Safety Handbook for

Metal Stamping *and* Sheet Metal

A resource guide for the metal stamping and sheet metal industry

Introduction

The safety and health of employees is of primary concern to all employers. After all, employers are your most valuable resource.

This guide identifies and explains safety and health workplace concerns in the metal stamping and sheet metal industries. It summarizes effective accident-prevention principles and techniques, provides management and employers with information to help them work safely, and enables safety teams to meet their goals and obligations.

BWC realizes that organizations within the metal stamping and sheet metal industries have individual needs, and that not all the information presented here is pertinent to every employer. However, this manual can serve as a good starting point and a convenient reference for managing safety issues.

This manual however, is not all encompassing and is not a compliance document. You must individualize safety and health programs to meet the needs of each workplace. BWC's Division of Safety and Hygiene (DSH) has many experienced safety and health consultants that specialize in the metal stamping and sheet metal industry. Many field staff have more than 20 years experience in the industry. In addition, several staff members hold professional certifications from the Board of Certified Safety Professionals. Please join BWC in making occupational safety and health a way of life at your sheet metal or metal stamping shop.

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

Safety works, and it can work for you and your employees. To learn more about BWC's other safety services, visit **ohiobwc.com**, or call **1-800-OHIOBWC**, and request a *Safety Services Catalog.*

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Knowing you and your industry

Introduction to the sheet metal/ metal stamping industry

BWC identified sheet metal and metal stamping employers among the top 10 workers' compensation classifications with the highest fre-quency of claims and highest claims costs in Ohio. According to the National Council on Compensation Insurance's (NCCI's) manual classifications, a sheet metal shop (manual 3066) is: "A place of employment that manufactures products using cir-cular and squaring shears, brakes, rolls (both smooth and corrugating), punches, riveters, flangers and, perhaps, some welding machines, both spot and continuous."

NCCI defines metal-stamping facilities (manual 3400) as plants that normally apply to facilities that mass-produce metal products by extensive stamping, punching or blanking of sheet metal, as well as shearing and braking operations. These operations are accented by incidental assembly and enameling operations.

Summary of employer interview from Wayne Dalton and PHD MFG

Below is an example of the steps Wayne-Dalton Corp., an overhead-door manufacturer headquartered in Mount Hope, took to establish a more safety-oriented corporate culture at its Door Systems Division in Dundee.

- Wayne-Dalton started to observe an increase in workers' compensation costs due to workplace accidents. Being self-insured, the company developed a corporate strategy to reduce its risk of potential accidents and manage current claims.
- The company contacted BWC's Canton Customer Service Office to seek assistance with its safety program.
- A BWC safety specialist started working with Wayne-Dalton. He conducted an initial hazard assessment throughout the Dundee facility, identifying eight items needing correction. The company developed an immediate action plan to abate the hazards and eliminate the risk of injury.
- The company continued to work with BWC regularly since its initial hazard assessment. BWC staff conducted industrial noise monitoring and air sampling. During the most recent safety audit, BWC safety specialists identified no physical hazards.
- To reward and recognize staff members the company developed an incentive program. Examples of rewards include: Gift certificates for working a certain period of time without a lost-time accident and catered dinners and lunches.
- The company rewarded the entire staff at the plant for not having a lost time accident in five years.
- Wayne-Dalton, which operates several facilities in the United States, also has a corporate safety-incentive program.
- One of the keys to achieving such great success was empowering the plants' staff members to take an active role in the safety process. Effective communication and feedback, and the use of a team-like atmosphere helped make this possible.
- Being responsible for all activities at the plant, Dundee plant manager Donald Diglaw took an active role in the safety process. He participated in hazard assessments, spoke with all employees daily, conducted monthly safety meetings, and helped develop standard procedures for safe equipment use and work processes (for example, driving fork lifts, operating saws or locking out equipment).
- Due to the Occupational Safety and Health Administration's (OSHA's) emphasis program on mechanical power presses Wayne-Dalton conducted comprehensive, machine-guarding evaluations. The company immediately addressed guards that needed modified or replaced.
- Employees are accountable for their actions by their peers, the plant supervisor, and the plant manager.
- The company provides training in monthly safety meetings.
- Without the employees' support of the in the shop, the system would not work. Through small successes, the employees started to take more pride in their work and truly try to reduce or eliminate taking risks.

Below is an overview of the safety-improvement efforts undertaken by PHD Manufacturing Inc., in Columbiana, Ohio.

- The company realized that job-related accidents were having an impact on its workers' compensation premiums and hired a third-party administrator.
- The company developed a safety team that met monthly.
- Pre-employment physicals and a drug screening process were implemented during this time period, as well.
- Through participating in BWC's Premium Discount Program+, the company started working very closely with BWC's safety and employer services departments.
- BWC safety consultants and industrial hygiene staff consulted with the company regularly. BWC employer services personnel worked with the human resources department to identify effective loss-control strategies such as claims settlement and early return to work.
- Members of the management team and hourly staff started attending several safety and health workshops and seminars provided through BWC.
- During this time, the company started evaluating the equipment and processes within the plant. They made machine guarding improvements on several machines.
- Two years later, the management staff decided to centralize the claims management function through the human resources department.
- They developed post-accident and reasonable-suspicion, and a drug-testing policy. It also formally entered BWC's Drug-Free Workplace Program.
- Employee involvement and recognition is a key factor in the success of the safety program. Employees are given the opportunity to participate on various teams. Ideas for improvements and suggestions are generated from the staff and reviewed by the management team.
- The company annually rewards and recognizes staff members through an all-employee celebration and recognition day. It provides a catered lunch and presents safety awards to staff members.

Identifying concerns

Assessing your company's safety management

We provide the assessment tool below to assist employers in evaluating their safety process.

1. Visible, active senior management leadership

Visible senior management leadership promotes the belief that management of safety is an organizational value.

This requires the following:

- Authorize the necessary resources for accident prevention;
- Discuss safety processes and improvements regularly during staff or employee meetings;
- Hold management accountable for accident-prevention activities and for managing accident-prevention processes;
- Use perception surveys, personal interviews and/or sampling to assess the success of the safety process annually;
- Encourage employees to take an active part in maintaining a safe workplace.

A. Describe how your organization addresses each of the above requirements and provide any supporting documentation.

B. Briefly describe planned improvements and activities for the coming year under Step 1.

2. Employee involvement and recognition

Employee involvement and recognition that affords employees the opportunity to participate in the safety-management process.

Employee participation opportunities include, but are not limited to, the following:

- Safety and health involvement teams, focus groups, or safety and health committees;
- Accident investigations analysis and assessment;
- Safety and health audits;
- Acting as instructors for safety and health training programs.

A. Describe how employees participate in the safety-management process (e.g., how they are involved in decision making and problem solving), and how often they meet with management to specifically discuss this process.

B. How often do these employees meet with management to address the safety-management process?

C. How often does management review employees' input and incorporate their ideas into the organization's safety culture?

D. Describe how you recognize employees for their actions and efforts in bettering the safety-management process (for example, contributions to decision making, suggestions). Recognition includes the establishment of an ongoing process to identify and formally recognize employees for excellence in accident prevention.

E. Briefly describe planned improvements and activities for the coming year under Step 2.

3. Medical treatment and return-to-work practices
Employers shall establish a post-injury or disability management policy and procedure consistent with the Health Partnership Program (HPP) to help injured or ill employees obtain quality medical care and return to work.

Components of the disability management procedure will include, at minimum:

- Informing employees of the selected managed care organization (MCO);
- Informing employees of where they can obtain medical treatment;
- Providing employees with other supporting information or materials;
- Immediately reporting accidents and illnesses to a supervisor;
- Communicating with off-work employees while they are convalescing;
- Investigating accidents within 24 hours to identify system or process improvements;
- When not prohibited by a labor agreement, implementing a modified-duty or transitional-work program that allows employees to return to work in a productive capacity during the recuperative period.

A. Do your employees now their MCO? ☐ Yes ☐ No

B. Do employees have supporting HPP information or materials? ☐ Yes ☐ No

C. Do employees know where they can obtain medical treatment? ☐ Yes ☐ No

D. Describe the accident-reporting process and the time frame in which this occurs. How and when do you communicate this to employees?

_____

_____

_____

E. Describe your medical treatment, accident analysis and correction procedures.

_____

_____

_____

F. Do supervisors contact recuperating injured workers? ☐ Yes ☐ No

G. If the supervisor does not contact the injured worker, who does? _____

H. How do you contact injured workers? _____

I. Do you have a modified-duty or transitional-work policy? ☐ Yes ☐ No

J. If no, why not?

K. If yes, have you used it? ☐ Yes ☐ No

L. How many times per year? _____

M. Briefly describe planned improvements and activities for the coming year under Step 3.

4. Communication

A program of regular communications on safety and health issues to keep all employees informed and to solicit feedback and suggestions.

A. How often do you advise employees of individual and organizational safety performance _____

B. How do you obtain workplace safety suggestions, and how do you respond to these suggestions?

C. How do you communicate and ensure all employees are informed on safety matters?

D. Briefly describe planned improvements and activities for the coming year under Step 4.

5. Timely notification of claims
Employers must immediately report claims to BWC or its designee, the MCO, which in turn, must report to BWC within 24 hours.

However, employers must assure they report all cases involving lost time of more than seven days to BWC within 14 days of the date of injury or one week after the ill or injured employee notifies them of the incident.

A. Describe your process to immediately report injuries to BWC or your MCO.

_____

_____

_____

B. Do you report claims within 14 days of the date of injury or within one week of notification from the ill or injured employee? ☐ Yes ☐ No

If the answer is no, what causes the delay? _____

_____

_____

C. What are you doing or what would you do to follow up with your MCO to ensure timely claim filing?

_____

_____

_____

6. Safety- and health-process coordination
Assigning an individual the role of coordinating safety efforts for the company.

Duties must include:

- Helping management and employees identify accident prevention, and safety and health training needs (possibly through the use of perception surveys, interviews, behavior sampling or other methods);
- Helping supervisors make changes or develop strategies that improve the organization's safety systems and processes;
- Identifying and communicating new safety and health requirements;
- Compiling accident- or illness-related records;
- Tracking progress on safety- and health-related projects;
- Working with employees to optimize safe work practices.

A. What are the name(s) of your accident-prevention coordinator(s)?_____

_____

B. Describe how your accident-prevention coordinator(s) perform the above duties.

_____

_____

_____

7. Orientation and training
Orientation and training for all employees.

Orientation must include:

- Company safety and health policy;
- Employee responsibilities;
- Medical procedures such as how and when to report injuries or illnesses;
- Actions to take in case of emergency;
- How to report unsafe practices and conditions;
- Return-to-work procedures.

A. Describe how you accomplished the above orientation activities.

_____

_____

_____

Develop a written safety- and-health training process that documents specific training objectives and instruction processes.

At a minimum, training must cover procedures for the safe and efficient use of machinery and tools, including:

- Ergonomic risk factors and the prevention of cumulative trauma disorders;
- Chemical hazards, and how to prevent contact or exposure;
- If appropriate, procedures for lockout/tagout, hot work permits and confined space entry.

B. Pertaining to safety and health, do you survey your employees to determine their training needs? ☐ Yes ☐ No

What other methods do you use to determine your training needs?

C. Do you have a written training plan designed to meet your employees' needs? ☐ Yes ☐ No

D. Describe how you will meet your training needs for the coming year under Step 7.

8. Written and communicated safe work practices

Publish safe work practices so employees have a clear understanding of how to safely accomplish their job requirements.

