procedures. The employer will update the program as necessary to reflect those changes in workplace conditions that affect respirator use.
2. The employer will provide a respirator suitable for the intended use.
3. The employer will establish and maintain a respiratory protection program whenever respirators are used.
4. The employer will designate a program administrator who is qualified by appropriate training or experience that is commensurate with the complexity of the program to administer or oversee the respiratory protection program and conduct the required evaluations of program effectiveness.
5. Where respirator use is not required, an employer may provide respirators at the request of employees or permit employees to use their own respirators, if the employer determines that such respirator use will not in itself create a hazard. If the employer determines voluntary respirator use is permissible, the employer will provide the respirator users with the information contained in Appendix D of the standard (Information for Employees Using Respirators When Not Required Under the Standard). In addition, the employer must establish and implement those elements of a written respiratory protection program necessary to ensure any employee using a respirator voluntarily is medically able. And the employer must ensure the respirator is cleaned, stored and maintained so its use does not present a health hazard to the user.

Exception: Employers are not required to include in a written respiratory protection program those employees whose only use of respirators involves the voluntary use of filtering facepieces (dust masks). An OSHA publication titled *The Small Entity Compliance Guide* contains criteria for the selection of a program administrator and a sample program.

6. The employer will provide respirators, training and medical evaluations at no cost to the employee.

II. Respiratory protection program

The sections below covers the elements of a respirator program.

A. Selection of respirators

1. The employer will select and provide an appropriate respirator based on the respiratory hazard(s) to which the worker is exposed and workplace and user factors that affect respirator performance and reliability.
2. The employer will select a NIOSH-certified respirator.
3. The employer will identify and evaluate the respiratory hazard(s) in the workplace. This evaluation will include a reasonable estimate of employee exposures to respiratory hazard(s) and an identification of the contaminant's chemical state and physical form. Where the employer cannot identify or reasonably estimate the employee exposure, the employer will consider the atmosphere to be immediately dangerous to life and health (IDLH).

4. The employer will select respirators from a sufficient number of respirator models and sizes so the respirator is acceptable to, and correctly fits, the user.
 5. The employer will provide the following respirators for employee use in IDLH atmospheres:
 - A full face piece pressure-demand self-contained breathing apparatus (SCBA) certified by NIOSH for a minimum service life of 30 minutes; or a combination full face piece pressure-demand supplied-air respirator with auxiliary self-contained air supply;
 - Respirators provided only for escape from IDLH atmospheres will be NIOSH-certified for escape from the atmosphere in which they will be used.
 6. Respirators for atmospheres that are not IDLH:
 - The employer will provide a respirator that is adequate to protect the health of the employee and ensure compliance with all OSHA statutory and regulatory requirements, under routine and reasonably foreseeable emergency situations;
 - The respirator selected will be appropriate for the chemical state and physical form of the contaminant.
 7. For protection against gases and vapors, the employer will provide:
 - An atmosphere-supplying respirator;
 - An air-purifying respirator provided the respirator is equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant. If there is no ESLI appropriate for conditions in the employer's workplace, the employer implements a change schedule for canisters and cartridges. The employer will base this schedule based on objective information or data that will ensure the change of canisters and cartridges before the end of their service life. The employer will describe in the respirator program the information and data relied upon and the basis for the canister and cartridge change schedule and the basis for reliance on the data.
 8. For protection against particulates, the employer will provide:
 - An atmosphere-supplying respirator;
 - An air-purifying respirator equipped with a filter certified by NIOSH under 30 CFR part 11 as a high efficiency particulate air filter, or an air-purifying respirator equipped with a filter certified for particulates by NIOSH under 42 CFR part 84;
 - For contaminants consisting primarily of particles with mass median aerodynamic diameters of at least two micrometers, an air-purifying respirator equipped with any filter certified for particulates by NIOSH.
- B. Medical evaluation**
1. The employer will provide a medical evaluation to determine the employee's ability to use a respirator. The medical evaluation will occur before the employee is fit tested or required to use the respirator in the workplace. The employer may discontinue an employee's medical evaluations when the employee is no longer required to use a respirator. Using a respirator may place a physiological burden on employees that vary with the type of respirator worn, the job and workplace conditions in which the respirator is used, and the medical status of the employee.
 2. Medical evaluation procedures
 - The employer will identify a physician or other licensed health-care professional (PLHCP) to perform medical evaluations using a medical questionnaire or an initial medical examination that obtains the same information as the medical questionnaire.
 - The medical evaluation will obtain the information requested by the questionnaire in Sections 1 and 2, Part A of Appendix C of the standard and included with this information.
 - The employer will ensure a follow-up medical exam is provided for an employee who gives a positive response to any question among questions 1 through 8 in Section 2, Part A of Appendix C or whose initial medical examina-

- tion demonstrates the need for a follow-up medical examination.
- The follow-up medical examination will include any medical tests, consultations or diagnostic procedures the PLHCP deems necessary to make a final determination.
 - The PLHCCP will administer the medical questionnaire and examinations confidentially during the employee's normal working hours or at a time and place convenient to the employee. The PLHCP will administer the medical questionnaire in a manner that ensures the employee understands its content.
 - The employer will provide the employee with an opportunity to discuss the questionnaire and examination results with the PLHCP.
3. The employer must provide the following supplemental information to the PLHCP before he or she makes a recommendation concerning an employee's ability to use a respirator:
- The type and weight of the respirator the employee will use;
 - The duration and frequency of respirator use (including use for rescue and escape);
 - The expected physical work effort;
 - Additional protective clothing and equipment to be worn;
 - Temperature and humidity extremes the employee may encounter;
 - Any supplemental information provided previously to the PLHCP regarding an employee need not be provided for a subsequent medical evaluation if the information and the PLHCP remain the same;
 - The employer will provide the PLHCP with a copy of the written respiratory protection program and a copy of this section.
4. Medical determination
In determining the employee's ability to use a respirator the employer will obtain a written recommendation regarding the employee's ability to use the respirator from the PLHCP.

The recommendation will provide the following information:

- Limitations on respirator use related to the medical condition of the employee, or relating to the workplace conditions in which the

employee will use the respirator, including whether or not the employee can medically use the respirator;

- The need, if any, for follow-up medical evaluations;
- A statement that the PLHCP has provided the employee with a copy of the PLHCP's written recommendation.

Note: If the respirator is a negative-pressure respirator and the PLHCP finds a medical condition that may place the employee's health at increased risk if the employee uses it, the employer will provide a powered air purifying respirator (PAPR) if the PLHCP's medical evaluation finds the employee can use such a respirator. If a subsequent medical evaluation finds that the employee is medically able to use a negative pressure respirator, then the employer is no longer required to provide a PAPR.

5. At a minimum, the employer will provide additional medical evaluations that comply with the requirements of this section if:
- An employee reports medical signs or symptoms related to the ability to use a respirator;
 - A PLHCP, supervisor or the respirator program administrator informs the employer that an employee needs to be re-evaluated;
 - Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee re-evaluation;
 - A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

C. Fit testing.

Before requiring an employee to use any respirator with a negative or positive pressure tight-fitting face piece, you must test fit the employee with the same make, model, style and size of respirator that he or she will use.

1. The employer will ensure employees using a tight-fitting face piece respirator pass an appropriate qualitative fit test (QLFT) or quantitative fit test (QNFT).
2. The employer will ensure an employee using a tight-fitting face piece respirator is fit tested

- prior to initial use of the respirator, whenever a different respirator face piece (size, style, model or make) is used and at least annually thereafter.
3. The employer will conduct an additional fit test whenever the employee reports, or the employer, PLHCP, supervisor or program administrator makes visual observations of changes in the employee's physical condition that may affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery or an obvious change in body weight.
 4. If after passing a QLFT or QNFT, the employee subsequently notifies the employer, program administrator, supervisor or PLHCP that the fit of the respirator is unacceptable, the employer will give the employee a reasonable opportunity to select a different respirator face piece and to be re-tested.
 5. The fit test will be administered using an OSHA-accepted QLFT or QNFT protocol. The OSHA-accepted QLFT and QNFT protocols and procedures are contained in Appendix A of the standard.
 6. You may only use QLFT to fit test negative pressure air-purifying respirators that must achieve a fit factor of 100 or less.
 7. If the fit factor, as determined through an OSHA-accepted QNFT protocol, is equal to or greater than 100 for tight-fitting half face pieces, or equal to or greater than 500 for tight-fitting full face pieces, the QNFT has been passed with that respirator.
 8. Fit testing of all tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators will be accomplished by performing quantitative or qualitative fit testing in the negative pressure mode, regardless of the mode of operation (negative or positive pressure) that is used for respiratory protection.

D. Use of respirators

The employer is required to establish and implement procedures for the proper use of respirators. These requirements include prohibiting conditions that may result in face piece seal leakage, preventing employees from removing respirators in hazardous environments, taking actions to

ensure continued effective respirator operation throughout the work shift, and establishing procedures for the use of respirators in IDLH atmospheres or in interior structural firefighting situations. The employer will not permit respirators with tight-fitting face pieces to be worn by employees who have:

- Facial hair that comes between the sealing surface of the face piece and the face or that interferes with valve function;
- Any condition that interferes with the face-to-face piece seal or valve function;
- Corrective glasses or goggles or other PPE. The employer will ensure that such equipment is worn in a manner that does not interfere with the seal of the face piece to the face of the user;

Tight-fitting respirators. The employer will ensure employees perform a user seal check each time they put on the respirator using the procedures in Appendix B-1 of the OSHA standard or procedures recommended by the respirator manufacturer, which the employer demonstrates are as effective as those in Appendix B-1 of the standard.

1. Ensure continuing respirator effectiveness by performing:
 - Appropriate surveillance of work-area conditions and degree of employee exposure or stress. When there is a change in work-area conditions or degree of employee exposure or stress that may affect respirator effectiveness, the employer will re-evaluate the continued effectiveness of the respirator.
2. The employer will ensure employees leave the respirator use area:
 - To wash their faces and respirator face pieces as necessary to prevent eye or skin irritation associated with respirator use;
 - If they detect vapor or gas breakthrough, changes in breathing resistance or leakage of the face piece;
 - To replace the respirator or the filter, cartridge or canister elements.
3. If the employee detects vapor or gas breakthrough, changes in breathing resistance or leakage of the face piece, the employer must

replace or repair the respirator before allowing the employee to return to the work area.

4. For all IDLH atmospheres, the employer will ensure:
 - One employee or when needed more than one employee is located outside the IDLH atmosphere;
 - Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere;
 - The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue;
 - The employer or designee is notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue;
 - The employer or designee authorized to do so by the employer, once notified, provides necessary assistance appropriate to the situation;
 - Employee(s) located outside the IDLH atmospheres are equipped with pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA, and either:
 - Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment will contribute to the rescue of the employee(s) and will not increase the overall risk resulting from entry;
 - Equivalent means for rescue where retrieval equipment is not required.
5. In addition to the requirements on the previous pages, while fighting interior structural fires, the employer will ensure:
 - At least two employees enter the IDLH atmosphere and remain in visual or voice contact with one another at all times;
 - At least two employees are located outside the IDLH atmosphere;
 - All employees engaged in interior structural firefighting use SCBAs.