You must identify, document and make available both general and job-specific safe work practices.

A. Do you have written general safe work practices? ☐ Yes ☐ No

B. Do you have written job-specific safe work practices? ☐ Yes ☐ No

C. What jobs still need written job-specific safe work practices?

D. Do you require employees to sign a statement that they have read, understand and will follow the safe work practices? ☐ Yes ☐ No

E. How do you plan on keeping these written practices current to keep your employees informed?

9. Written safety and health policy
Your top executive must sign a safety and health policy document to be given to all new hires. Communi-cate the policy to all employees, and then review with them on an annual basis.

A. Do you display this on a bulletin board? ☐ Yes ☐ No
If no, where is it posted? _____

B. Do you display this in an employee handbook? ☐ Yes ☐ No

C. If no to both B and C, where do you post it? _____

D. What other method do you use to inform employees that their safety and well-being is important to the senior officer?

_____

_____

_____

E. How often do you review the safety policy with employees? _____

10. Record keeping and data analysis
Internal program verification to assess the success of the company safety efforts, to include audits, surveys and record analysis.

Compile injury- and illness-related data to:

- Identify safety and health process problems;
- Help manage the compensation process;
- Provide information necessary for developing solutions to problems.

A. What injury- and illness-related data do you record and compile for analysis?

_____

_____

_____

B. Do you keep an OSHA 300 log? ☐ Yes ☐ No
If not, how do you keep record of injury? _____

_____

_____

C. How does recordkeeping and data analysis help you identify problems, develop solutions and manage the compensation process?

D. Do you track near misses or close calls? ☐ Yes ☐ No

E. If yes, what trends have you discovered/corrected?

Safety- and health-management assessment and action plan (Step 1)

Please use the following template to document your plan for improving your safety and health-management process. The assessment section helps you review your organization and identify areas that may not exist or that need improvement. The plan is an effective way to list intended improvements, required action steps, who is responsible for completing each item and the deadline for completing each step. As mentioned earlier, accountability is critical for effectively completing the performance goals. This type of action plan will help you hold people accountable.

Step 1 Visible, active senior-management leadership	Action Plan (describe) a) Doing now	 b) Improvements to be made	Person responsible	Completion date
a) Authorizing necessary resources for accident prevention				
b) Discussing safety processes and improvements regularly during staff or employee meetings				
c) Holding management accountable for accident-prevention activities and for managing accident-prevention processes				
d) Assessing annually the success of the safety process by using surveys, personal interviews and/or behavior-sampling				
e) Encouraging employees to take an active part in maintaining a safe workplace				

Safety- and health-management assessment and action plan (Step 2)

Step 2 Employee involvement and recognition	Action plan (describe) a) Doing now	 b) Improvements to be made	Person responsible	Completion date
a) Safety and health involvement teams, focus groups, or safety and health committees				
b) Accident investigations analysis and assessment				
c) Safety and health audits				
d) Acting as instructors for safety and health training programs				
Recognition opportunities can include:				
a) Recognizing employees for excellence in accident prevention;				
b) Recognizing employees for consistently contributing to safety and health;				
c) Recognizing employees' contributions to continuous improvement by participating in problem solving, decision making or perception surveys;				
d) Recognizing employees who suggest safety and health improvements or complete safety and health projects.				

Safety- and health-management assessment and action plan (Steps 3 and 4)

Step 3 Medical treatment and return-to-work practices	Action Plan (describe) a) Doing now	 b) Improvements to be made	Person responsible	Completion date
a) Informing employees of procedures for obtaining medical treatment, including informing employees of the selected MCO				
b) Immediate reporting of injuries and illnesses to a supervisor				
c) Regular communication with injured or ill employees who are off work				
d) Investigate injuries or illnesses within 24 hours to identify processes and corrective measures				
e) When not prohibited by a labor agreement, a modified-duty or transitional work program allows employees to return to work in a productive capacity during the recuperative period				

Step 4 Communication	Action plan (describe) a) Doing now	 b) Improvements to be made	Person responsible	Completion date
a) Quarterly written and/or verbal feedback to all employees on their accident-prevention performance				
b) A process for upward and downward communication throughout the organization, including obtaining and responding to employee suggestions				

Safety- and health-management assessment and action plan (Steps 4, 5 and 6)

c) Communication can include memos, bulletin boards, staff and general meetings				
d) Feedback should include the organization's overall safety and health performance				

Step 5 Timely claims notification	Action plan (describe) a) Doing now	 b) Improvements to be made	Person responsible	Completion date
a) Immediately report claims to the MCO				
b) Verified MCO reports claim to BWC within 24 hours				

Step 6 Safety- and health-process coordination	Action plan (describe) a) Doing now	 b) Improvements to be made	Person responsible	Completion date
a) Helping management and employees identify accident prevention and safety-and health-training needs through perception surveys, interviews, behavior sampling or other similar methods				
b) Helping supervisors make changes or develop strategies that improve the organization's safety systems and processes				

Safety- and health-management assessment and action plan (Steps 6 and 7)

c) Identifying and communicating new safety and health requirements				
d) Compiling injury- and illness-related records				
e) Tracking progress on safety- and health-related projects				
f) Working with employees to optimize safe work practices				
Step 7 Written orientation and training plan	**Action plan (describe) a) Doing now**	**b) Improvements to be made**	**Person responsible**	**Completion date**
Safety and health written orientation and training plan will include:				
a) Organization safety and health policy statement;				
b) Employee responsibilities;				
c) Medical procedures, such as how and when to report injuries or illnesses;				
d) Actions to take in case of an emergency;				

Safety- and health-management assessment and action plan (Step 7)

e) How to report unsafe practices and conditions;				
f) Return-to-work procedures.				
Safety and health training will include:				
a) Hazard communication;				
b) Bloodborne pathogens, if applicable;				
c) Specific job/task safe work practices and hazard recognition;				
d) Recordkeeping of employee training and sign-off of training.				
At a minimum, training must cover:				
a) Procedures for safe and efficient use of machinery and tools;				
b) Ergonomic risk factors, including the prevention of cumulative trauma disorders;				
c) Chemical hazards and how to prevent contact or exposure;				

Safety- and health-management assessment and action plan (Steps 7, 8 and 9)

d) If appropriate, procedures for lock-out/tagout, hot work permits and confined space entry.				
Step 8 Written and communicated safe work practices	**Action plan (describe) a) Doing now**	**b) Improvements to be made**	**Person responsible**	**Completion date**
a) General safe work practices				
b) Job-specific safe work practices				
c) Employees sign statement saying they understand and will follow safe work practices				
Step 9 Written safety and health policy	**Action plan (describe) a) Doing now**	**b) Improvements to be made**	**Person responsible**	**Completion date**
a) Top administrator's philosophy on safety and well-being of employees with his/her commitment to quality				
b) Managers, supervisors, team leaders and employees' responsibilities regarding the organization's commitment to workplace safety and health				

Safety- and health-management assessment and action plan (Steps 9 and 10)

c) Commitment to returning injured or ill employees to work at the earliest opportunity				
d) Communicated to employees verbally, posted on the bulletin boards, in the employee handbook				

Step 10 Recordkeeping and data analysis	Action plan (describe) a) Doing now	b) Improvements to be made	Person responsible	Completion date
a) Identify safety- and health-process problems				
b) Help manage the compensation process				
c) Provide information necessary for developing solutions				
d) Linkage between accident prevention and profitability				
e) Specific costs associated with safety and health problems and accidents				

Safety- and health-management assessment (Steps 1, 2 and 3)

Step	Item	None/Poor	Fair	Good	Excellent
1	**Visible, active senior management leadership**	No or very little evidence that owner provides leadership in safety.	Owner expresses views on the value of safety only two to four times yearly. Efforts are only to comply with most safety regulations. There is little or no documentation.	Owner frequently, two times weekly, talks about safety matters. Monthly assessments of the safety program success is undertaken, and employees usually are encouraged to participate. Documentation exists to support what has been done.	Owner holds all levels accountable for safety performance, authorizes the necessary expenditures for equipment and training, and establishes safety goals. The owner is visible weekly to employees in the workplace, asking questions and requesting opinions. Safety is on the agenda of all regular meetings and workers are involved in the accident-analysis process.
2	**Employee involvement**	Owner's and other's style is essentially top down with no employee involvement.	Employee involvement is low. Little evidence that employees have a say in how things are done safely. Accident investigations usually find employees to be at fault.	The customary practice is to involve employees in the safety process through teams or committees. Participation by workers in accident/closecall analysis is significant. Changes are made as a result.	Significant evidence exists that employees are part owners in the safety process by participating in decisions and problem solving, acting as instructors, auditing or reviewing performance. Employees routinely brief each other on safety matters before starting jobs.
2	**Recognition for safe performance**	No recognition for employee efforts in workplace safety.	Less than once a week, workers are recognized for safe performance. Recognition for safe performance is not widely practiced. Most employees are told when they do something wrong.	Owner/supervisor recognizes safe performance three times weekly. People are congratulated for safe work on the spot. Documentation is good.	Safe performance is recognized almost daily by using verbal, positive reinforcement. Supervisors are praised; part of their raise and advancement is based on safety leadership.
3	**Care of injured or ill employees**	No policies or procedures. Training is not done. Medical supplies are short.	Few employees are trained in first aid/cardio pulmonary resuscitation. Limited medical supplies on job site.	Medical supplies are adequate. On-site emergency health care is provided through trained persons. Medical facilities are identified and communicated to all employees. All know the MCO and its function.	Cases, which cannot be handled onsite, are promptly dispatched to clinic or emergency room (ER) with documentation. Good relationships with the clinic or ER are preestablished. Good communication exists and continues.

Safety- and health-management assessment (Steps 3, 4, 5 and 6)

Step	Item	None/Poor	Fair	Good	Excellent
3	**Returntowork program**	No return-to-work program established.	Verbal program, no formal commitment to the program and documentation is poor.	Modified duty or a transitional work program is formally established in writing for return to work. Documentation is maintained.	Documentation shows the program is used and the company is committed to return to work. Supervisors make weekly contact with injured workers while they are away from work.
4	**Communication**	Communication on safety is only undertaken when necessary or when something goes wrong.	Some safety literature is on bulletin boards. Supervisors discuss safety infrequently or when necessary. Monthly safety meetings, which present little meaningful information, may be used.	Bulletin boards are used effectively in safety communication. Memos, general meetings and/or regular discussions that focus on real issues, performance and problem solving take place two times monthly and are documented.	Employee ideas and suggestions are actively sought and used. Meetings to discuss safety are meaningful with valuable information shared so problems get resolved. Employees are informed about change and new practices before they occur. Supervisor/ owner talks oneonone to employees about safety monthly.
5	**Timely notification and handling of claims**	Accident-reporting process is not established, not understood or used effectively.	Most accidents are reported in a timely manner and documentation may be lacking.	All accidents are reported to supervision within 24 hours. Supervisor or owner demonstrates care and concern for employee by analyzing accident causes and making changes. There is good documentation.	Open lines of communication are maintained with injured workers. Effective working relationship and communication with MCO can be documented.
6	**Safety and healthprocess coordination**	No coordination established or, if established, is not used.	Coordinator is identified. Person is vaguely familiar with job safety requirements, injury and cost data, or looks only for compliance with safety rules.	Coordinator/owner identifies safety training needs, communicates timely information to the organization on accidents/costs, trends and safety requirements, and participates in annual safety reviews.	Coordinator/owner tracks progress on safety improvement plans and new safety requirements, helps employees make changes or develop and improve their operational safety. Coordinator solicits input from employees on safety matters.