Note: You may assign one of the two individuals located outside the IDLH atmosphere to an

additional role, such as incident commander in charge of the emergency or safety officer. This can only occur if this individual can perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident.

Note: Nothing in this section of the standard is meant to preclude firefighters from performing emergency rescue activities before an entire team has assembled.

E. Maintenance and care of respirators

1. Cleaning and disinfecting

The employer will provide each respirator user with a clean, sanitary respirator in good working order. The employer will ensure respirators are cleaned and disinfected using the procedures in Appendix B-2 of the OSHA standard or procedures recommended by the respirator manufacturer, provided such procedures are of equivalent effectiveness.

Clean and disinfect respirators at the following intervals:

- As often as necessary to be maintained in a sanitary condition when issued for the exclusive use of an employee;
- Before being worn by different individuals when issued to more than one employee;
- After each use for respirators maintained for emergency use;
- After each use for respirators used in fit testing and training.

2. Storage

The employer will ensure respirators are stored as follows:

- Store all respirators to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and pack or store them to prevent deformation of the face piece and exhalation valve.
- In addition, emergency respirators will be:
 - Kept accessible to the work area;
 - Stored in compartments or in covers that are clearly marked as containing emergency respirators;
 - Stored in accordance with any applicable manufacturer instructions.

3. Inspection

The employer will ensure he or she, or employees will inspect all respirators used in routine situations before each use and during cleaning. You will inspect respirators maintained for use in emergency situations at least monthly and in accordance with the manufacturer's recommendations, and you will check for proper function before and after each use. Additionally:

- Inspect emergency escape-only respirators before being carried into the workplace for use;
- Ensure respirator inspections include the following:
- A check of respirator function, tightness of connections and the condition of the various parts including, but not limited to, the face piece, head straps, valves, connecting tube, and cartridges, canisters or filters;
- A check of elastomeric parts for pliability and signs of deterioration;
- An inspection of self-contained breathing apparatus monthly. You will maintain air and oxygen cylinders in a fully charged state, and you will re-charge them when the pressure falls to 90 percent of the manufacturer's recommended pressure level. The employer will determine that the regulator and warning devices function properly.

For respirators maintained for emergency use, the employer will:

- Certify the respirator by documenting the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator;
- Provide this information on a tag or label attached to the storage compartment for the respirator, kept with the respirator, or included in inspection reports stored as paper or electronic files. Maintain this information until replaced following a subsequent certification.

4. Repairs

The employer will ensure he or she will remove respirators that fail an inspection or are otherwise found to be defective from service, and discard,

or repair or adjust in accordance with the following procedures:

- Repairs or adjustments to respirators are to be made only by persons appropriately trained to perform such operations and will use only the respirator manufacturer's NIOSH-approved parts designed for the respirator;
- Repairs will be made according to the manufacturer's recommendations and specifications for the type and extent of repairs to be performed;
- Reducing and admission valves, regulators and alarms will be adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

F. Breathing air quality and use

The employer will provide employees using atmosphere-supplying respirators (supplied-air and SCBA) with breathing gases of high purity. The employer will ensure compressed air, compressed oxygen, liquid air and liquid oxygen used for respiration accords with the specification below.

1. Compressed and liquid oxygen meet the United States Pharmacopoeia requirements for medical or breathing oxygen.
2. Compressed breathing air will meet at least the requirements for Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1, to include:
 - Oxygen content (v/v) of 19.5-23.5 percent;
 - Hydrocarbon (condensed) content of five milligrams per cubic meter of air or less;
 - Carbon monoxide (CO) content of 10 ppm or less;
 - Carbon dioxide content of 1,000 ppm or less;
 - Lack of noticeable odor.
3. The employer will ensure compressed oxygen is not used in atmosphere-supplying respirators that have previously used compressed air.
4. The employer will ensure oxygen concentrations greater than 23.5 percent are used only in equipment designed for oxygen service or distribution.

5. The employer will ensure cylinders used to supply breathing air to respirators meet the following requirements:
 - Test and maintain cylinders as the Shipping Container Specification Regulations of the Department of Transportation (49 CFR part 173 and part 178) prescribe;
 - Cylinders of purchased breathing air have a certificate of analysis from the supplier that the breathing air meets the requirements for Grade D breathing air;
 - The moisture content in the cylinder does not exceed a dew point of -50 degrees F (-45.6 degrees C) at one atmosphere pressure.
6. The employer will ensure compressors used to supply breathing air to respirators are constructed and situated so as to:
 - Prevent entry of contaminated air into the air-supply system;
 - Minimize moisture content so the dew point at one atmosphere pressure is 10 degrees F (5.56 degrees C) below the ambient temperature;
 - Have suitable in-line air-purifying sorbent beds and filters to further ensure breathing air quality. He or she will maintain, replace or refurbish periodically sorbent beds and filters following the manufacturer's instructions;
 - Have a tag containing the most recent change date and the signature of the person authorized by the employer to perform the change. The tag will be maintained at the compressor.
7. For compressors that are not oil lubricated, the employer will ensure carbon monoxide levels in the breathing air do not exceed 10 ppm.
8. For oil-lubricated compressors, the employer will use a high-temperature or carbon monoxide alarm, or both, to monitor carbon monoxide levels. If you only use high-temperature alarms monitor the air supply at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm.
9. The employer will ensure breathing air couplings are incompatible with outlets for non-respirable work-site air or other gas systems.

No asphyxiating substance will be introduced into breathing air lines.

10. The employer will use breathing gas containers marked in accordance with the NIOSH respirator certification standard, 42 CFR part 84.

G. Identification of filters, cartridges, and canisters

The employer will ensure all filters, cartridges and canisters used in the workplace are labeled and color coded with the NIOSH approval label, and that the label is not removed and remains legible.

H. Training and information

The employer must provide effective training to employees who are required to use respirators. The training must be comprehensive, understandable and recur annually, and more often if necessary. This paragraph also requires the employer to provide the basic information on respirators in Appendix D of the standard to employees who wear respirators when not required by the standard or by the employer to do so.

1. The employer will ensure each employee can demonstrate knowledge of at least the following:
 - Why the respirator is necessary and how improper fit, usage or maintenance can compromise the protective effect of the respirator;
 - The respirator's limitations and capabilities;
 - How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;
 - How to inspect, put on and remove, use, and check the seals of the respirator;
 - What the procedures are for maintenance and storage of the respirator;
 - How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators;
 - The general requirements of this section.
2. The employer will conduct the training in a manner that is understandable to the employee.
3. The employer will provide the training prior to requiring the employee to use a respirator in the workplace.

4. An employer who can demonstrate a new employee has received training within the last 12 months that addresses the elements specified above is not required to repeat such training provided the employee can demonstrate knowledge of those element(s). Previous training not repeated initially by the employer must be provided no later than 12 months from the date of the previous training.
5. Retraining will be administered annually, and when the following situations occur:
 - Changes in the workplace or the type of respirator render previous training obsolete;
 - Inadequacies in the employee's knowledge or use of the respirator indicate the employee has not retained the requisite understanding or skill;
 - Any other situation arises in which retraining appears necessary.
6. When employees voluntarily wear a respirator, the employer will provide the basic advisory information on respirators, as presented in Appendix D of the standard. The information may be in any written or oral format.

I. Program evaluation

1. The employer will conduct evaluations of the workplace as necessary to ensure the provisions of the written program are effectively implemented and that it continues to be effective.
2. The employer will regularly consult employees required to use respirators to assess the

employees' views on program effectiveness and to identify any problems. You will correct any problems identified during this assessment. Factors for to assess include, but are not limited to:

- Respirator fit (including the ability to use the respirator without interfering with effective workplace performance);
- Appropriate respirator selection for the hazards to which the employee is exposed;
- Proper respirator use under the workplace conditions the employee encounters;
- Proper respirator maintenance.

J. Recordkeeping

1. You must retain records of medical evaluations required by the respirator standard and make available in accordance with 29 CFR 1910.1020 (Access to employee exposure and medical records)
2. The employer will establish a record of the qualitative and quantitative fit tests administered to an employee including:
 - The name or identification of the employee tested;
 - Type of fit test performed;
 - Specific make, model, style, and size of respirator tested;
 - Date of test;
 - The pass/fail results for QLFTs or the fit factor and strip chart recording or other recording of the test results for QNFTs;
 - Fit test records shall be retained for respirator users until the next fit test is administered.
3. The employer will retain a written copy of the current respirator program.

Employee Respirator Assignment Form

Date: _____

1. Plant name: _____ 2. Plant number: _____
3. Employee name: _____ 4. Clock number: _____
5. Job title: _____ 6. Work location: _____

Respirator issue

7. Type of respirator(s) to be issued: _____

8. To be issued under the conditions specified here: _____
9. Estimated frequency of cartridge and filter replacement — Air-purifying respirators only
 Hourly Twice per shift Daily Weekly Monthly Other/specify

Medical surveillance

10. At this examination on _____ no contraindications to the use of equipment described in Item 7 have been identified

Physician's signature: _____

Re-examination

Date: _____

Contraindications: Yes _____ No _____

Comments: _____

Physician's signature: _____ Date: _____

Contraindications: Yes _____ No _____

Comments: _____

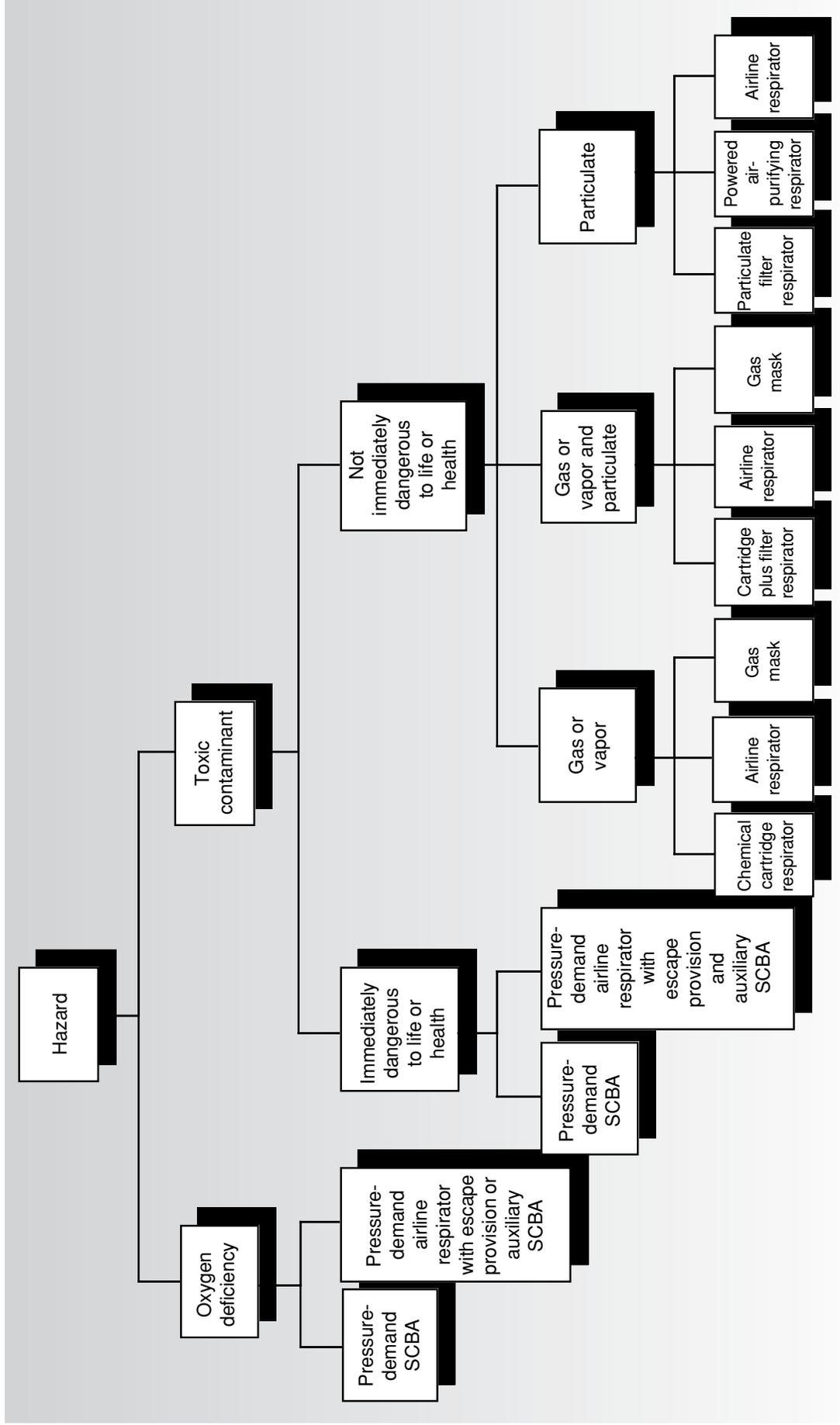
Program surveillance

	Date	By whom	Employee's signature	Comment
11. Informed of hazard				
12. Trained in proper work practices				
13. Issued respirator or given permission to draw one (see item 7)				
14. Trained in respirator use				
15. Fitted in test atmosphere (qualitative)				
16. Fitted in test atmosphere (quantitative)				
17. Trained in emergency procedures				

Use this space for additional information on items 7 through 17. _____

NOTE: This form and the information contained herein are specifically for the conditions described in item 8 and relate to the respirator described in item 7. If conditions (work practices, raw materials, processes or issued respirators) change, fill out and file a new form.

Selection for routine use of respirator



Hearing conservation

Conserving the ability to hear is an important objective in an overall employee protection program. Noise can be much more than just a nuisance. It can cause hearing loss — either temporarily or permanently.

The severity of hearing loss depends on:

- Loudness (intensity) and pitch (frequency) of noise;
- Length of exposure to noise;
- Age and general health of person exposed;
- Whether noise is continuous or intermittent (including impact noise).

Noise-induced hearing loss is irreversible. Implementing an effective hearing conservation program that includes wearing adequate hearing protection, even when not legally required, may prevent this loss from occurring.

The goal of OSHA's hearing conservation amendment (outlined below) is to reduce the risk of noise-induced hearing loss by reduction of noise exposure levels to or below the action level of 85 dBA, eight-hour time-weighted average (TWA). If the exposure level exceeds 85 dBA, TWA the employee is required to be included in a hearing conservation program.

Where feasible, reduce noise exposure levels below the OSHA permissible exposure limit of 90 dBA, eight-hour TWA with engineering and administrative controls. For operations where such controls are not feasible (economically or technically), rely on hearing protection to reduce exposure levels below 90 dBA, TWA.

Hearing conservation amendment summary

The following outline provides the minimum requirements of the hearing conservation amendment (29 CFR 1910.95 (c) - (o)). Consult the noise standard for specific questions.

Monitoring

The hearing conservation amendment (HCA), 29 CFR 1910.95 (c) - (o), requires employers to monitor employees' noise exposure to identify those who are exposed to noise at or above the

85 dBA action level (AL). The exposure measurement must include all continuous, intermittent and impulsive noise from 80 dBA to 130 dBA. Employees are entitled to observe the monitoring procedures. The employer must notify all employees exposed to noise at or above the 85 dBA AL. The method used to notify affected employees is left to the employer's discretion.

Audiometric testing

Use audiometric examination to detect changes in an employee's hearing over time. The elements of an audiometric testing program include baseline audiograms, annual audiograms and follow-up procedures. Audiometric testing must be made available to all employees exposed to noise at or above the AL. Such testing will show whether hearing loss is being prevented by the employer's hearing conservation program. Paragraph 20 CFR 1910.95(g)(3) lists the qualifications necessary for performing and overseeing audiometric testing.

Baseline audiograms

Obtain a baseline audiogram for comparison with future audiograms. You must obtain a baseline audiogram within six months of an employee's first noise exposure at or above the AL. When using mobile test vans, you must complete the baseline audiogram within one year. If you delay baseline audiograms for more than six months, employees exposed to noise at or above the AL must wear properly fitted hearing protectors until you obtain the baseline tests. A 14-hour period of no excessive noise exposure must precede the audiogram. You can achieve this by using properly fitting hearing protection.

Annual audiograms

Obtain, at least annually after the baseline audiogram, a new audiogram for employees with noise exposures at or above the AL. You can compare the annual audiogram to the baseline to determine if it is valid and to identify employees who may have developed a standard threshold shift (STS). STS is an average 10 dB change in hearing threshold compared with the baseline audiogram at 2000, 3000 and 4000 hertz (Hz) in either ear.

Audiogram evaluation

You must fit or refit the employee with adequate hearing protectors if he or she has STS. Show him or her how to use them and require the employee to wear them. You must notify employees in writing within 21 days if an STS is observed on their audiograms. If subsequent tests show the STS is not persistent, employees whose noise exposure is less than 90 dBA, eight-hour TWA may stop wearing hearing protectors.

Hearing protectors

You must make a variety of hearing protectors available to all employees exposed to noise at or above the AL. The employer may choose to require their use or make available hearing protection at levels lower than those listed in the standard. Hearing protectors must be worn by: affected employees after six months of exposure who have not had a baseline audiogram because of the mobile test van exception, employees who have an STS or employees exposed above 90 dBA. Hearing protectors must attenuate employee noise exposure to at least 90 dBA and to 85 dBA or less if an STS has been identified. If workplace noise levels increase, you must reassess hearing protector attenuation to ensure it is adequate. You must show employees how to use and care for their protectors, and you must supervise them on the job to ensure they wear them correctly. (Please refer to the paragraph following the HCA summary for additional information on hearing protection.)

Training

Employers must train annually affected employees on the health effects of noise; the purpose, advantages and disadvantages of various types of hearing protectors; the selection, fitting and care of protectors; and the purpose and procedures of audiometric testing.

The employer will make available to affected employees or their representatives copies of the noise standard and also will post a copy in the workplace.

Recordkeeping

The OSHA standard requires employers to keep noise exposure records for a minimum of two years. You must maintain employee audiometric test records for the duration of their employment. Also, consult the OSHA access to employee exposure and medical records standard, 29 CFR 1910.1020, for other applicable record keeping and training requirements.

Obtain assistance from an audiologist or physician before establishing a hearing conservation program. This will help ensure that an effective, comprehensive and cost-effective program is developed.

Additional information on hearing protection

Hearing protection is available in three types: ear plugs, earmuffs and canal caps. The EPA's noise reduction rate (NRR) indicates the level of noise reduction afforded by a specific type of ear protector required to be listed on the product's packaging. The EPA establishes NRRs, however, on the basis of laboratory tests. Attenuation levels during use are usually less than those achieved in the laboratory.

The OSHA noise standard, Appendix B, lists several methods for determining the acceptability of ear protection in the field. One method is to subtract seven decibels from the published NRR. OSHA compliance officers apply an additional safety factor to the modified NRR when determining the feasibility of engineering controls. They divide the (NRR - 7 dB) value by two. Thus, ear protectors with a published NRR of 27 dB will have a field rating of 10 dB. For example, with the NRR listed, an exposure of 90 dBA will be reduced to 80 dBA, TWA when the hearing protectors are worn properly, $(27 \text{ dB} - 7 \text{ dB}) / 2 = 10 \text{ dB}$.

Confined space entry

This chapter provides an overview of confined space practices and uses OSHA's compliance requirements as a basis for developing effective confined space programs. BWC does not intend the information contained in this chapter to be a comprehensive review of OSHA's confined space compliance requirements. You may obtain specific detailed information concerning compliance matters by consulting the standard.

Background and definitions

The OSHA confined spaces rule, 29 CFR 1910.146, establishes the definition for permit-required confined space, as a confined space that contains or has a potential to contain a hazardous atmosphere, contains a material that has the potential for engulfing an entrant, has an internal configuration, whereas an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section, or contains any other recognized serious safety or health hazard.

OSHA also indicates that some confined spaces may be excluded from the definition. Those areas are termed non-permit confined spaces, which means a confined space that does not contain, or with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm. Examples of confined spaces include: tanks, vessels, silos, storage bins, hoppers, vaults, vats and pits.

Commonly recognized confined space hazards include: toxic vapors, gases or liquids, flammable gases; insufficient oxygen; electric shock; flowing solid materials like grain, fly ash and sand; mechanical equipment that could be activated, like agitators, mixers, augers, pumps or valves; and physical hazards, such as slippery surfaces or sharp objects.

General requirements

- The employer must evaluate the workplace to determine if any spaces are permit-required confined spaces.
- If the workplace contains permit-required confined spaces, the employer must inform workers by posting signs or by any other equally effective means of the existence, location and danger.

- If the employer determines employees will not enter permit-required spaces, he or she must take effective measures to prevent entry, and will comply with other referenced requirements in the standard.
- If employees will enter permit-required spaces, the employer must develop and implement a written program. The program must be available to employees or their representatives.
- An employer may use alternative methods for assuring safe entry into confined spaces, if done in accordance with specific OSHA guidelines.
- Changes in use or configuration for non-permit confined spaces may result in their reclassification to permit-required spaces.
- The employer must communicate, coordinate and educate contractors who may be working on-site on confined space locations, program and entry practices.

Confined space programs must include:

- Measures necessary to prevent unauthorized entry;
- Means to identify and evaluate hazards associated with confined spaces;
- Procedures and practices necessary for safe entry and operations;
- Appropriate equipment to accomplish the job safely;
- Pre-entry evaluation procedures and continued monitoring procedures during entry for oxygen, flammable gases or vapors, and toxic gases or vapors;
- Attendant or attendants stationed outside the confined space having specific responsibilities;
- Specifically named authorized entrants, attendants, entry supervisors or persons who test and monitor entry conditions. Identify the responsibilities for each function;
- Procedures for summoning rescue and emergency personnel;
- A permit system for authorizing entry;
- Procedures for concluding or securing entry operations;
- Program review and evaluation procedures, both following entry operations and as an annual process.