Safety- and health-management assessment (Steps 6 and 7)

Step	Item	None/Poor	Fair	Good	Excellent
6	**Safety co-ordinator — continuing education**	No actual continuing education.	Attendance at local meetings.	Attends professional development seminars (managing safety systems and improving personal management expertise) exceeding six hours class time annually.	Attends professional development seminars a minimum of two days annually and belongs to a professional safety organization.
7	**New employee orientation**	No orientation program.	Informal program with no documentation and no script. No written handout information.	Informal orientation with written program and script, and written information provided. Maintains documentation.	Formal orientation program followed by individual on the job instruction providing detailed safety information with excellent documentation. Transferred employees receive an orientation on the safety of new job practices and equipment.
7	**Orientation training content**	Content is not written and topics are variable.	Content is written, but does not include all key components or orientation comes long after new employees are onboard.	Orientation includes safety policy, employee responsibilities, medical procedures, emergency procedures, reporting unsafe practices or conditions, and return-to-work procedures. Good documentation provided.	In addition, orientation includes hazard communication, specific job risks and safe work practices needed to prevent injuries/ illnesses. Employees educated on new substances or risks introduced to the work.
7	**Management education**	No education or training for supervisors and managers provided.	Some owner/ supervisor safety and management education, but not within the past year. Little documentation provided.	Owner/supervisor participates in safety and/or management education yearly with good documentation.	Owner/supervisor training is well documented. Evidence of knowledgeable supervision that involves employees in safety systems. Evidence of good owner/supervisor technical and leadership safety knowledge and practices.
7	**Ongoing management education**	No continuing safety education for management provided.	Informal, ongoing education program. Inconsistent training, not all supervisors participate. Incomplete documentation provided.	Documentation shows the owner/supervisor participates in continuing safety education each yearly.	Continuing education program provides highquality education opportunities and good documentation. Owner and supervisor participate.

Safety- and health-management assessment (Steps 8, 9 and 10)

Step	Item	None/Poor	Fair	Good	Excellent
8	**Written and communicated safe work practices**	There are no written safe work practices.	Safe work practices are written, but may be incomplete or have not been reviewed for more than one year, or evidence exists that they are not followed.	Safe work practices are in place, well documented, and have been reviewed with new workers. They are annually reviewed with existing workers.	Employees participate in developing the safe work practices. All employees have ready access to safe practices. Employees are encouraged to challenge or suggest modifications.
9	**Written safety and health policy**	No safety and health policy exists.	A policy exists, but it is incomplete. For example, no responsibilities listed or communication is insufficient so not many people know its content or its requirements are not being practiced.	Policy is communicated to all employees and its used to guide employee behavior and the organization's decisions/practices. Policy reviewed annually with each employee. Policy is updated annually.	Employees participate in policy development. Policy is reviewed annually with employees. Responsibilities for owner and employees are clear; the organization's commitment to safety is clear and a commitment to return employees to work is clear.
10	**Employee exposure and medical records**	Records incomplete. Communication not undertaken.	Records are kept, but not regularly. Accuracy is lacking. Communication is minimal.	Required records are complete. Details could be improved. Communication to employees is provided annually.	All records are accurate and reviewed annually with each employee. Records are kept up to date. Employee communication and understanding is good.
10	**Recordkeeping and data analysis**	Records are not kept or are sketchy, inaccurate or incomplete.	Records are available, but are not effectively used to improve safety performance.	Statistical records assess performance, identify process problems, manage the compensation process and develop problem solutions.	Information beyond just accident and cost statistics is used. Perception surveys provide information. The formal assessment system or process provides information on the effectiveness of planning, accountability, communication systems, problem identification and correction, employee involvement and the use of positive reinforcement.

Small business implementation strategies

Check list for the 10-Step Business Plan

Step 1 Visible, active senior management leadership

Hold all organization members accountable for accident prevention.
Authorize the necessary resources for creating a safe work environment.
Review accident prevention performance monthly.
Issue and sign a safety and health policy (refer to Step 9).

Step 2 Involvement and recognition

Ask employees for their opinions regarding safety problems and accident-prevention improvement efforts.
Involve employees in the decision-making process to improve safety performance.
Involve employees in periodic safety surveys.
Include employees in the accident-analysis process.
Recognize one employee every six months for his/her contribution to occupational safety.

Step 3 Medical treatment and return to work

Ensure each employee knows the MCO and the procedures for obtaining medical treatment.
Establish procedures that require immediate reporting of accidents.
Analyze all accidents and close calls to identify the causes, so corrective measures can be taken.
Establish a transitional work policy/procedure that allows injured workers to return to work, unless prohibited by a labor agreement.

Step 4 Communication

Establish an easy process for employees to communicate their thoughts and suggestions for improving safety performance.
Discuss safety issues and improvements with employees at least monthly.

Step 5 Timely notification of claims

Ensure employees know they are responsible for reporting injuries or illnesses immediately to their supervisor.
Establish a process to provide the MCO with accident and claims information in a timely manner. Follow up with the MCO to ensure claims are filed.

Step 6 Safety- and health-process coordination

Identify a person in a leadership position to be the safety and health coordinator.
Define the role of the safety and health coordinator in writing.
Ensure the safety coordinator is actively involved in the safety and health process.
Ensure the safety and health coordinator attends a one-day annual safety management seminar approved by BWC.

Step 7 Orientation and training

Educate all new employees in the following areas:

Safety policy;
Employee-safety responsibilities;
How to report unsafe practices or conditions;
How and when to report occupational injuries and illnesses;
How to obtain medical treatment;
Return-to-work procedures;
Emergency-response procedures.

Train all employees in specific safe work practices such as but not limited to:

Ergonomic risk factors and considerations;
Hazard recognition, chemical and physical;
Personal protective equipment;
Other work-specific education and training, as necessary;
Establish a process to determine when additional training is needed.

Step 8 Written and communicated safe work practices

Ensure all job-specific safe work practices are in writing.
Provide each employee with a copy of the written safe work practice.

Step 9 Written safety and health policy

The safety policy, signed by the top official, must be in writing and provided to each employee. It should contain:

A statement of philosophy and commitment to safety and health;
Identified safety responsibilities for all organization members;
A commitment to return injured or ill employees to full health and employment at the earliest possible moment.

Step 10 Recordkeeping and data analysis

You must recored occupational injury and illness information accurately, and use it to improve operational safety for all workers.

Data that you should track, analyze and communicate includes:

Number and types of accidents/illnesses;
Days lost due to injury/illness;
Compensation costs;

Additional questions to evaluate your current safety process

Ask yourself questions to evaluate your present circumstances.

Strategic issues (for company president, top officers)

Maintenance

What would you consider a quick overview of your current situation?
What are your company's strengths?
What is your situation with regard for safety?
Who has responsibility for safety?
How do you hold personnel accountable for safety performance?

Problem

What are your most pressing business concerns at this point? (labor, quality, production)
What are the economic consequences of these problems?
What are your goals for these areas this year?
Are you aware of your safety experience rating and its impact on your bottom line?
What do you think contributed to this poor safety performance?

Opportunity

What is your company's vision?
Where would you like it to be in four years? Could you describe the end-result you would like to achieve?
If you could achieve that vision, what economic impact would that have on the business?
How does creating a safe work environment fit into your vision of the future?

Avoidance

From your past experience, is there anything you would want to avoid as you move forward?

Middle-management issues (for human resources, safety, operations)

Maintenance

What is the overall emphasis of management for the business this year? (costs, profits, quality)
What does your safety process look like?
What are your responsibilities?

Problem

What are your most pressing safety concerns at this point?
What do you think are the causes of your safety problems?
What are the economic consequences of those problems?
What are your goals for those areas this year?

Opportunity

What is the desired situation you would like to see the business achieve?
If you could achieve that vision, what economic impact would that have on the business?
What would a safe work environment look like in your business? What would the economic impact be?

Avoidance
From your past experience, is there anything you have tried that didn't work for you?

End-users' issues (for supervisors, team leaders, employees)

Maintenance
What is the overall emphasis of management for the business this year (costs, profits, quality)?
What are your job responsibilities?
What do you enjoy the most about your job?

Problem
How do you view safety?
What do you think are the causes of your safety problems?
What are your most pressing problems and concerns?
What are the economic consequences of those problems?

Opportunity
If you were the boss, what would you do differently?
What would a safe work environment look like in your business?
What would the economic impact be?

Avoidance
From your past experience, is there anything you tried that didn't work for you?Do the answers cause you to think about where your safety systems are today and what you hope fortomorrow?

Best management practices

Safety management

Information contained in this chapter was obtained from interviews conducted with employers statewide working in the sheet metal and metal stamping industries. The primary objective of this chapter is to provide employers with spe-cific safety and health work practices that have been successful for employers in this industry. By no means are the items identified totally conclu-sive of an employer's safety and health process.

For any safety process or safety system to have long-lasting impact, all management levels must support the system. Presidents, vice presidents, general managers, plant managers and front-line supervisors must fully embrace safety as a core business function. The key element of BWC's Premium Discount Program Plus is senior management.

One business owner provided the following comments:

> *"These people are like family. I want to pro-vide them with the safest work environment possible. They are my most valuable re-source. I want them to be able to go home every day and see their wives and children in the same condition as when they left for work in the morning."*

Another key element for an effective safety system requires the senior management team to designate an individual or group of individuals to coordinate the company's safety activities. This person or group is charged with developing and coordinating the firm's safety process. Front-line supervisors are accountable for implementing the various process elements.

According to leading business professionals across the country, accountability and responsibility are vital for senior managers to have success with their business ventures. Like quality and production, specific systems must be developed to effectively manage safety efforts. Managers and supervisors must be accountable for safety just as with other business functions. One element identified to hold managers and supervisors accountable is to include safety as an element of the employee's performance review. Business leaders should hold their supervisors and managers accountable for monthly reports regarding safety inspections, employee training, incident reports, safety meet-ings, etc. Developing accident charge-back systems for various departments is another way to hold supervisors accountable.

Another illustration of management's support and commitment to safety includes being involved with various activities. This includes attending safety meetings, assisting with facility audits and, perhaps, conducting employee training. One company president personally provides training sessions for hourly staff members monthly. In addition, the president participates in training classes provided by outside vendors.

Commitment and dedication to safety also includes providing time and resources for the management team and hourly staff to attend professional development workshops and providing time during working hours to participate in safety activities. This includes, but is not limited to, company-sponsored incentive programs, comprehensive employee training programs, professional development for supervisory and hourly staff, equipment maintenance and modifications, and personal protective equipment.

For example, one metal stamping employer allocated $56,000 specifically for employee training programs. Also, one machine manufacturer provided $30,000 for training on cranes and hoists for all supervisors and equipment operators.

Another key element that illustrates senior management's support for safety is developing and implementating a drug- and alcohol-testing program. Generally, this involves a process of testing employees prior to employment, after accidents and randomly throughout the year. In addition, employers provide training to staff on the effects of drugs and alcohol abuse associated with workplace accidents. BWC provides premium discounts for employers who take advantage of its Drug-Free Workplace Program. For information, contact your local customer service office or visit BWC's Web site at ohiobwc.com.

Best practices

Pre-employment screening

Employers who develop a comprehensive pre-employment screening and interview process illustrate fewer accidents and workers' compensation claims. You should conduct extensive background reviews for all potential employees. Generally, a member of senior management, who is often part owner of the company, conducts initial interviews. Departmental managers, supervisors and group leaders conduct additional interviews.

Accident analysis

Accident analysis (investigation) is a crucial element for any employer's safety process. Leading safety and health journals indicate that to truly determine the real cause of accidents, managers, supervisors and employees must be involved in the accident analysis/investigation process. Senior management must also be involved with this process. In addition, front-line supervisors and employees are accountable for reporting and following up with incident reports. Most organizations assign this responsibility to one person. However, the most effective method to identify the root cause of an accident is to hold managers, supervisors and other staff members accountable for conducting a thorough incident analysis. Review and share incident reports with staff members during weekly work group meetings, monthly safety training and regular safety committee meetings. The time and resources used for accident analysis and investigation can be returned many times by the useful information identified to prevent future accidents.

Claims management

In an effort to control and reduce the cost of workers' compensation claims and premiums, employers should identify a person in senior management to coordinate claims-management efforts. To manage and control the cost of all claims the claims-management coordinator should work closely with the employer's MCO, BWC claims service specialist and third party administrators. Strategies, such as transitional work, return-to-work programs and claims settlement, assist with keeping costs to a minimum. Employers that develop strong relationships with their BWC representatives and MCO typically tend to have fewer claims costs than other employers.

Safety management training

Employers should take advantage of every opportunity to gain the latest knowledge of effective safety management strategies. BWC's OCOSH training center offers a variety of safety-management courses throughout the state. These courses include, but are not limited to, the following:

- Accident Analysis;
- Controlling Workers' Compensation Costs;
- Measuring Safety Performance;
- Effecting Safety Teams.

Aside from the training center, many employers permit staff memebers to attend seminars and workshops provided by employer associations statewide.

Employee involvement

Employee involvement is another key element when developing an effective safety system. You can obtain employee involvement through several avenues. Safety committees, work groups and safety teams all promote employee involvement.

Safety committees or project teams focus their efforts on hazard correction and abatement, equipment modifications to improve safety and efficiency, and safety and health program review and development. Generally, these teams or work groups meet monthly for an hour at a time. Depending on the circumstances, focus groups may need to meet more frequently.

To promote employee involvement, employers will assign hourly staff with the task of providing safety training for new employees (on-the-job training). To ensure staff members are competent, manage-ment must allocate time and resources for professional development. This is typically accomplished by using local safety and health seminars and workshops.

Employee recognition

You can illustrate employee recognition through company-sponsored luncheons, family dinners, holiday parties, flexible work schedules or gift certificates. Other illustrations of employee recognition include opportunities to attend the Ohio Safety Congress & Expo, year-end bonuses, employee-of-the-month plaques and special rec-ognition certificates provided when staff members assist with special projects.

Employers with the greatest success primarily showed their associates they value them as individuals. Staff members are recognized through positive re-enforcement (a pat on the back for a job well done).

Employers also feature staff in monthly newsletters for achievements in their career and/ or job performance.

Hazard recognition and abatement

Safety audits or inspections are a critical element in an employer's safety process. For the safety audits to have impact, assign multi-functional teams to conduct surveys of specific work areas or departments. Use the expertise of third parties to assist with the safety-inspection process. Conduct comprehensive annual inspections. Proactive employers typically assign senior managers to be involved with this process. Develop a system to assign accountability and responsibility for timely corrective action.

When using in-house staff to conduct safety audits, employee training is vital. Provide staff members training on all applicable safety and health standards, company standard operating procedures and industry guidelines. For example, maintenance staff should know and understand the National Electrical Code prior to conducting electrical-safety inspections. Also, machine op-erators should know and understand OSHA and American National Standards Institute standards for equipment and machinery when performing machine-guarding audits.

Technical support

A. Machinery and machine guarding

To prevent injuries such as crushed hands and arms, severed fingers and blindness, safeguards are essential. Guard or eliminate machine parts, functions or processes that may cause injury. Affix guards to the machine where possible and secure elsewhere if attachment to the machine is not possible. Make sure the guard is not a hazard in itself.

Safeguarding the point of operation

Provide and ensure the use of point-of-operation guards or properly applied and adjusted point-of-operation devices on every operation performed on machinery and equipment. Guard the point of operation for every type of equipment — not just power presses.

Point-of-operation guards:

- Prevent hands or fingers from entering the point of operation by reaching through, over, under or around the guard;
- Do not create a hazard themselves;
- Conform to the maximum permissible openings;
- Create no pinch point between the guard and moving machine parts;
- Use fasteners not readily removable by operator, so as to minimize the possibility of misuse or removal;
- Facilitate inspection;
- Offer maximum visibility of the point of operation consistent with other requirements.

The point of operation is the area on a machine where work is performed upon the material being processed. Provide and ensure the use of point-of-operation guards or properly applied and adjusted point-of-operation devices to prevent entry of hands or fingers into the point of operation by reaching through, over, under and around the guard.

Provide one or more methods of machine guarding (barrier guards, two-hand tripping devices, electronic safety devices, etc.) to protect the operator and other employees in the machine area from hazards. These can include those created by point of operation, in-going nip points, rotating parts, flying chips and sparks.

Make sure the guarding device conforms to appropriate standards. If there are no specific standards,ensure you design and construct to prevent the operator from having any body part in the danger zone during the operating cycle.

Use special hand tools for placing and removing material to permit easy handling of material without the operator placing a hand in the danger zone. Do not use these tools in place of other required guarding, but only to supplement protection provided.

Point-of-operation devices protect the operator by:

- Preventing and/or stopping normal stroking of the press if the operator's hands are inadvertently placed in the point of operation;
- Preventing the operator from inadvertently reaching into the point of operation or withdrawing his or her hands if they are inadvertently located in the point of operation as the dies close;
- Preventing the operator from inadvertently reaching into the point of operation at all times;
- Requiring application of both of the operator's hands to machine operating controls and locating the controls at such a safe distance from the point of operation that the slide completes the downward travel or stops before the operator can reach into the point of operation with his or her hands;
- Enclosing the point of operation before the operator can initiate a press stroke and maintaining this closed condition until the motion of the slide ceases;
- Enclosing the point of operation before the operator can initiate a press stroke to prevent him or her from reaching into the point of operation prior to die closure or prior to cessation of slide motion during the downward stroke.

Machines that usually require point-of-operation guarding include:

- Guillotine cutters;
- Shears;
- Alligator shears;
- Power presses;
- Milling machines;
- Power saws;
- Portable power tools;
- Forming rolls;
- Press brakes;
- Riveters.

Where mechanical hazards occur

Dangerous moving parts in three basic areas require safeguarding. These include:

Point of operation — that point where work is performed on the material such as cutting, shaping, boring or forming of stock;

Power transmission apparatus — all mechanical-system components that transmit energy to the part of the machine performing the work. These components include fly-wheels, pulleys, belts, connecting rods, couplings, cams, spindles, chains, cranks and gears;

Other moving parts — all machine parts that move while the machine is working. These can include reciprocating, rotating and transverse moving parts, as well as feed mechanisms and auxiliary machine parts.

Guards

Guards are barriers that prevent access to danger areas. The four general types of guards include:

- **Fixed**: A permanent part of the machine. It is not dependent upon moving parts to perform its intended function. It may be constructed of sheet metal, screen, wire cloth, bars, plastic or any other material that is substan-tial enough to withstand impact and to endure prolonged use. This guard is usually preferable to all other types because of its relative simplicity and permanence. A fixed guard on a power press completely encloses the point of operation. The stock is fed through the side of the guard into the die area, with the scrap stock exiting on the opposite side;
- **Interlocked**: When this type of guard is opened or removed, the tripping mechanism and/or power automatically shuts off or disengages, and the machine cannot cycle or be started until the guard is back in place. An interlocked guard may use electrical, mechanical, hydraulic or pneumatic power or any combination of these. Interlocks should not prevent inching by remote control if required. Replacing the guard should not automatically restart the machine. To be effective, interlock all movable guards to prevent occupational hazards;
- **Adjustable**: Adjustable guards are useful because they allow flexibility in accommodating various sizes of stock;
- **Self-adjusting**: The movement of the stock determines the openings of these barriers. As the operator moves the stock into the danger area, the guard is pushed away, providing an opening which is only large enough to admit the stock. After the stock is removed, the guard returns to the rest position. This guard protects the operator by placing a barrier between the danger area and the operator. The guards may be constructed of plastic, metal or other substantial material. Self-adjusting guards offer different degrees of protection.

Devices

A safety device may perform one of several functions. It may:

- Stop the machine if a hand or any part of the body is inadvertently placed in the danger area;
- Restrain or withdraw the operator's hands from the danger area during operation;
- Require the operator to use both hands on machine controls, thus, keeping, both hands and body out of danger;
- Provide a synchronized barrier with the operating cycle of the machine to prevent entry to the danger area during the hazardous part of the cycle.

Presence-sensing

The photoelectric (optical) presence-sensing device uses a system of light sources and controls that can interrupt the machine's operating cycle. If the light field is broken, the machine stops and will not cycle. You must only use this device on machines that can be stopped before the worker can reach the danger area. The design and placement of the guard depends upon the time it takes to stop the mechanism and the speed at which the employee's hand can reach across the distance from the guard to the danger zone.

The radio frequency (capacitance) presence-sensing device uses a radio beam that is part of the machine control circuit. When the capacitance field is broken, the machine will stop or will not activate. Like the photoelectric device, only use this device on machines that can be stopped before the worker can reach the danger area. This requires the machine to have a friction clutch or other reliable means for stopping. The design and placement of the guard depends upon the time it takes to stop the mechanism and the speed at which the employee's hand can reach across the distance from the guard to the danger zone.

The electromechanical sensing device has a probe or contact bar that descends to a predetermined distance when the operator initiates the machine cycle. If there is an obstruction preventing it from descending its full, predetermined distance, the control circuit does not actuate the machine cycle.

Pullback

Pullback devices use a series of cables attached to the operator's hands, wrists and/or arms. This type of device is primarily used on machines with stroking action. When the slide/ram is up between cycles, the operator is allowed access to the point of operation. When the slide/ram begins to cycle by starting its descent, a mechanical linkage au-tomatically ensures withdrawal of the hands from the point of operation. Have the operator inspect all restraints and pullback devices prior to each equipment use. This includes prior to the beginning of each shift, after lunch and after breaks. Document each inspection and have a supervisor or management member verify the inspections.

Restraint

The restraint (holdout) device uses cables or straps that are attached to the operator's hands at a fixed point. The operator must adjust the cables or straps to let his or her hands travel within a predetermined safe area. There is no extending or retracting action involved. Consequently, hand-feeding tools are often necessary if the operation involves placing material into the danger area.

Have the operator inspect all restraints and pullback devices prior to each equipment use. This includes prior to the beginning of each shift, after lunch, after breaks, etc. Document each inspection and have a supervisor or member of management verify.

Gate guards

A gate is a movable barrier that protects the operator at the point of operation before he or she can start the machine cycle. In many instances, gates are designed to operate with each machine cycle.