Training requirements

- Provide training to all workers who might be involved with confined space entry operations: entrants, attendants and supervisors.
- Provide training before workers are first assigned duties associated with confined spaces.
- Training must establish worker proficiency.
- Maintain documentation showing certified workers, dates of training and have the worker's signature attesting to the training.

Permit system

Employers must have a standardized permit system for confined space entry. The permit system must contain the following information on the permit:

- Identity of the permit space;
- Purpose of entry;
- Date of the entry and the authorized duration;
- Authorized entrants;
- Eligible attendants;
- Individuals eligible to be in charge of the entry process;
- Signature of the person authorizing entry;
- Hazards of the permit space;
- Measures for isolation of the permit space;
- Measures, such as lockout/tagout or purging used to remove or control hazards;
- Acceptable environmental conditions, quantified with regard to the hazards identified in the permit space;
- Testing and monitoring equipment, and procedures used to verify that all acceptable environmental conditions are maintained;
- Rescue and other services that would be summoned;
- Communication procedures and equipment to be used;
- PPE required.

Note: If hot work is required as part of the work to be done, use a separate hot work permit.

Pre-entry operations

- Isolate the tank from piping that may convey materials such as inert gases, flammable or hazardous materials, to the space by blanking or valving off in conjunction with a lockout system.
- Test the atmosphere within the space for oxygen deficiency, flammable gases or vapors, and toxic materials.
- If you identify a hazardous condition, take steps to eliminate or mitigate the condition, such as purging the space with steam, water or air.
- Lockout/tagout all energy sources, which might include electrical, pneumatic, hydraulic, steam and gravity sources.

Entry operations

- Station a trained attendant or attendants at the entry area.
- You may require ventilation fans and hoses.
- Continue and record confined space atmospheric testing.
- You may require non-sparking, pneumatic and/or low voltage electrical equipment.
- Keep compressed gas cylinders, with the exception of self-contained breathing apparatus cylinders, outside the space.
- Entrants should use a full-body harness with lifeline attached.
- You may need a communication system.
- PPE that might be necessary includes:
 - Coveralls;
 - Chemical protective clothing;
 - Safety eyewear (goggles, face shields, glasses);
 - Hearing protection;
 - Hard hat;
 - Gloves;
 - Boots;
 - Respiratory equipment;
 - Leathers, if welding.

The confined space entry permit on the following page is a sample only. See 29 CFR 1910.146 (f) for further details.

Confined Space Entry Permit

General information	Procedures/equipment																												
Confined space Identification number: _____ Confined space location: _____ Purpose of entry: _____ Date: _____ Time: _____ to _____ This entry permit is valid only for the date and time specified Additional permits: (Check only those that apply) Yes or No Hot work _____ Lockout/tagout _____ Line breaking _____ Other (specify) _____	Procedures/equipment (Check all that apply) Yes or No Isolation Lockout/tagout _____ Double block and bleed _____ Blanking and blinding _____ Line breaking/misalignment _____ Inerting (specify) _____ Ventilation Continuous forced air ventilation _____ Local exhaust ventilation _____ Air monitoring Initial _____ Periodic (i.e., 15-minute intervals) _____ Continuous _____ Respirator protection (specify) _____ _____ Personal protective or rescue equipment (specify) Tripod with mechanical winch _____ Full body harness _____ Portable lighting _____																												
Personal																													
Entry supervisor: _____ Attendant(s): _____ Entrant(s): _____ Time in: _____ Time out: _____ _____ Only designated personnel are authorized to enter the permit space																													
Hazard	Emergency services																												
<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Hazards (Check all that apply)</th> <th style="text-align: center;">Yes or No</th> </tr> </thead> <tbody> <tr><td>Mechanical</td><td style="text-align: center;">_____</td></tr> <tr><td>Electrical</td><td style="text-align: center;">_____</td></tr> <tr><td>Engulfment</td><td style="text-align: center;">_____</td></tr> <tr><td>Configuration (entrapment)</td><td style="text-align: center;">_____</td></tr> <tr><td>Atmospheric</td><td style="text-align: center;">_____</td></tr> <tr><td> Oxygen deficient</td><td style="text-align: center;">_____</td></tr> <tr><td> Oxygen enrichment</td><td style="text-align: center;">_____</td></tr> <tr><td> Explosive (gas or vapor)</td><td style="text-align: center;">_____</td></tr> <tr><td> Explosive (dust)</td><td style="text-align: center;">_____</td></tr> <tr><td> Hydrogen sulfide</td><td style="text-align: center;">_____</td></tr> <tr><td> Carbon monoxide</td><td style="text-align: center;">_____</td></tr> <tr><td>Other (i.e., radiation, noise, toxics)</td><td style="text-align: center;">_____</td></tr> <tr><td>_____</td><td style="text-align: center;">_____</td></tr> </tbody> </table>	Hazards (Check all that apply)	Yes or No	Mechanical	_____	Electrical	_____	Engulfment	_____	Configuration (entrapment)	_____	Atmospheric	_____	Oxygen deficient	_____	Oxygen enrichment	_____	Explosive (gas or vapor)	_____	Explosive (dust)	_____	Hydrogen sulfide	_____	Carbon monoxide	_____	Other (i.e., radiation, noise, toxics)	_____	_____	_____	Provided by: Name: _____ Phone: _____ Method of summoning: (Check all that apply) Yes or No Radio _____ Phone (specify) _____ Other (specify) _____ Verification of emergency services - initials _____
Hazards (Check all that apply)	Yes or No																												
Mechanical	_____																												
Electrical	_____																												
Engulfment	_____																												
Configuration (entrapment)	_____																												
Atmospheric	_____																												
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Other (i.e., radiation, noise, toxics)	_____																												
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	Communication																												
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Attendant or entrant (Check all that apply)	Yes or No																												
Visual	_____																												
Radio	_____																												
Other (specify) _____	_____																												

Air monitoring

Contaminant	Acceptable Exposure Level	Time Readings	Time Readings	Time Readings
Oxygen 19.5 - 23.5%	_____			
Explosive (gas/vapor) <105 LFL	_____			
Explosive (dust) <LFL (5 ft. visibility)	_____			
Hydrogen sulfide 10 ppm	_____			
Carbon monoxide 25 ppm	_____			
Air monitoring conducted By: _____		* Record calibration check on the back of this form.		

Authorization	Cancellation
Entry authorized by: Name: _____ Date: _____ Signature: _____ Time: _____ Post entry permit at entrance to permit space	Entry canceled by: Name: _____ Date: _____ Signature: _____ Time: _____ Return completed entry permit to appropriate authority

Lockout/tagout

Before a worker performs any maintenance, setup or service work on powered machinery, design and implement a fail-safe plan for the protection of that worker. Unexpected energizing or start-up of machines and equipment, or the release of stored energy, can expose workers to a host of hazards that can result in severe injury and even death. Workers can eliminate the risk of working with hazardous energy sources by employing the correct methods found in a lockout/tagout system.

Definitions

- Hazardous energy source — You may classify a hazardous energy source as mechanical, electrical, pneumatic, hydraulic, chemical, thermal or gravity.
- Zero energy state — Machine movement is either locked off, blocked or pinned. Every power source that can produce a machine member movement has been locked off, blocked or vented, leaving the kinetic energy of members at its lowest practicable value.
- Lockout device — A device (a padlock or combination of padlock and multiple-lock hasp hardware) that you can use to prevent a hazardous energy source from being re-energized.
- Tagout device — A warning tag that you can attach to critical areas to communicate why an energy source should not be re-energized. The tag will contain the name of the employee, the date and time the tag was initiated, and a brief description of work to be performed.
- Authorized employee — A person who locks out the energy source of a machine and tags it to perform the maintenance or service task.
- Affected employee — A person who is exposed to lockout/tagout procedures.

Program elements

The objective of good lockout procedures is to achieve a zero-energy state in any machine system being worked on. A sound lockout program includes a written program, employee training and periodic inspections. General program elements include:

- A written program documenting procedures used for identifying all sources of energy for each piece of equipment in the facility, training requirements and records, and assigned responsibilities and application of control procedures;
- Energy-control procedure training for all authorized and affected employees;
- Procedures annually inspected and revised by an authorized and certified employee;
- Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners or other hardware provided by management for isolating, securing or blocking of machines or equipment;
- A tagout system for lockout purposes if it provides full protection to the employees. A tag is only a warning device and requires additional safety measures (removal of circuit breaker, valve handle, etc.) to reduce the likelihood of inadvertent energizing.

Control procedures

The established lockout/tagout procedure should cover the following elements and actions in the following sequence:

1. Before the machine or equipment is shut off, the authorized employee will know the type, magnitude and hazards of the energy to be controlled and the methods used to control the energy;
2. Use an orderly shutdown procedure established for the equipment;
3. Identify and place all devices used to control the energy to the equipment or machine in an off or safe position;

4. Attach lockout devices in a manner that keeps the energy control devices in an off or safe position. Attach tagout devices at the same point a lock would have been attached and clearly indicate that the device is to remain in the off or safe position;
5. Relieve, disconnect, restrain and otherwise render safe all potentially hazardous energy;
6. Prior to starting the work, the authorized employee should verify that all energy to the machine or equipment has been eliminated;
7. Upon completion of the work, the authorized person will verify all tools and materials are removed, and all controls are operational and guards are in place. Authorized employees must be safely positioned when lockout/tagout devices are removed, and notify all affected employees that all lockout/tagout devices have been removed. The supervisor should verify the equipment or machine is safe to operate.

The flow diagram provides effective lockout procedure logic for safe hazardous energy control.