A gate or movable barrier device protects the operator as follows:

- A Type A gate or movable barrier device protects the operator by enclosing the point of operation before a press stroke can be initiated and maintaining this closed condition until the motion of the slide ceases;
- A Type B gate or movable barrier device protects the operator by enclosing the point of operation before the operator can initiate a press stroke, so he or she cannot reach into the point of operation prior to die closure or prior to cessation of slide motion during the downward stroke. Type B gates are not permitted on full revolution clutch presses.

Put a system in place to properly inspect all machinery for appropriate point-of-operation guards. In addition, have a system in place to train machine operators and other personnel on the importance of machine guarding.

Training

Even the most elaborate guarding system cannot offer effective protection unless the worker knows how to use it and why. Specific and detailed training is a crucial part of any effort to provide guarding against machine-related hazards. Thorough operator training should involve instruction or hands-on training in the following:

- A description and identification of the hazards associated with particular machines;
- The guards themselves, how they provide protection and the hazards for which they are intended;
- How to use the guards and why;
- How and under what circumstances can workers remove guards and by whom (in most cases, repair or maintenance personnel only);
- What to do (such as, contact the supervisor) if a guard is damaged, missing or unable to provide adequate protection.

This safety training is necessary for new operators and maintenance or setup personnel when putting into service any new or altered safeguards, or when you assign workers to a new machine or operation.

References
29 Code of Federal Regulation 1910.212 and .217
Ohio Administrative Code 4123:1-5-10

B. Mechanical power presses

Mechanical power presses are one of the areas that have the most potential for serious accidents. With this in mind, DSH committed an entire chapter to mechanical power presses. DSH suggests that employees attempt to keep hands out of the dies whenever possible. The following chapter will give you an overview of the OSHA standard 29 Code of Federal Regulations (CFR) 1910.217-b (Mechanical power press guarding and construction, general).

Reconstruction and modification

It's the responsibility of any person reconstructing or modifying a mechanical power press to do so in accordance with 29 CFR 1910.217-b.

- Hazards to personnel associated with broken or falling machine components: machine components are designed, secured or covered to minimize hazards caused by breakage, loosening and falling, or release of mechanical energy (broken springs).
- Friction brakes provided for stopping or holding a slide movement are inherently self-engaging by requiring power or force from an external source to cause disengagement. Brake capacity shall be sufficient to stop the motion of the slide quickly and capable of holding the slide and its attachments at any point in its travel.

Machines using full revolution positive clutches

- Full revolution clutch is a type of clutch that, when tripped, cannot be disengaged until the crankshaft has completed a full revolution and the press slide a full stroke.
- Machines using full revolution clutches incorporate a single-stroke mechanism.
- If the single-stroke mechanism is dependent upon spring action, the spring(s) is of the compression type, operating on a rod or guided within a hole or tube and designed to prevent interleaving of the spring coils in event of breakage.

Foot pedals (treadle)

- The pedal mechanism is protected to prevent unintended operation from falling or moving objects, or by accidentally stepping onto the pedal.

- A pad with a non-slip contact area is firmly attached to the pedal.
- The pedal return spring(s) is of the compression type, operating on a rod or guided within a hole or tube, or designed to prevent interleaving of spring coils in event of breakage.
- If pedal counterweights are provided, the path of the travel of the weight is enclosed.

Hand-operated levers
- Hand lever-operated power presses are equipped with a spring latch on the operating lever to prevent premature or accidental tripping.
- The operating levers on hand-tripped presses having more than one operating station are interlocked to prevent the tripping of the press, except by the concurrent use of all levers.

Two-hand trip
A two-hand trip has:

- The individual operator's hand controls protected against unintentional operation;
- The individual operator's hand controls arranged by design and construction and/or separation to require the use of both hands to trip the press;
- A control arrangement requiring concurrent operation of the individual operator's hand controls.

Two-hand trip systems on full revolution clutch machines incorporate an anti-repeat feature. If two-hand trip systems are used on multiple operator presses, each operator has a separate set of controls.

Machines using part revolution clutches

Part revolution clutch means a type of clutch that the operator can disengage at any point before the crankshaft has completed a full revolution and the press slide a full stroke.

Anti-repeat means the part of the clutch/brake control system designed to limit the press to a single stroke if the tripping means is activated. Anti-repeat requires release of all tripping mechanisms before the operator can initiate another stroke. Anti-repeat is also called single stroke reset or reset circuit.

- The clutch shall release and the brake is applied when the external clutch engaging means is removed, deactivated or de-energized.
- A red-color stop control is provided with the clutch/brake control system. Momentary operation of the stop control shall immediately deactivate the clutch and apply the brake. The stop control will override any other control, and reactivation of the clutch shall require use of the operating (tripping) means that is selected.
- A means of selecting off, inch, single stroke and continuous (when the continuous function is furnished) is supplied with the clutch/brake control to select type of operation of the press. Fixing of selection shall be by means capable of supervision by the employer.
- Inch operating prevents exposing the worker's hands within the point of operation by:
  - Requiring the concurrent use of both hands to actuate the clutch;
  - Being a single control protected against accidental actuation and so located that the worker cannot reach into the point of operation while operating the single control.

Two-hand controls for single stroke will conform to the following requirements:

- Each hand control is protected against unintended operation and arranged by design, construction and/or separation so that the concurrent use of both hands is required to trip the press.
- The control system permits an adjustment that requires concurrent pressure from both hands during the die-closing portion of the stroke.
- The control system incorporates an anti-repeat feature.

The control system

- The control systems require release of all operators' hand controls before an interrupted stroke is resumed. This requirement pertains only to those single-stroke, two-hand controls manufactured and installed on or after Aug. 31, 1971.
- Controls for more than one operating station activate and deactivate in complete sets of two operator's hand controls per operating station by means capable of being supervised by the employer.
- The clutch/brake control system prevents actuation of the clutch if all operating stations are bypassed.
- Those clutch/brake control systems that contain both single and continuous functions to allow the employer to supervise the completion of continuous circuits. The initiation of continuous run shall require a prior action or decision by the operator in addition to the selection of continuous on the stroking selector. Before actuation of the operating means shall result in continuous stroking.
- If a foot control is provided, the selection method between hand and foot control is separate from the stroking selector so the employer may supervise the selection.
- If used, protect foot-operated tripping controls so to prevent operation from falling or moving objects, or from unintended operation by accidental contact with the foot control.
- The control of air-clutch machines to prevent a significant increase in the normal stopping time due to a failure within the operating value mechanism and to inhibit further operation if such failure does occur. This requirement applies only to those clutch/brake air-valve controls manufactured and installed on or after Aug. 31, 1971, but will not apply to machines intended only for continuous, automatic feeding applications.
- The clutch/brake control incorporate an automatic means to prevent initiation or continued activation of the single stroke or continuous functions unless the press drive motor is energized and in the forward direction.
- The clutch/brake control automatically deactivate in event of failure of the power or pressure supply for the clutch engaging means. Reactivation of the clutch requires restoration of normal supply and the use of the tripping mechanism(s).
- The clutch/brake control automatically deactivate in event of failure of the counterbalance(s) air supply. Reactivation of the clutch requires restoration of normal air supply and use of the tripping mechanism(s).
- Selection of bar operation is capable of being supervised by the employer. A separate pushbutton is used to activate the clutch and the clutch is activated only if the driver motor is de-energized.

Electrical

- A main power disconnect switch capable of being locked only in the off position is provided with every power-press control system.
- The motor start button is protected against accidental operation.
- All mechanical power press controls incorporate a type of drive motor starter that disconnects the drive motor from the power source in the event of control voltage or power source failure. All mechanical power press controls also require operation of the motor start button to restart the motor when voltage conditions are restored to normal.
- All alternating current (AC) control circuits and solenoid value coils are powered by not more than a nominal 120-volt AC supply obtained from a transformer with an isolated secondary. If you require higher voltages for operation of machine or control mechanisms, you will isolate them from any control mechanism handled by the operator. Motor starters with integral start-stop buttons may use line voltage control. All direct

current (DC) control circuits are powered by not more than a nominal 240-volt DC supply isolated from any higher voltages.
- All clutch/brake control electrical circuits are protected against the possibility of an accidental ground in the control circuit causing false press operation.
- Electrical clutch/brake control circuits incorporate features to minimize the possibility of an unintended stroke in the event of the failure of a control component to function properly, including relays, limit switches and static output circuits.

Slide counterbalance systems

- Spring counterbalance systems, when used, incorporate means to retain system parts in event of breakage.
- Spring counterbalances, when used, can hold the slide and its attachments at mid-stroke, without the brake applied.
- Air counterbalance cylinders incorporate means to retain the piston and rod in case of breakage or loosening.
- Air counterbalance cylinders have adequate capability to hold the slide and its attachments at any point in stroke, without applying a brake.
- Air counterbalance cylinders will incorporate means to prevent failure of capability (sudden loss of pressure) in event of air-supply failure.

Air-controlling equipment

Air-controlling equipment is protected against foreign material and water entering the pneumatic system of the press. You will provide air lubrication when needed.

Hydraulic equipment

The maximum anticipated working pressures in any hydraulic system on a mechanical power press shall not exceed the safe working pressure rating of any component used in that system.

Pressure vessels

All pressure vessels used in conjunction with power presses will conform to the *American Society of Mechanical Engineers Code for Pressure Vessels*, 1968 edition, which is incorporated by reference as specified in Sec. 1910.6.

Control reliability

Additional requirements for safe guarding include:

- Where the operator feeds or removes parts by placing one or both hands in the point of operation and a two-hand control, use a presence sensing device of Type B gate or movable barrier (on a part revolution clutch) for safeguarding;
- Construct the control system so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected;
- The failure is by a simple test or indicated by the control system. This requirement does not apply to those elements of the control system that have no effect on the protection against point-of-operation injuries.
- When required by paragraph (c)(5) of this section, the brake system monitor will meet the following requirements:
  - Be so constructed as to automatically prevent the activation of a successive stroke, if the stopping time or braking distance deteriorates to a point where the safety distance being used does not meet the requirements set forth in paragraph (c)(3)(iii)(e) or (c)(e)(vii)(c) of this section;
  - The brake monitor used with the Type B gate or moveable barrier device is installed in a manner to detect slide top-stop overrun beyond the normal limit reasonably established by the employer.
  - Be installed on a press such that it indicates when the braking system's performance deteriorates to the extent described in paragraph (b)(14)(i) of this section;

- Be constructed and installed in a manner to monitor brake system performance on each stroke.

Safeguarding the point of operation

General requirements

It will be the employer's responsibility to provide and ensure the usage of point-of-operation guards or properly applied and adjusted point-of-operation devices on every operation performed on a mechanical-power press.

Table 4.1 below shows the distances that you will position guards from the danger line in accordance with the required openings.

The requirement of paragraph (c)(1)(i) of this section will not apply when the point of operation opening is .25 inch or less. **See Table 4.1**.