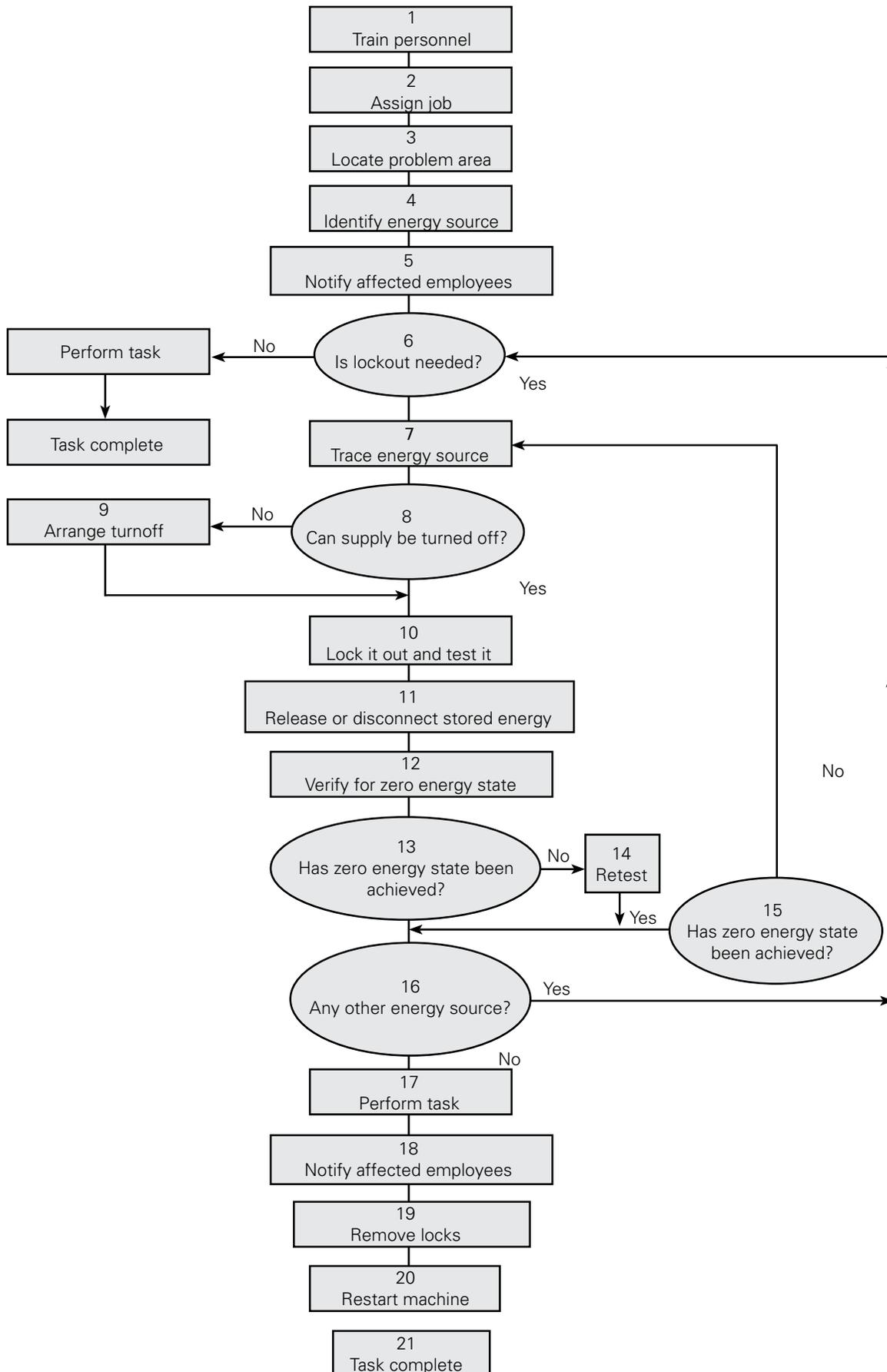
Special conditions

During certain operations, it may be necessary to energize the equipment for a short period of time. Notify employees in the immediate area and direct them to stay clear of the equipment. If the operation is to be deactivated again, the authorized person should repeat steps four to six above before work resumes.

In some instances work will carry over to another shift. A designated person must affix a department lock to the equipment so it is not energized during the transition. When the next shift employee comes to work on the equipment, he or she must repeat steps three to six before work can resume on the equipment.

If the work is completed and a lock remains on the equipment, employees will not remove it until the employee responsible for the lock is found or the supervisor investigates and ascertains that the equipment is safe to operate. Unauthorized removal of a lock will subject the employee to disciplinary action.

Lockout Procedures



Fork lift truck safety

Although the fork lift provides an extremely efficient method of moving materials, it also can be the source of severe injury and damage. Permit only trained and authorized workers to operate a fork lift.

The safe operation of a lift truck is up to the driver. The professional fork lift operator becomes thoroughly familiar with both the truck's capabilities and its limitations, then applies the high degree of skill and judgment necessary for the competent use of the lift truck.

Fork lifts are powered by three fuel types: electric, gasoline and LPG. From an operational standpoint, gasoline- and LPG-powered lift trucks are very similar. Electric fork lifts present several different operational safety needs.

Common safety considerations

- Because a worker knows how to drive a car, it does not mean that the same worker can drive a fork lift safely or efficiently. Years of experience are needed to develop expertise in driving safely and in material handling.
 - The rear wheels steer the vehicle, which causes the rear of the vehicle to swing out in the opposite direction of the turn. Many co-workers have been severely injured, or equipment damaged, because the operator failed to account for the swing.
 - Stability is greatly decreased when loads are carried in an elevated position. Fork lifts have overturned while traveling at moderate speeds with the load elevated. They also have tipped forward when stopping abruptly with the load in an elevated position.
 - Have the operator perform and document vehicle safety and operational checks at the start of each shift. Pre-shift checking identifies safety problems and operational deficiencies. Address those issues before they lead to an accident or high repair costs.
 - Visibility may be difficult when carrying loads that obstruct the forward view. Traveling in reverse, with the operator turning to maintain a clear and unobstructed view, eliminates forward visibility problems.
- Never permit riders on fork lift trucks. Fork lifts are not designed to accommodate additional riders, and many times riders have been injured because they fell from the vehicle.
 - Elevate co-workers on the forks only when a safety pallet is available. Safety pallets have guardrails, toeboards and a means for securing the pallet to the forks.
 - Gasoline- and diesel-powered fork lift trucks produce carbon monoxide (CO). Use of these forklifts in closed or poorly ventilated areas could cause worker exposures to CO to exceed healthful concentrations. Periodic measurements for CO are strongly recommended.

Education and training

Formally teach drivers the fundamentals of safe, effective fork lift driving techniques, including:

- Operating instructions;
- Truck controls and instrumentation;
- Vehicle capacity;
- Vehicle stability;
- Any other related topics in the owner's manual;
- Hazardous locations;
- Pedestrian traffic;
- Ramps and sloped surfaces.

Training should encompass both classroom and hands-on training.

Classroom training should encompass the following areas:

- Basic fork lift design and capacities, attachments and limitations;
- How fork lifts operate;
- Stability considerations;
- Load stability;
- Passengers;
- Driving over obstacles;
- Driving on ramps;
- Visibility obstruction;
- Maneuvering and stacking;
- Dock boards or bridge plates;
- Driving in trailers or rail cars;
- Fueling or recharging;
- Speed limits;
- Stunt driving and horseplay;
- Pre-shift safety and operational checks;

- How to obtain maintenance and repair assistance;
- Driver responsibilities;
- Differences between a fork truck and an automobile.

Hands-on training

- Demonstrate pre-shift safety and operational checks, then have each driver perform the checks and complete a pre-shift record form.
- Demonstrate proper driving techniques under a variety of simulated driving circumstances, then have each driver go through each simulation.
- Demonstrate materials-handling techniques, using actual loads and job-like circumstances, then ask each driver to duplicate the techniques.
- Set up an obstacle course using pallets, cones and boxes. Have drivers practice driving forward and backward, turning and maneuvering. Repeat the exercise while drivers carry actual loads.

Supervised practice will greatly assist drivers in gaining confidence and developing their capabilities. Drivers may wish to continue practicing at their own pace.

Conduct refresher training when:

- A fork lift driver operates the vehicle in an unsafe manner;
- Post-accident or following a near-miss incident;
- When driving a different type of truck;
- When performing a new or different job.

OSHA

OSHA requirements are found in 20 CFR 1910.178, powered industrial trucks. BWC strongly suggests that supervisors and operators be familiar with the requirements that apply to fork lift operation. Requirements include:

- The customer or user will not perform modifications and additions that affect capacity and safe operation without the manufacturer's prior written approval;

- Nameplates and markings must remain in place and legible;
- Lift trucks may be designed for use in different environments. Some may be specifically designed for use in hazardous locations. It is important that you equip lift trucks with all the necessary safeguards associated with the environment in which use will occur;
- Storage and handling of fuels should be in accordance with National Fire protection Association (NFPA) requirements: for gasoline, NFPA 30; for CPB, NFPA 58.

Locate battery changing, charging and storage areas in areas designated for that purpose. Provide facilities for flushing and neutralizing electrolyte, fire protection, protecting charging apparatus from damage and providing adequate ventilation. OSHA regulations may specify other requirements. It is strongly suggested that a copy of the forklift compliance requirements be used as a guide to compliance.

Employer responsibility

The employer will ensure that each powered industrial truck operator is competent to operate a powered industrial truck safely. It is the employer's responsibility to make sure employees have been properly trained before allowing them to operate a powered industrial truck.

Each operator needs to be certified, which includes:

- Operator's name;
- Date of training;
- Date of evaluation and testing;
- Identity of the trainer.

Forklift Truck Driver's Daily Check List

Electric

Truck number: _____ Check before start of each shift

S/N: _____

Check boxes accordingly OK Not OK

Date:										
Hour meter reading:										
Operator:										
Visual/operational checks	OK	Not OK								
Obvious damage/leaks Check floor										
Tire condition										
Battery plug connect										
Is connection tight?										
Warning lights										
Battery discharge meter										
Horn										
Steering										
Foot brake										
Parking brake										
Hydraulic controls										
Fire extinguisher Check pin and gauge										
Battery water level Check once a week										

Repairs needed:

Remarks:

Additional comments on back

Forklift Truck Driver's Daily Check List

Gas, LPG or Diesel

Truck number: _____ Check before start of each shift

S/N: _____

Check boxes accordingly OK Not OK

Date:									
Hour meter reading									
Operator									
Obvious damage/leaks Check floor									
Tire condition									
Engine oil level									
Fuel level									
Warning lights									
Radiator water level									
Horn									
Steering									
Foot brake									
Parking brake									
Hydraulic controls									
Fire extinguisher Check pin and gauge									
Battery water level Check once a week									

Repairs needed: _____

Remarks: _____

Additional comments on back

Ergonomics in the workplace

Effective job design must include balancing task demands with human operator capabilities. Ergonomics is the application of engineering and scientific principles to design a work environment that accommodates the employee in relationship to the workplace, workpiece, equipment, tools, workspace and organization of the work. The objective of ergonomics is to fit the task to the worker, rather than force the person to adapt to the work environment.

Traditionally, the workstation is set up for the sake of the workpiece. Industry took great strides to ensure the product was accommodated in every way to best meet production targets and quality goals. Most often, however, the most versatile element of the workplace is the human operator. In the past, the human operator was not considered in the design and layout of the workplace. The result of ignoring human limitations has been increased occupational injury and illness and lowered productivity levels.

Maximizing efficiency and reducing costs are sound business reasons for using ergonomically well-designed work environments. These work environments improve competitiveness and raise operational quality.

Workers' compensation statistics show that back injuries comprise 20 percent of all claims in Ohio, costing an estimated \$500 million annually. More than half of all occupational illnesses are due to cumulative trauma disorders. This boldly implies that task demands far exceed human capabilities.

The demand for ergonomics

Designing work environments that allow workers to operate more comfortably, without excess physical or mental stress, improves productivity, work quality, vigilance, job satisfaction and attitude.

Working without the distractions of aches, pains and premature fatigue can reduce or eliminate:

- Complaints, absenteeism, tardiness and high turnover rates;
- Injuries, work restrictions, disabilities, error or scrap rates and quality problems;
- Economic loss;
- Loss in expertise.

Workplace applications

Ergonomics is part of a broader science called human factors. Many disciplines, including psychology, physiology, anatomy, mathematics, statistics and engineering contribute to designing safe and productive work places.

Ergonomic workplace applications address:

- Manual materials handling;
- Cumulative trauma disorders (CTDs);
- Video display terminal use and office workstations;
- Adverse environmental conditions;
- Shift work and occupational stress;
- Display and control placement, design or arrangement.

Tangible indicators

Study accident records, such as the OSHA 300 workers' compensation history reports and first-aid logs to identify frequency and severity of ergonomically related problem areas, departments or job classes. Chapter 27 talks about other helpful recordkeeping practices.

Production records may point out bottlenecks, quality-control problems and other inefficiencies where the task demand versus worker capability may be out of balance. Use personnel records to identify areas of high absenteeism or tardiness and jobs that turn over personnel frequently.

Finally, employees can be helpful in providing insight and identifying potential problem areas. After all, who knows the job better than the person who does it on a daily basis? Find out what is the toughest part of the job, encourage symptom reporting and get them actively involved in workplace safety.

Also, retrofitting in the work environment is a potential problem area. When workers modify a tool, chair or any other part of their workstation, the original design may have been deficient or uncomfortable in some way.

Finally, task analyses or JSA are advanced techniques used to uncover and document the not-so-obvious hazards of a job or task.

Cumulative trauma

Cumulative trauma is a term referring to wear and tear on the musculoskeletal system. Cumulative indicates that physical stresses add up gradually over a period of time and result from many repeated stresses on a particular body part. Trauma signifies a bodily injury that can be classified as a disorder because it refers to a physical ailment or abnormal condition.

CTDs are not limited to any particular body part. Any link, element or joint of the musculoskeletal system can be subject to cumulative trauma. For instance, many back injuries are a result of cumulative trauma; they are not necessarily always acute traumatic incidences. Carpal tunnel syndrome, tendinitis, vibration syndrome and thoracic outlet syndrome are a few examples of the more commonly recognized CTDs. Repetitive motion disorders and overuse syndrome are other common terms that apply to the same class of injuries.

Risk factors

Certain physical elements of a job or a task are potentially stressful and known to contribute to CTDs. Job stresses become harmful and may result in CTDs when the capabilities and limitations of the worker are exceeded.

Risk factors that increase the risk of developing CTDs include:

- Repetitive motions;
- Awkward postures;
- Forceful exertions;
- Mechanical pressure on soft tissues;
- Inadequate rest.

Other contributing factors include adverse environmental conditions, such as cold, vibration and personal characteristics. It is important to note that humans are exposed to such risk factors off the job as well.

Just because one or more of these factors are present in a job does not necessarily mean that a CTD will develop. However, especially with exposure to multiple risk factors, the potential for CTD is higher. Conversely, if you can reduce or eliminate any or all of these risk factors, the potential for overexertion or injury decreases.

CTDs of the upper extremities

- Bend the tool, not the wrist. Select the proper tool design to eliminate poor posture. Reorient the tool, workpiece, container or workstation to achieve a straight wrist and reduce the stresses.
- Use powered instead of manual tools or equipment when work requires high forces or repetition. Keep frequently used tools and parts within easy reach.

- Working heights and reaches should allow the worker to keep the elbows as close to the side of the body as possible.
- Reduce excessive or unnecessary gripping and grasping forces. Design jigs or fixtures to hold workpieces, parts or tools. Also, power grips where all fingers can wrap around the object are preferable to using finger tips or pinch grips.
- If gloves are necessary for comfort, protection or cleanliness, take care in selecting the proper size, material and style. Poor-fitting gloves can prematurely tire the hand. Proper textures and thickness are often crucial to effective handling.

Often, the key to eliminating risk factors is in the proper design and selection of hand tools. The table at the end of this chapter offers guidelines for both manual and powered tools.

Manual materials handling

First, it is important to recognize that materials handling is often one of the largest cost components of a product, operation or service. Unnecessary handling of materials costs time and money. Ergonomics focuses on job design, not on teaching how to lift.

The following is a basic list of materials handling principles designed to eliminate individual exposure to risk factors and overexertion. These principles include strategies concerning management operations, material flow, the task, the load, workplace and workspace, the worker and equipment.

Management operations

- Make purchasing agents part of the program to pay attention to details, such as size, weight, packaging and convenience for handling. Also, ship direct from supplier to customer to avoid freight costs and handling.
- Reduce overall work-in-process quantities to avoid overcrowding, extra handling and inventory problems.

Material flow

- Eliminate unnecessary materials handling by combining operations or shortening the distances that the materials must be moved.
- Look for crossing paths, loops, backtracking and a general lack of direction as production of a material goes from start to finish. Short distances allow the workstations to be linked by conveyors and reduces carrying distances.
- Never work and/or store materials in aisles. Safe passage is necessary in the event of an emergency.

The job

- Be aware of the tradeoff between frequency of lift and weight. Frequency challenges endurance; weight challenges strength.
- Allow the employee as much time as possible to complete the task.
- Minimize reach requirements. Design the operation for the smallest person's reach.
- Avoid needless material stacking, storing or placement of work-in-process materials such as neatly orienting parts in containers when employees may be dump them out in the next operation.
- Simplify tasks by combining operations and steps.

The load

- Use large containers for high-flow volume and small containers for low volume.
- Plan for incoming materials to arrive in suitable containers so parts do not require unloading.
- Keep manually handled loads as small as possible and keep load height less than 30 degrees so the view is not obstructed.
- Ensure loads are easy to grip by providing handles, cutouts, straps or textured containers.
- Stabilize contents in containers by using vertical baffles or dividers to balance the weight and prevent shifting.

Workplace workspace

- Practice good housekeeping. Damaged floor surfaces, obstacles on the floor, damaged wheels and dirty/slippery surfaces can complicate handling.
- Try to restrict lifting postures by storing materials between knuckle height and shoulder height.
- Provide adjustable chairs and work surfaces wherever possible to accommodate more of the working population.

Worker

For jobs with considerable manual materials handling, whenever possible:

- Rotate employees from less strenuous jobs;
- Split work among two or more employees;
- Institute appropriate work/rest schedules.

The worker should receive specific training in:

- Mechanical handling aids;
- Recognizing materials-handling problems in the workplace;
- Procedures that can prevent excessive manual materials handling.

Remember that requiring employees to use particular lifting techniques, such as the squat lift, is not specifically recommended. Workers should lift the material in the position they find most comfortable.

Mechanical aids

- Pallet jack
- Two-wheeled hand cart
- Four-wheeled cart
- Motorized hand truck
- Hoist
- Crane
- Conveyor
- Powered industrial vehicle
- Lift table
- Lift and tilt table
- Winch
- Manipulator
- Positioner
- Uprender
- Dumper
- Chute

Try to incorporate concepts that fit the job to the worker. Consider maintenance and setup needs when planning, designing, purchasing and installing equipment. Build equipment around materials handling requirements.

Recommend, review and implement change

Once workers, staff and line personnel are aware of ergonomics, you must act upon any problems they identify. Ergonomics is not accomplished until exposure to the hazards and risk factors are eliminated.

One of the most effective means of achieving this is by establishing a formal ergonomics program. Key elements of a good ergonomics program include: work-site analysis, hazard prevention and control, sound medical management, and training. It also is crucial to ensure top management commitment, draft a written program, get employee involvement and meet regularly to plan, implement and evaluate the program's effectiveness.

Common to manual and power	
Handle length	<ul style="list-style-type: none"> • Full width of palm • 4-5" long
Handle shape	<ul style="list-style-type: none"> • Strive for power grip
Diameter	<ul style="list-style-type: none"> • 1.25 - 1.75" • Avoid one-size-fits-all
Hand fit	<ul style="list-style-type: none"> • Avoid grooves and contours that cause pressure points
Handle material	<ul style="list-style-type: none"> • Non-conductive • Textured to avoid slip or twist • Avoid thickening handle beyond range
Handle orientation	<ul style="list-style-type: none"> • Accommodates straight waist for given application
Free hand implications	<ul style="list-style-type: none"> • Jigs and fixtures to hold workpiece • Fixtures can even hold tool
Storage of tool between cycles	<ul style="list-style-type: none"> • Suspend if frequently grasped and released • Workstation or waist-mounted holster
Manual tools	
Handle span	<ul style="list-style-type: none"> • Not too large to grasp easily • 2-2.75" maximum width
Spring load feature	<ul style="list-style-type: none"> • Open span automatically
Grip strength considerations	<ul style="list-style-type: none"> • Consider power when operator has difficulty with forces or high repetition

Power tools	
Center of gravity of tool	<ul style="list-style-type: none"> • Should be near the center of the fist • Avoid nose-heavy tools
Weight	<ul style="list-style-type: none"> • Support or counterbalance if more than 2 lbs.
Trigger design	
Location	<ul style="list-style-type: none"> • Placed within grip so digits don't have to reach
Tension	<ul style="list-style-type: none"> • Light enough to avoid fatigue, heavy enough to avoid accidental activation
Size	<ul style="list-style-type: none"> • Preferably large enough to span multiple fingers;
Torque reaction	<ul style="list-style-type: none"> • Manual stop or reaction bar • Some tools stall rather than kick • Other tools ratchet or have adjustable clutches
Maintenance	<ul style="list-style-type: none"> • Upkeep and repair avoids vibration
Power	<ul style="list-style-type: none"> • Torque and speed adequate to match fastening requirements • Avoid overkill

Non-routine tasks

A non-routine task is one that is not normally a part of the worker's usual job assignment or one that is performed infrequently. Data indicate that the likelihood of severe injury is significantly increased when workers are not familiar with the tasks management asks them to complete. Supervisors who know the task are best qualified to handle familiarization and training.

Examples of non-routine tasks include:

- Cleaning a storage tank;
- Cleaning up hazardous waste;
- Moving major machinery;
- Working on the roof;
- Excavating;
- Cleaning a silo;
- Demolition work;
- Cleaning an auger or conveyor;
- Unloading a damaged drum;
- Rebuilding a furnace;
- Cleaning up spilled liquid;
- Digging out a sump hole;
- Rigging a heavy lift;
- Inspecting a pipe;
- Operating an unusual machine.

Effectively managing non-routine tasks requires preparation. What materials will you need for the job? Will special procedures and equipment be necessary? What can go wrong? How can you do it better?

A check list can be helpful to identify subtle problem areas and to pinpoint difficult, hard-to-find pitfalls in complex procedures.