Table 4.1 Maximum width of opening distance of opening from point of operation hazard

1/2 to 1 1/2	1/4
1 1/2 to 2 1/2	3/8
2 1/2 to 3 1/2	1/2
3 1/2 to 5 1/2	5/8
5 1/2 to 6 1/2	3/4
6 1/2 to 7 1/2	7/8
7 1/2 to 12 1/2	1 1/4
12 1/2 to 15 1/2	1 1/2
15 1/2 to 17 1/2	1 7/8
17 1/2 to 31 1/2	2 1/8

Point-of-operation guards

- Every point-of-operation guard will meet the following design, construction, application and adjustment requirements:
  - It will prevent entry of hands or fingers into the point of operation by reaching through, over, under or around the guard;
  - It will conform to the maximum permissible openings of Table 4.1;
  - It will, in itself, create no pinch point-between the guard and moving machineparts;
  - It will use fasteners not readily removable by operator so as to minimize the possibility of misuse or removal of essential parts;
  - It will facilitate its inspection;
  - It will offer maximum visibility of the point of operation consistent with the other requirements.
- Attach die enclosure guard to the die shoe or stripper in a fixed position.
- Attach fixed barrier guard securely to the frame of the press or to the bolster plate.
- Attach an interlocked press barrier guard to the press frame or bolster. It will be interlocked with the press clutch control so the clutch cannot be activated unless the guard, or the hinged or movable sections of the guard, are in position to conform to the requirements of Table 4.1.
- Do not use the hinged or movable sections of an interlocked press barrier guard for manual feeding. The guard will prevent opening of the interlocked section and reaching into the point of operation prior to die closure or prior to the cessation of slide motion. See paragraph (c)(3)(ii) of this section regarding manual feeding through interlocked press barrier devices.
- The adjustable barrier guard will securely attach to the press bed, bolster plate or die shoe, and will adjust and operate in conformity with **Table 4.1** and the requirements of this subparagraph. Only authorized personnel whose qualifications include knowledge of the provisions of **Table 4.1** and this subparagraph will make adjustments.

- Use only a point-of-operation enclosure that does not meet the requirements of this subparagraph and **Table 4.1** in conjunction with point-of-operation devices.

Point-of-operation devices

Point-of-operation devices will protect the operator by:

- Preventing and/or stopping normal stroking of the press if the operator's hands are inadvertently placed in the point of operation;
- Preventing the operator from inadvertently reaching into the point of operation, or withdrawing his or her hands if they are inadvertently located in the point of operation, as the dies close;
- Preventing the operator from inadvertently reaching into the point of operation at all times; or
- Requiring application of both of the operator's hands to machine-operating controls and locating such controls at a safety distance from the point of operation that the slide completes the downward travel or stops before the operator can reach into the point of operation with his or her hands; or
- Enclosing the point of operation before a press stroke can be initiated and maintaining this closed condition until the motion of the slide ceases; or
- Enclosing the point of operation before a press stroke can be initiated so as to prevent an operator from reaching into the point of operation prior to die closure or prior to cessation of slide motion during the downward stroke.

Note: The employer may not use a presence sensing point-of-operation device on machines using full-revolution clutches.

Note: The employer may not use the sweep device for point-of-operation safeguarding.

Note: The two-hand trip device when used in press operations requiring more than one operator, the employere will provide separate two-hand trips for each operator and they will require concurrent application of all operators' trips to activate the slide.

Note: Hand-feeding tools are intended for placing and removing materials in and from the press. Hand-feeding tools are not a point-of-operation guard or protection device, and the employer should not use them in lieu of the guards or devices required in this section.

Dies

The employer will:

- Use dies and operating methods designed to control or eliminate hazards for operating personnel; and furnish and enforce the use of hand tools for freeing and removing stuck work or scrap pieces from the die so no employee needs to reach into the point of operation for such purposes;
- Scrap handling – Provide means for handling scrap from roll feed or random length stock operations. Safeguard scrap cutters used in conjunction with scrap-handling systems in accordance with 29 CFR 1910.219;
- Guide post hazard – Consider the hazard created by a guide post (when it is located in the immediate vicinity of the operator) when separated from its bushing by more than .25 of an inch as a point of operation hazard and protect it;
- Unitized tooling – If unitized tooling is used, safeguard the opening between the top of the punch holder and the face of the slide, or striking pad.

All dies will be:

- Stamped with the tonnage and stroke requirements or have these characteristics recorded if these records are readily available to the die setter;
- Stamped to indicate upper die weight when necessary for air counterbalance pressure adjustment;
- Stamped to indicate complete die weight when handling equipment may become overloaded.

Die fastening

- Make provision in both the upper and lower shoes for securely mounting the die to the bolster and slide. Where clamp caps or set-screws are used in conjunction with punch stems, use additional means of securing the upper shoe to the slide.

Die handling

- Provide handling equipment attach points on all dies requiring mechanical handling.

Die setting

- The employer will establish a die-setting procedure that will insure compliance with paragraph (c) of this section.
- The employer will spring-loaded turnover bars for presses designed to accept such turnover bars.
- The employer will provide die stops or other means to prevent losing control of the die while setting or removing dies in presses which are inclined.
- The employer will provide and enforce the use of safety blocks for use whenever dies are being adjusted or repaired in the press.
- The employer shall provide brushes, swabs, lubricating rolls and automatic or manual pressure guns so that operators and die-setters are not required to reach into the point of operation or other hazard areas to lubricate material, punches or dies.

Inspection, maintenance and modification of presses

- It is the employer's responsibility to establish and follow a program of periodic and regular inspections of his or her power presses to ensure that all parts, auxiliary equipment and safeguards are in a safe-operating condition and adjustment. The employer will maintain a certification record of inspections, which includes the date of inspection, signature of the person who performed the inspection and the serial number or other identifier of the power press inspected.
- Inspect and test each press no less than weekly to determine the condition of the clutch/brake mechanism, anti-repeat feature and single-stroke mechanism. Perform and complete necessary maintenance, repair or both before operating the press. These requirements do not apply to those presses that comply with paragraphs (b) (13) and (14) of this section. The employer shall maintain a certification record of inspections, tests and maintenance work which includes:
  - Date of the inspection, test or maintenance;
  - Signature of the person who performed the inspection, test or maintenance;
  - Serial number or other identifier of the inspected, tested or maintained press.
  - Modification – It is the responsibility of any person modifying a power press to furnish instructions with the modification to establish new or changed guidelines for use and care of the power press modified.

Training of maintenance personnel

- It is the employer's responsibility to ensure the original and continuing competence of personnel caring for inspecting and maintaining power presses.

Operation of power presses

- The employer will train and instruct the operator in the safe method of work before starting work on any operation covered by this section. The employer will insure by adequate supervision that correct operating procedures are followed.
- The employer shall provide clearance between machines so that movement of one operator will not interfere with the work of another. He or she will provide ample room for cleaning machines, handling material, work pieces and scrap. Keep all surrounding floors in good condition and free from obstructions, grease, oil and water.
- The employer will operate his or her presses within the tonnage and attachment weight ratings specified by the manufacturer.

Reports of injuries to employees operating mechanical power presses

- The employer reports all point-of-operation injuries within 30 days of the occurrence to the director of the directorate of safety standards programs, OSHA, U.S. Department of Labor, Washington, D.C. 20210.
- Include the following information in the report:
  - Employer's name, address and location of the workplace (establishment);
  - Employee's name, injury sustained and the task being performed (operation, set-up, maintenance or other);
  - Type of clutch used on the press (full revolution, part revolution or direct drive);
  - Type of safeguard(s) being used (two-hand control, two-hand trip, pullouts, sweeps or other). If the safeguard is not described in this section, give a complete description;
  - Cause of the accident (repeat of press, safeguard failure, removing stuck part or scrap, no safeguard provided, no safeguard in use or other);
  - Type of feeding (manual with hands in dies or with hands out of dies, semiautomatic, automatic or other);
  - Means used to actuate press stroke (foot trip, foot control, hand trip, hand control or other);
  - Number of operators required for the operation and the number of operator-sprovided with controls and safeguards.

References

29 CFR 1910.217 Ohio Administrative Code (OAC) 4123:1-5-10 American National Standards Institute (ANSI) B11.1 Mechanical Power Presses ANSI B11.2 Hydraulic Power Presses

Mechanical Power Press SAF105

C. Hand tools

Hand tools are non-powered tools, including wrenches, hammers, chisels and screwdrivers. While hand-tool injuries tend to be less severe than power-tool injuries, hand-tool injuries are more common.

The most common hand-tool accidents are caused by failure to:

- Use the right tool;
- Use a tool correctly;
- Keep edged tools sharp;
- Replace or repair a defective tool;
- Store tools safely.

Safety guidelines

- Wear safety glasses whenever you hammer or cut, especially when working with surfaces that chip or splinter. All persons in the area should wear them.
- Do not use a screwdriver as a chisel. The tool can slip and cause a deep puncture wound.
- Do not use a chisel as a screwdriver. The chisel's tip may break and cause an injury.
- Do not use a knife as a screwdriver. The blade can snap and injure an eye.
- Never carry a screwdriver or chisel in your pocket. If you fall, the tool can cause a serious injury. Instead, use a toolbelt holder.
- Replace loose, splintered or cracked handles. Loose hammer, axe or maul heads can fly off defective handles.
- Use the proper wrench or socket to tighten or loosen nuts.
- Always chip or cut away from yourself when using a chisel. Use a soft-headed hammer or mallet to strike a wooden chisel handle. A metal hammer or mallet may cause the handle to split.
- Do not use a wrench if the jaws are sprung.
- Do not use impact tools such as chisels, wedges or drift pins, if the heads are mushroomed. The heads may shatter upon impact.
- Direct saw blades, knives and other tools away from aisle areas and other employees.
- Keep knives and scissors sharp. Dull tools are more dangerous than sharp tools.
- Iron or steel hand tools may cause sparks and be hazardous around flammable substances. Use spark-resistant tools made

from brass, plastic, aluminum or wood when working around flammable hazards.

Improper tool storage is responsible for many shop accidents, so:
- Have a specific place for each tool;
- Do not place unguarded cutting tools in a drawer;
- Store knives or chisels in their scabbards;
- Hang saws with the blades away fromsomeone's reach;
- Provide sturdy hooks for hanging tools;
- Rack heavy tools, such as axes and sledges, with the heavy end down.

References
29 CFR 1910.242
OAC 4123:1-5-07

D. Power tools, machinery and equipment

Common accidents associated with power tools include abrasions, cuts, lacerations, amputations, burns, electrocution and broken bones. These accidents are often caused by:

- Touching the cutting, drilling or grinding components;
- Getting caught in moving parts;
- Suffering electrical shock due to improper grounding, equipment defects or operator misuse;
- Being struck by particles that normally eject during operation;
- Touching hot tools or work pieces;
- Slips, trips and falls in the work area;
- Being struck by falling tools.

Safety guidelines

- Use the correct tool for the job. Do not use a tool or attachment for something it was not designed to do.
- Refer to the operator's manual or safety instructions provided with the equipment.
- Wear the appropriate personal protective equipment (PPE) for the job.
- Select the correct bit, blade, cutter or grinder wheel for the material at hand. This precaution will reduce the chance for an accident and improve the quality of your work.
- Keep all guards in place. Cover exposed belts, pulleys, gears and shafts that can cause injury.
- Always operate tools at the correct speed for the job at hand. Working too slowly can cause an accident just as easily as working too fast.
- Watch your work when operating power tools. Stop working if something distracts you.
- Do not rely on strength to perform an operation. The correct tool, blade and method should not require excessive strength. If you have to use undue force, you may be using the wrong tool or have a dull blade.
- Disconnect from the power source before clearing jams or blockages on power tools.
- Do not use your hand to clear jams or blockages, use an appropriate tool.
- Never reach over equipment while it is running.
- Never disable or tamper with safety releases or other automatic switches.
- Use a push stick to move material through a machine when the chance for operator injury is great.
- Disconnect power tools before performing maintenance or changing components.
- Remove chuck keys or adjusting tools prior to operation.
- Keep bystanders away from moving machinery.
- Do not operate power tools when you are sick, fatigued or taking strong medication.
- Secure work pieces with a clamp or vise to free the hands and minimize the chance of injury when possible. Use a jig for pieces that are unstable or do not lie flat.
- Never wear gloves, loose clothing, jewelry, etc., when working with power tools.