To safely perform non-routine tasks, you may need to:

- Use PPE: gloves, hoods and coveralls;
- Block passages and use warning notices and barriers to prevent access of unauthorized people and vehicles;
- Rope off the area and provide signs to protect others from falling objects;
- Lock out and tag all sources of energy before beginning work.

The OSHA hazard communication standard requires a company to make provision for non-routine tasks in its hazard communication program. Provisions you should incorporate include:

- Training methods to use when dealing with non-routine tasks;
- Specific chemicals and protective safety measures to use;
- Other measures, like ventilation, respirators and emergency procedures.

Non-Routine Task Form

Name of task: _____

Department location where task is performed: _____

Special conditions: _____

Permits required

- Confined space entry
- Pressure/chemical pipe opening
- Lockout/tagout (or zero energy state)
- Welding/hot/burning
- Electrical only

Job materials needed

Safety equipment needed (air monitors, rigging, safety belts, disposal containers, etc.)

Personal protective equipment needed (gloves, eye protection, clothing, hood, hat, respirator, ear plugs, etc.)

Safety procedures (back up procedures, standby help, chemical hazards, physical hazards, environmental conditions, what to watch for, etc.)

Completed by: _____ Reviewed by: _____

New on date: _____ Revised by: _____

Hot-work permits

Welding, brazing, flame or plasma cutting, hot riveting, grinding, chipping, soldering, and other activities that produce sparks or use flame are commonly referred to as hot work.

These operations are normally performed in specially designed firesafe areas, but workers can use portable hot-work equipment for maintenance, construction or other modifications. Portable cutting, welding and other hot work can introduce temperatures sufficient to start fires or ignite explosive materials.

To properly control these hazards, management should establish a comprehensive hot-work control (permit) system. An effective system will specify safe work practices, require authorization before any work is done and ultimately assure that fire protection provisions are observed. Permit systems vary from simple verbal procedures to formal paperwork, depending upon site circumstances.

Hot-work control procedures

Issue a management policy statement specifying that no hot work be performed outside designated areas without authorization (a permit). Also designate a competent person to dispatch permits and monitor the use of the permit. Before a competent person can issue a permit, a supervisor must complete and file a pre-work evaluation, work-site inspection and fire protection evaluation.

The pre-work evaluation determines the need and feasibility for hot work. Management and area supervision should ask the following questions:

- Can this job be avoided? Does a safer procedure exist?
- Can the work be moved to a firesafe maintenance area?
- Are hot-work personnel properly trained and authorized?

- Are fixed fire protection systems functioning properly?

An individual in charge should perform a work-site inspection to identify and eliminate fire and explosive hazards. Consider the following precautions before issuing a permit:

- Equipment is approved and well-maintained;
- Gas cutting and welding equipment is properly secured to prevent upset;
- All possible combustible material has been moved at least 35 feet from the work area;
- Combustible material and equipment that cannot be relocated temporarily are covered with fire-retardant tarpaulins or other non-combustible covers;
- The work atmosphere is free from flammable or explosive vapors. Air sampling with approved equipment should indicate vapors are less than 10 percent of the lower explosive limit;
- Vessels containing flammable or combustible materials have been drained, cleaned, purged and tested. Transfer piping has been drained, purged and blanked;
- Combustible floors or roofs are wet down and/or covered with metal shield or fire-resistant tarps;
- Wall and floor openings are covered with non-combustible shields.

A fire protection evaluation should assure that all systems are on alert and fully functioning. Whenever workers are to perform hot work in areas containing combustibles and there is danger of fire from undetected smoldering combustibles:

- Post a fire watch;
- Have available appropriate portable fire extinguishers and/or one and one-half-inch charged fire hoses in the immediate area.

Issuance of the permit

The competent person issues the permit once he or she observes all precautions and the fire watch is in place. The authorizing person should sign the permit and issue it to the authorized hot-work employee. A form or tag is generally used to administer the program. The permit itself should specify:

- Equipment to be worked on;
- Type of work to be performed (cutting, welding, grinding);
- Protective equipment required;
- Standby fire protection equipment and/or personnel required;
- Permit's expiration date and time;
- Authorizing individual's signature (must be a competent person);
- Signature of the supervisor where work is being performed.

Post the permit in the area where the work is being performed. It should expire no later than the end of the authorizing person's shift.

If any unsafe condition arises, immediately stop work and report the condition. After the work is complete, the authorizing person should relieve the fire watch, inspect the work site, sign the permit verifying that the area is safe and file the permit for documentation purposes.

Fire watch

Specifically, a fire watch is required when:

- Appreciable combustible materials are closer than 35 feet from the point of operation;
- Appreciable combustibles are more than 35 feet away, but are easily ignited by sparks;
- Wall or floor openings within a 35-foot radius expose combustible material in adjacent areas;
- Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings or roof and are likely to be ignited by heat conduction or radiation.

The fire watch's duty is to maintain fire surveillance of the work area and areas not readily visible to the operator. The fire watch should remain on duty 30 minutes after the work has been completed. Equip the fire watch with water to prevent stray sparks or slag from starting fires, or to immediately extinguish any subsequent fires.

When the permit expires

Hot-work permits must not be extended to cover an area or a time not originally specified — no matter how small the job may seem or how little time it will take. Work during a succeeding shift requires a new permit from the responsible official on that shift.

Fire arrest and alert systems

When sprinklers and smoke detectors are disabled to perform hot work, develop and follow a fire protection impairment notification procedure. The procedure should include:

- Advanced notification to plant fire protection department, plant fire alarm service, public fire department and insurance company;
- Appropriate fire protection precaution being taken during the impairment;
- Sprinkler valve system is tagged out.

Permit for Cutting and Welding With Portable Gas or ARC Equipment

Date: _____

Building: _____

Dept.: _____ Floor: _____

Work to be done _____

Special precautions: _____

Is fire watch required? _____

The location where this work is to be done has been examined, necessary precautions taken and permission is granted for this work. (See other side)

Permit expires: _____

Signed: _____

(Individual responsible for authorizing welding and cutting)

Time started: _____ Completed: _____

Final check up

Work area and all adjacent areas to which sparks and heat might have spread (including floors above and below and on opposite sides of walls) were inspected 30 minutes after the work was completed and were found firesafe.

Signed: _____

(Supervisor or fire watcher)

Attention

Before approving any cutting and welding permit, the fire safety supervisor or his appointee will inspect the work area and confirm that precautions have been taken to prevent fire in accordance with NFPA-51B.

Precautions

Sprinklers in service
Cutting and welding equipment in good repair

Within 35 feet of work

Floor swept clean of combustibles
Combustible floors wet down, covered with damp sand, metal or other shields
No combustible material or flammable liquids
Combustibles and flammable liquids protected with covers, guards or metal shields
All wall and floor openings covered
Covers suspended beneath work to collect sparks

Work on walls or ceilings

Construction noncombustible and without combustible covering
Combustibles moved away from opposite side of wall

Work on enclosed equipment

(Tanks, containers, ducts, dust collectors, etc.)
Equipment cleaned of all combustibles
Containers purged of flammable vapors

Fire watch

To be provided during and 30 minutes after operation
Supplied with extinguisher and small hose
Trained in use of equipment and in sounding fire alarm

Final check up

To be made 30 minutes after completion of any operation

Signed _____
(Supervisor)

Safety committees

Many organizations do not take advantage of formal safety committees. Often, organizations underestimate the value of these committees. However, safety committees have the potential to significantly affect workers' compensation costs by enhancing the organization's accident—prevention process.

Purpose

Safety committees foster communications, an important component of the organization's safety process. Involving employees in the safety of their workplace and the company's safety process provides many benefits. The company benefits by tapping the reservoir of knowledge that workers possess and by incorporating supervisors' perspectives into the decision-making process. Close collaboration between workers and supervisors encourages a closer working relationship and provides opportunities for greater understanding.

Composition and design

Safety committees are composed of both labor and management representatives. Representatives may come from a single department or from a variety of areas. The committee's composition is up to the company. Some companies use first-level operating committees and also have higher-level review or leadership committees. Members may be volunteers or appointees. Support staff with safety responsibilities, such as safety coordinators, also may participate on committees.

It is important that upper-level managers recognize the important contribution that safety committees can make with regard to accident prevention and cost containment in their organization. Upper-management support is important to achieve successful outcomes.

The two-way communication process, up and down the organization, is crucial for achieving success. Employees need to feel the organization is listening, they have a say in safety-related matters and their opinions are important. Participation in group decision-making and problem-solving discussions helps to involve employees in the company's safety processes and creates a sense of ownership.

The chairperson should be a regular member of the committee and work in the operational or line organization, as opposed to being a staff safety person. Safety people generally attend as ad hoc members of the committee. It is helpful to elect a vice-chairman or secretary who will assist with meeting minutes, communications, scheduling and follow-up. Some committees use a system where the vice-chair assumes the chairmanship at the end of the present chairperson's term. The committee then elects a new vice-chair for the next term. In this way, continuity is maintained and each new chairperson learns the important aspects of committee operation while acting as the vice chair.

Functions and responsibilities

Committees function best when they define their own mission and objectives. Functions vary by company. What works for one, may not work for another. You may use the following list of functions as guidance for developing functional responsibilities:

- Review the company's safety and health program;
- Conduct regular safety inspections to identify safety problems with equipment, procedures or behaviors;
- Conduct safety training for the general staff;

- Take action to address and correct safety-related problems;
- Review and/or investigate accidents and near-misses;
- Recommend corrective actions in response to accidents or identified problems;
- Develop safe work practices and policies;
- Accompany OSHA compliance inspectors;
- Represent other employees' views on safety matters.

The committee should regularly meet to review the safety of operations, the adequacy of safety training programs and the organization's illness and injury records. With this information, the committee can participate in the establishment of company safety goals and objectives on a regular basis. Committees also should be involved in the process of working toward achievement of agreed-upon safety and health goals.

Benefits

Safety committees can be a valuable resource for the management of operational safety. Remember, however, the company's line or operations management, with the employees, is responsible for the safety of the work place. View committees as a resource for enhancing or facilitating workplace safety.

As companies find more and more ways to involve employees in the safety of the work place, the momentum for working safely will build. Employees will feel good about their contribution to the safety of their own workplace and emerge as stakeholders.

Viewed as a constructive resource, labor/management committees that focus on safety can be a very effective driver for safety and health. The financial and human benefits include reduced costs, increased profitability, and the preservation of human resources.

Chapter 27

Recordkeeping systems

Recordkeeping systems provide a controlled and consistent method of documenting safety data and to summarize loss-prevention activities. Reasons for generating and maintaining good recordkeeping systems are based on:

- Gathering information to reduce accidents, injuries and illnesses;
- Maintaining regulatory compliance;
- Tracking and analyzing data and activities;
- Providing a source of information for management;
- Justifying programs and budgets.

This chapter provides a selection of recordkeeping forms not included in this manual's individual chapters. Use these samples to build the indi-

vidual systems that will assist you in meeting your organizational needs and challenges. You may use the ideas and forms presented here in a way that best suits your needs. However, you may need to develop other forms for your particular business needs. The forms included here represent the basic recordkeeping needs of most organizations.