References
29 CFR 1910.242
OAC 4123:1-5-07

Miscellaneous references for metal stamping and sheet metal
ANSI B11.5 Iron Workers
ANSI B11.7 Cold Headers and Cold Formers
ANSI B11.10 Metal Sawing Machines
ANSI B11.12 Roll Forming and Roll Bending Machines
ANSI B11.14 Coil-Slitting Machines
ANSI B11.15 Pipe, Tube and Shape Bending Machines
ANSI B11.17 Horizontal Hydraulic Extrusion Presses
ANSI B11.21 Machine Tools Using Lasers

Press brakes
Press brakes will have a point-of-operation guard or device or a combination guard and device to protect the operator and other workers from injury. Refer to the ANSI standards for specifics on guarding. If a press brake is used as a power press (punching, etc.), it must meet the requirements of a mechanical power press.

References
29 CFR 1910.212
OAC 4123:1-5-10-F
ANSI B11.3 Power Press Brakes

Shears
Provide guards to protect against contact with the material hold-down devices and the blade on the feed side of the shear, and blade protection on the discharge side use vacuum lifters (suction cups) or magnets to handle materials fed into the shear.

References
29 CFR 1910.212
OAC 4123:1-5-11-D-3
ANSI BII.4 Shears

Forging machines
- Once activated, it is impossible to stop punchers, shears and benders until the end of a cycle. Use extreme care when working with these tools.
- Maintain all forge shop equipment in a condition that will ensure continued safe operation.
- Position or install all hammers so they remain on or are anchored to foundations sufficient to support them according to applicable engineering standards.
- Make die keys and shims from a grade of material that will not unduly crack.
- Clearly identify and make readily accessible all manually operated valves and switches.
- Make sure every steam or air hammer has a safety cylinder head to act as a cushion if the rod breaks or pulls out of the ram.
- Air-lift hammers must have a safety cylinder head.
- When dies are being changed or maintenance is being performed on the press, ensure that the:
  - Power to the press is locked out and-tagged out;
  - Energy sources are at a zero energy state;
  - Flywheel is at rest;
  - Ram is blocked with a material of theappropriate strength;
  - Upsetters are installed so they remain on their supporting foundations.

References
29 CFR 1910.218
OAC 4123:1-5-11
ANSI B24.1 Forging Machinery

Drill presses
- To prevent spinning, securely fasten work materials. Never use your hands to secure work materials.
- Use a center punch to score the material before drilling.
- Run the drill at the correct speed. Forcing or feeding too fast can break drill bits.
- Never attempt to loosen the chuck unless the power is off.
- Lower the spindle before removing a chuck.
- Never use a regular auger bit in a drill press.
- Frequently back the drill out of deep cuts to clean and cool the bit.

- Secure or anchor drill presses.
- Never wear gloves, loose clothing, jewelry, etc., when working with a drill press.
- Guard the point of operations on all drill presses. This includes the spindle, chuck, and belt and pulley system.

Reference
ANSI B11.8 Drilling, Milling and Boring Machines

Grinders

- Ensure that no combustible or flammable materials are nearby that sparks from the grinder wheel can ignite.
- Ensure that a guard covers at least 270 degrees of the grinding wheel on bench-mounted machines.
- Place the upper peripheral guard (tongue guard) not more than one-fourth inch above the grinding wheel for bench or pedestal grinders.
- Place the grinder tool rest at not more than one-eighth inch from the wheel and slightly above the centerline.
- Allow the grinder to reach full speed before stepping into the grinding position. Faulty wheels usually break at the start of an operation.
- Grind on the face of the wheel, unless otherwise designed.
- Use a vise-grip, pliers or clamp to hold small pieces.
- Slowly move work pieces uniformly across the face of the wheel. This will keep the wheel sound.
- Do not grind non-ferrous materials.
- When mounting new grinder wheels, check them for soundness. Suspend the wheel on a string and tap it. If the wheel rings, it is probably sound.
- Check the revolutions per minute (RPM) of the grinder and the wheel to ensure the grinder's RPM does not exceed the RPM rating of the wheel.
- Immediately replace wheels that are badly worn, cracked or chipped.
- Never use a wheel that has been dropped or received a heavy blow, even if there is no apparent damage.
- Before using a new wheel, let it a run a few seconds at full speed to ensure it is balanced.
- Secure, or anchor in place, pedestal or bench grinders.
- Never wear gloves, loose clothing or jewelry when working with grinders.
- Use a face shield in addition to eye protection when using a grinder for any operation.
- Never mount a stone without the blotters in place.

References
29 CFR 1910.215
OAC 4123:1-5-12
ANSI B7.1 Abrasive Wheels
ANSI B11.9 Grinding Machines

Metal lathes

- Ensure that all gear and belt guards are in place.
- Use a spring-loaded or self-ejecting chuck wrench on lathes with manually adjusted chucks.
- Keep your hands off chuck rims when a lathe is in operation.
- Do not attempt to screw the chuck onto the lathe spindle with the power on as it may get cross-threaded and cause injury. Stop the machine, place a board under the chuck and then screw it on by hand.
- Properly adjust steady rests to conform with the material being worked on.
- Always face the head stock and chuck when filing work in a lathe.
- See that tail stock, tool holder and work are properly clamped before turning on the power.
- Never attempt to adjust a tool while the lathe is running.
- Never wear gloves, loose clothing, jewelry, etc., when working with a lathe.
- Never apply a wrench to revolving work or parts.

- Always use a brush to remove chips; never use your hands.
- Use pipe sleeves to cover work protruding from the end of the lathe when possible.
- Remove the tool bit before you remove your work from the lathe.
- Make sure chuck guards are in place any time an employee operates the lathe with the jaws sticking out beyond the chuck.
- Use chip guards to prevent flying chips from hitting the operator or bystanders.

References
29 CFR 1910.212
OAC 4123:1-5-04
ANSI B11.6 Lathes

Pneumatic-fastening tools

- Nail guns and air guns are powered by compressed air. The main danger associated with pneumatic fastening tools is injury from a tool attachment or fastener.
- Disconnect pneumatic tools from the air supply when they are not in use.
- Equip pneumatic tools that shoot nails, rivets or staples with a device that keeps fasteners from ejecting, unless the muzzle is pressed against a firm surface.
- Never point a tool at items you do not want to fasten.
- Keep your finger off the trigger until you are ready to begin work. Most pneumatic tools have a hair-trigger that requires little pressure to activate the gun.
- Treat air hoses with the same care as an electrical cord.
- Do not drive fasteners into hard, brittle surfaces or areas where the fastener may pass through the material and protrude on the other side.
- Train all operators of pneumatic fastening tools according to the manufacturers' guidelines prior to operatiing equipment.

References
29 CFR 1910.243 (b)
OAC 4123:1-5-07-L

E. Lockout/tagout

Employers must develop and implement an effective isolation and control program for hazardous energy when service is performed. Employers must develop specific procedures to isolate and control all energy sources for each piece of equipment in the workplace. In addition, employers must identify specific employees who are authorized to perform machine lockout/tagout. The following outline identifies the requirements of an effective lockout/tagout program.

Purpose

To protect employees from unexpected release of stored energy, including:

- Mechanical;
- Hydraulic;
- Chemical;
- Gravity;
- Electrical;
- Pneumatic;
- Thermal;
- Any other sources of stored energy.

Note: The standard does not apply to construction sites, but does apply to yards and fabrication shops, or when a contractor is working in your facility.

Written program

- Identify all sources of energy for each piece of equipment.
- Each employee has his or her own locks and keys. The supervisor may have a second key, but well-established procedures must be in place for when he or she can use the second key.

- Verify the employee is not at the facility.
- Make a reasonable effort to inform the employee that the lock has been removed.
- Ensure you inform the employee about the action before returning to work in the facility.
- Review procedures annually (not by one performing lockout/tagout).
- Notify outside contractors of the program.

Employee training
- Methods of identifying energy sources
- Shut down/start-up procedures
- Lockout procedures

References
29 CFR 1910.147
OAC 4123:1-5-05-D
ANSI Z244.1 Control of Hazardous Energy

F. Electrical safety

Share these basic electrical safety issues with all employees:

- Inspect all cord- and plug-connected equipment on a regular basis;
- Train employees on the hazards of electricity and the importance of electrical safety;
- Use extension cords temporarily when using portable power tools, maintaining or servicing machinery;
- Use three-wire type extension cords with an appropriate grounding conductor;
- Do not use two-wire extension cords;
- Provide all equipment unless it is double insulated with an appropriate grounding conductor;
- Ground and secure electrical outlets;
- Do not use damaged or defective equipment;
- Identify and make accessible all electrical equipment;
- Do not use flexible cords and cables as a substitute for fixed wiring;
- Do not permit extension cords with metal knockout boxes;
- Provide a ground-fault circuit interrupter in damp or wet locations.

References
29 CFR 1910.301 through .399
29 CFR 1910.137
OAC 4123:1-5-05-G
OAC 4123:1-5-23

G. Welding and cutting

Welding and cutting are two forms of hot work that require special safety considerations. Unless they are done in a designated shop area, welding and cutting are strictly prohibited without proper authorization.

Before conducting welding or cutting operations, make sure:

- Welding leads are completely insulated and in good condition;
- Cutting tools are leak-free and equipped with proper fittings, gauges, regulators, and flow and flashback devices;
- Oxygen and acetylene tanks are secured in a safe place.

In addition:

- Conduct welding and cutting operations in a designated area free from combustible and flammable materials. When welding or cutting is necessary in an undesignated or hazardous area, obtain a hot work permit from management and have someone nearby act as a fire attendant. The permit should include a review and inspection of the work area by a supervisor;
- Ensure a fire extinguisher is in the vicinity and a fire watch is in place during and at least 30 minutes after work is completed;
- Remove or cover all combustible/flammable liquids;
- Periodically check welding and cutting areas for combustible atmospheres;
- Use caution to prevent sparks from igniting a fire;
- Remove unused gas cylinders from the welding and cutting area;
- Keep hoses out of doorways and away from

other people. A flattened hose can cause a flashback;
- Mark hot metal with a sign or other warning when welding or cutting operations are completed.

Welding guidelines

PPE is important when welding. Make sure the welding helmet visor is dark enough to provide adequate protection. Wear a fireproof apron and fireproof gloves. In addition, protect other people from the hazards of welding. For example, use a welding curtain to protect other employees from ultraviolet (UV) radiation.

There are various types of welders:

- Workers use AC welders, powered by an electrical cord, for standard welding procedures;
- Workers commonly use portable DC welders in manholes. DC welders have their own power supply;
- Wire-feed welders use inert gas for light metal work (such as stainless steel or aluminum);
- Resistance welders or spot welders.

Common hazards associated with welding include:

- Electrocution;
- Burns;
- UV radiation exposure;
- Oxygen depletion;
- Sparking.

In addition to the general guidelines for welding and cutting:

- Make sure the welding area has a nonreflective, noncombustible surface;
- Ensure that adequate ventilation and exhaust are available;
- Be aware of electrocution hazards, particularly in damp conditions. Be sure to properly ground electrical cords. Use cords that pull down from an overhead pulley;
- Use welding curtains or welding screens to protect and shield other workers and visitors from UV rays.