Most forms are self-explanatory and require no discussion. A few forms may require a certain degree of background knowledge and understanding for successful implementation. In such instances, consult safety management texts and articles pertaining to the specific subject.

Safety Inspection Report

To: _____ Date: _____

From: _____

CC: _____

Area: _____

Toured by: _____

Our findings are not for placing blame, but rather to gather information so that we will provide working conditions, policies and procedures that will be conducive to the prevention of injury or illness, so that we will comply with federal and state safety laws and standards (OSHA, NEC, ANSI, EPA, DOT, RCRA). References to the requirements are available through safety services.

Priorities listed in this report are based on probability and severity of accident or non-compliance on a 1 to 10 basis.

1 = Least

10 = Most

NOTE: This report is placed on a _____ day follow up by safety services. This report requires a written reply on corrections.

Comments: _____

Safety inspection report

Area of condition or act	Condition/act	Priority	
Building		Reference standard	
Department		OSHA	
Procedures		NFPA	
Machine		NRC	
Correction		Other	

Action taken/date _____

Area of condition or act	Condition/act	Priority	
Buildin		Reference standard	
Department		OSHA	
Procedures		NFPA	
Machine		NRC	
Correction		Other	

Action taken/date _____

Area of condition or act	Condition/act	Priority	
Building		Reference standard	
Department		OSHA	
Procedures		NFPA	
Machine		NRC	
Correction		Other	

Action taken/date _____

Suggested Weekly Press Inspection Procedure

(For OSHA Compliance)

This list for presses with part revolution (air) clutches

Press serial number: _____ Inspection date: _____

Press model number: _____ Inspector: _____

Users equipment number: _____ Type of point of operation guarding: _____

Location: _____

Warning

Use extreme caution when performing press inspection. Disconnect power to the press and lock disconnect switch in the off position. Make certain flywheel has stopped turning. When necessary to restore electrical power and air pressure, make certain that all persons avoid pinching points associated with operation of the press and/or its auxiliary equipment. Press inspection should be performed only by authorized, experienced personnel.

Components Inspection

Note: Refer to the manufacturer's instructions for further information.



Brake disc, anchor brackets and pins

- Check condition of brake disc, brake anchor pins and/or brackets. Check for wear, including excessive vertical clearance between brake disc and anchor brackets. Also, make certain these components are properly located and secured. Replace parts that are cracked, broken or worn.

Brake friction material

- Check brake friction material to make certain it is not worn or oil soaked. Clean oil film from brake facings, if necessary, with an approved solvent. Replace facings heavily saturated with oil. Replace all brake facings if thinnest section is worn to limit specified by manufacturer of clutch/brake unit.

Brake springs

- Check brake springs for proper adjustment; broken springs; broken spring studs. Readjust or replace parts as necessary.

External clutch mechanism

- Check external clutch mechanism for cracked, broken or missing parts. Check for missing or loose nuts, bolts and other fasteners. Repair or replace as necessary. Make certain protective covers are in place.

Clutch air line lubricator

- Check condition of clutch air line lubricator.
- Remove any accumulation of water from bowl.
- Fill to line on bowl with light grade turbine oil, rust inhibited. (Minster lube specification No. 3)
- If, after a week of press operation, oil level has not lowered, observe drip tube to make certain oil is being dispensed by the unit.

Rotary limit switch

- Check drive to limit switch for loose, worn or damaged parts.
- Check condition of protective cover and make certain that it is properly secured.
- Perform internal inspection of limit switch parts and wiring at time intervals specified by limit switch manufacturer.

Suggested Weekly Press Inspection Procedure

This list for presses with part revolution (air) clutches



	<ul style="list-style-type: none"> ○ Check all components inside to make certain they are in good working condition and mounted securely. Replace damaged or overheated components.
Electrical control Panel	<ul style="list-style-type: none"> ○ Check for loose wire terminals and connections — tighten if necessary. ○ Check wiring for burned or damaged insulation.

	<ul style="list-style-type: none"> ○ Inspect all control buttons for broken, cracked or loose sections. Replace entire switch if any part of it is damaged or worn. ○ Check all stop control and top stop buttons to make certain they function properly. ○ Check all two-hand run buttons to make certain they function properly and that slide cannot be stroked by depressing one button only. ○ Check to make certain both run buttons must be released to obtain another stroke. ○ With stroking selector in the single stroke mode, make certain press stops after completing one stroke even though both run buttons are held depressed.
Push buttons	

	<ul style="list-style-type: none"> ○ Check condition of each selector switch. Replace any switch that is worn, damaged or not functioning properly. ○ Check for proper response from each designated function of each selector switch.
Selector switches	

	<ul style="list-style-type: none"> ○ Make certain ring protectors or shrouds are secured around all operator's run buttons. ○ Make certain controls are used properly and in a safe manner. ○ Make certain all electrical covers are in place and that unprotected wires are properly secured. ○ Check guard switch receptacle to make certain it is being used where necessary, and that it functions properly.
Operator's controls and associated components	

	<ul style="list-style-type: none"> ○ Check condition of solenoid air valve and its mounting. ○ Check condition of hose connected to the solenoid valve. Replace, if necessary, only with correct length and type of hose. (Hose must not kink during operation.) ○ Set clutch pressure regulator to provide at least 60 psi (4.2 kg/cm²) air pressure. Then, with slide at bottom of stroke, drive motor turned off and flywheel stopped, energize clutch solenoid valve by actuating inch or bar buttons. While the valve is held energized, have another person check for air leaks at the valve, air distributor and clutch. <p>WARNING: Clutch will engage when clutch valve is energized. Repair or replace any parts causing air leakage.</p> <ul style="list-style-type: none"> ○ Make certain solenoid valves operate properly and that their response is immediate and snappy. Replace the complete solenoid valve if it is worn or working improperly.
Clutch solenoid air valve	

Enter description of repairs and/or maintenance work completed.

Date completed: _____ Signed _____

Press serial number: _____

Stopping Time Test (Weekly Inspection)

For part revolution (air) clutch presses

Record the following test conditions so that stopping time results can be compared with those obtained under similar conditions.

1. Press speed during test. _____ S.P.M.
2. Upper die weight _____ BS.
3. Clutch air pressure. _____ P.S.I.
4. Counterbalance air pressure. _____ P.S.I.

Prior to performing stopping tests, single stroke the press for several minutes to allow press parts, clutch and brake to warm up. Then check the stopping times (or stopping angles) of at least five different strokes. Record the longest stopping time.

5. Measured press stopping time _____ millisec.
Note: If a stopping time readout instrument is not available, record
stopping angle of the crankshaft _____ degrees.

6. Established normal press stopping time _____ millisec.
Note: The normal press stopping time (or the stopping angle shown in Step 6. a.) is the amount previously recorded when clutch/brake performance was optimum and operating conditions were similar to those of the present test.

- 6.a. (Optional Established normal press stopping angle of press crankshaft _____ degrees.
Important: For accurate comparison of the stopping position with those of previous tests — to determine possible braking deterioration—the values of items 1 through 4, above, must duplicate those of the previous tests. Additionally, the press rotary limit switch adjustment, either internally or externally (adjustable sprocket), must be the same as in the original test with which the weekly test is compared.

7. Increase in stopping time, if any
(Subtract line 6 from line 5.) _____ millisec.

- 7.a. Increase in stopping angle, if any _____ degrees.

8. Maintenance or repair required. No Yes

NOTE: A 15 to 20 degree increase in stopping time (or a 15 to 20 degrees increase in stopping angle), above that established as normal for similar operating conditions, indicates the need for corrective maintenance or repair.

Suggested Weekly Press Inspection Procedure

(For OSHA Compliance)

This list for presses with full revolution (air) clutches

Press serial number: _____ Inspection date: _____

Press model number: _____ Inspector: _____

Users equipment number: _____ Type of point of operation guarding: _____

Location: _____

Warning

Use extreme caution when performing press inspection. Disconnect power to the press and lock disconnect switch in the off position. Make certain flywheel has stopped turning. When necessary to restore electrical power and air pressure, make certain that all persons avoid pinching points associated with operation of the press and/or its auxiliary equipment. Press inspection should be performed only by authorized, experienced personnel.

Components Inspection

Note: Refer to the manufacturer's instructions for further information.

Satisfactory
Unsatisfactory

○

○

○

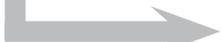
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Brake mechanism	<input type="radio"/> Check condition of brake arm, yoke and brake wheel. Make certain brake arm clamp is in good condition and that it is properly secured. Make certain brake arm pin is properly secured. Repair or replace as necessary.
Brake friction material	<input type="radio"/> Check brake friction material to make certain it is not worn or oil soaked. Clean oil film from friction material, if necessary, with an approved solvent. Replace friction material that is heavily saturated with oil. Replace friction material if thinnest section is worn to limit specified by the press manufacturer.
Brake spring	<input type="radio"/> Check brake spring for proper adjustment; broken spring; broken spring bolt. Make certain jam nut is tight against the adjusting nut. Readjust or replace parts as necessary.
External clutch mechanism	<input type="radio"/> Check external clutch mechanism for cracked, broken or missing parts. <input type="radio"/> Check for missing or loose nuts, bolts and other fasteners. <input type="radio"/> Make certain all protective covers are in place. Repair or replace as necessary.
Clutch trip mechanism	<input type="radio"/> Make certain that the foot treadle, shaft levers, links, rods and other mechanisms used to engage clutch are in good condition, properly secured and lubricated, and protected against operation by means other than by the foot of the operator. <input type="radio"/> If hand trips are used, check condition and operation of hand buttons, associated air cylinders and/or related mechanism for actuating the clutch. Repair or replace parts as necessary.
Clutch lubrication	<input type="radio"/> Make certain internal and external clutch parts, and bearings, are properly lubricated per manufacturer's instructions.

Enter description of repairs and/or maintenance work completed. _____

Press Serial number: _____

Operational Tests (Weekly Inspection)

For full revolution clutch presses

⚠ Warning

Before stroking press, make certain that all persons avoid any pinching points associated with operation of the press and/or its auxiliary equipment.

Satisfactory
Unsatisfactory

Start the press main drive motor, observe the above warning and perform the following tests:

1. Place clutch mode selector switch in the single stroke position, then actuate the clutch engaging means — foot treadle or hand trips.

- a. Make certain crankshaft stops near top of stroke when clutch is tripped in the normal manner.
- b. Make certain crankshaft stops near top of stroke even though engaging means is held depressed.

Note: The crankshaft should normally stop within five to 10 degrees before top of stroke on most presses equipped with the full revolution clutch. Make certain crankshaft does not overtravel its top of stroke position and strike the safety stop.

2. Place clutch mode selector switch in the continuous position, then actuate the engaging means and allow press to stroke continuously for about five to ten strokes.

- a. Make certain crankshaft stops near top of stroke after clutch is disengaged.

Enter description of repairs and/or maintenance work completed.

Date completed _____ Signed _____