Cutting guidelines

Oxygen or acetylene gas cylinders usually power gas welding and cutting tools. These tanks require special safety precautions to prevent explosions and serious injuries.

- Ensure acetylene/oxygen systems are equipped with flame or flashback arresters.
- Secure and store acetylene bottles upright.
- Keep cylinder fittings and hoses free from oil and grease.
- Repair or replace defective hoses by splicing. Do not use tape.
- Do not tamper or attempt to repair cylinders, valves or regulators.
- Do not interchange regulators or pressure gauges with other gas cylinders.
- Carefully purge hoses and torches before connecting a cylinder.
- Set acetylene pressure at or below 15 pounds per square inch. Always use the minimum acceptable flow rate.
- Never use a match to light a torch. Use an approved lighter.
- Do not store oxygen and fuel gas together. Safety standards require oxygen and fuel gas are separated by at least 20 feet or by a noncombustible barrier at least 5 feet high with a fire resistance of at least 30 minutes.
- According to ANSI Z49.1, cylinder storage refers to cylinders of compressed gas standing by on the site (not those in use or attached ready for use).
- Cylinder in use — refers to cylinders connected for use, a single cylinder for each gas to be used, in the use location, ready to be connected, or a one-day supply of cylinders, in the use location, ready to be connected.
- Separate cylinders in storage from flammable and combustible liquids and from easily ignited materials such as wood, paper, packaging materials oil and grease.

Hot work permits

Make sure you do not conduct a hot work inspection and permit program in place for welding operations in a normal welding area and where there is a potential for fire. Before any hot work (such as welding or cutting operations, use of spark-producing power tools, chipping operations, etc. is permitted, an individual authorized to approve the operation will inspect the area. Conduct work only under the supervision of the authorized person and, preferably, issue a written permit that outlines safe working procedures.

References
29 CFR 1910.251 through .255
OAC 4123:1-5-16
ANSI Z49.1 Welding & Cutting Safety

H. Compressed gas cylinders/ compressed air

The in-plant handling, storage and use of all compressed gases in cylinders, portable tanks, rail tank cars or motor vehicle cargo tanks will be in accordance with the Compressed Gas Association Pamphlet P-1.

- Do not handle oxygen cylinders if your gloves are greasy or oily.
- Store all compressed gas cylinders in the upright position.
- Place valve-protection caps on compressed gas cylinders that are in storage or are not being used.
- Do not lift compressed gas cylinders by the valve-protection cap.
- Do not store compressed gas cylinders in areas where they can come in contact with chemicals labeled corrosive.
- Hoist compressed gas cylinders on the cradle, sling board, pallet or compressed gas cylinder basket.
- Do not place compressed gas cylinders against electrical panels or live electrical cords where the cylinder can become part of the circuit.

Compressed air used for cleaning

Do not use compressed air for cleaning equipment unless the pressure for the equipment is reduced to 30 pounds per square inch or less and proper protective equipment is in place. Never allow employees to use compressed air to clean or blow debris from a person.

References
29 CFR 1910.251 through .255
29 CFR 1910.242
OAC 4123:1-5-16
CGA P-1 Safe Handling of Commpressed Gases in Containers

I. Flammable and combustible liquids

Statistics indicate that more than 21 percent of industrial fires and 15 percent of office fires start with the ignition of a flammable or combustible liquid. Contributing factors include:

- Lack of a fire-prevention program;
- Improper container storage;
- No storage limits;
- Inadequate employee training;
- Inadequate bonding and grounding procedures;
- Lack of interaction with local emergency management agencies;
- No preventive-maintenance program for emergency equipment and devices;
- No procedures to control ignition sources during maintenance and contractor activities;
- No established hot work procedures and a no-smoking policy.

Flammable and/or combustible liquids are substances that catch fire and burn easily. Flammable liquids continue to burn even after ignition sources are removed from the source.

The flammability of a combustible liquid is determined by these factors:

- Flash point — the lowest temperature at which vapors or gases will ignite;

- Fire point — the temperature at which a combustible liquid gives off vapors that will ignite;
- Minimum concentration of extinguishing agents needed to extinguish the fire;
- Combustion rate;
- Increase of temperature during combustion.

Employees need to know the various sources that might ignite flammable liquid vapors. They include, but are not limited to, the following:

- Open flames;
- Electrical switches;
- Open motors;
- Static electricity;
- Smoking;
- Friction and mechanical sparks;
- Heat guns;
- Cutting and welding;
- Radiant heat.

Standard operating procedures should limit the amounts of any given flammable liquids stored on-site and in the work area. Develop storage strategies by considering daily usage requirements, storage capacity and delivery time. Permit only a limited amount of flammable liquids outside approved storage areas or containers. Limit the amount of flammable liquids outside an approved storage container or room to the following: 25 gallons of Class IA, 120 gallons of Class IB, IC, Class II or Class III. Permit no more than one day's supply of combustible/flammable liquids in spraying areas.

Only trained and authorized employees should handle and dispense flammable materials. Containers must be properly labeled, designed for flammable liquids and equipped with flame arresters. When dispensing flammable liquids from containers, bond and ground the containers. Place no-smoking signs where you store or use flammable liquids for operations.

Incorporate general exhaust ventilation for storage locations housed inside facilities. The ventilation system should include low-level venting, approximately 12 inches above the floor level. Federal safety standards require six room-air changes per hour.

References
29 CFR 1910.106 & .108
OAC 4123:1-5-07-M
NFPA 30 Flammable and Combustible Liquids Code

J. Spray booths and spraying operations

Make sure spray booths conform to the following:

- Cover or contain light fixtures when mounted above an area where flammable vapors may be present;
- Provide sprinkler protection in a spray booth;
- Provide an audible or visual airflow monitoring system to assist in maintaining adequate airflow;
- Keep a clear space of not less than 3 feet on all sides free of storage or combustible material;
- Maintain the surfaces of the paint booth so they are smooth and easy to clean and/or use a non-combustible covering or stripable coating to facilitate the safe cleaning and removal of residues;
- Comply with OSHA standards that require spark-producing equipment or any ignition source used within 20 feet of any spraying area (and not separated by a partition) must be designed for a Class I, Division 2, location.

Exhaust ventilation system

Ensure the system for removing contaminated air from a space comprises two or more of the following elements: enclosure or hood, duct work, dust-collecting equipment, exhauster and discharge stack. The construction, installation, inspection and maintenance of exhaust systems must conform to the principles and requirements in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust 9.2 Ventilation Systems,

ANSI Z9.2, and National Fire Protection Agency, (NFPA) 91, Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids.

References
29 CFR 1910.94
29 CFR 1910.107
ANSI Z9.2 Local Exhaust Ventilation Systems
NFPAA 91 Standard for Exhaust Systems

K. Hazard communication standard

OSHA hazard communication requirements ensure all employees who come in contact with chemicals are aware of the hazards associated with the substances.

According to OSHA's hazard communication (HAZCOM) standard, employers will conduct an inventory of all chemicals in their facilities and obtain material safety data sheets (MSDSs) for each chemical identified. In addition, employers should develop written plans that identify specific standard procedures for handling chemicals, storage of chemicals and required protective equipment. Employers and employees will verify all containers are labeled properly. Employers also must provide training for each employee regarding safely handling chemicals in the work environment.

- Follow the instructions on the label and in the MSDS for each chemical product used in your workplace.
- Use personal protective clothing or equipment such as neoprene gloves, rubber boots, shoe covers, rubber aprons and protective eyewear when using chemicals labeled flammable, corrosive, caustic or poisonous.
- Do not use protective clothing or equipment that has split seams, pinholes, cuts, tears or other signs of visible damage.
- Always wash your hands with soap and water after using cutting fluids or solvents.
- Each time you use your gloves, wash your gloves using cold tap water and normal hand washing motion before removing them. Always wash your hands after removing your gloves.
- Only dispense liquid labeled flammable from its bulk container located in areas posted flammable-liquid storage.
- Do not use chemicals from unlabeled containers.

Written program
Identify responsibilities:
- Who is responsible for training?
- Who is responsible for ordering/maintaining MSDSs?

Container labeling
- Legible
- Chemical name
- Target organs
- Manufacturer's name and address

MSDSs
- Where located?
- How to obtain?

Employee training
- Frequency
- Who conducts training?
- Who needs to be trained?

Chemical inventory
- What company has on hand/quantity?
- Where located?

Employee training
- New hires
- Transfers
- Temporaries
- New operations
- New products
- After accidents/incidents

Training topics that need to be covered
  - Overview of HAZCOM requirements
  - Chemicals present in workplace
  - Location/availability of written program
  - Health effects of chemicals
  - How to lessen or prevent exposures

- Engineering controls the company is using
- Location of MSDSs
- How to read MSDSs
- Labeling requirements

Contractors
Notification procedures
Training contractors of company hazards
Training company employees of contractor hazards

References
29 CFR 1910.1200

L. Personal protective equipment

Engineering controls that eliminate the hazard at the source offer the best and most reliable means of safeguarding. But whenever engineering controls are not available or fully capable of protecting employees, they must wear protective clothing or PPE. Employers muat perform a PPE-hazard assessment for their workplaces and determine if PPE is required. If PPE is required, employers will identify each type of PPE required and the specific task or operations that require its use. The employer will certify and date the assessment. In addition, the employer will provide training to each employee on the specific type of PPE required in the work environment.

To provide adequate protection, protective clothing and equipment will always be:

- Appropriate for the particular hazards;
- Maintained in good condition;
- Properly stored to prevent damage or loss when not in use;
- Kept clean, fully functional and sanitary.

Eye protection
Make sure employees use appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

Ensure each affected employee uses eye protection that provides side protection when there is a hazard from flying objects. Detachable side protectors (for example, clip-on or slide-on side shields) meeting the pertinent requirements are acceptable.

Employees who wear prescription lenses while engaged in operations involving eye hazards should wear eye protection that incorporates the prescription in its design or wear eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses. Protective eye and face devices will comply with ANSI Z87.1, American National Standard Practice for Occupational and Educational Eye and Face Protection.

Hearing protection
Administer a continuing, effective hearing conservation program whenever employee noise exposures equal or exceed an eight-hour, time-weighted average sound level (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of 50 percent. For purposes of the hearing conservation program, compute employee noise exposures in accordance with appropriate references and without regard to any attenuation provided by the use of PPE.

Make hearing protectors available to all employees exposed to an eight-hour TWA of 85 decibels or greater at no cost to the employees. Replace hearing protectors as necessary.

Respiratory protection
The primary objective in controlling occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smoke, sprays or vapors is to prevent atmospheric contamination. Accomplish this by using accepted engineering control measures such as enclosure or confinement of the operation, general and local ventilation, and substitution of less-toxic materials. When effective engineering controls are not feasible or while you are instituting them, use appropriate respirators.

Develop and implement a written respiratory protection program with required work site-specific procedures and elements for required respirator use. A suitably trained program administrator must administer the program. In addition, certain program elements are required for voluntary use of respirators to prevent hazards associated with respirator use. Requirements include fit testing, employee training, including maintenance, cleaning and care, respirator limitations and verification that the respirator will protect against contaminant of concern.

Head protection

Ensure affected employees wear protective helmets when working in areas where there is a potential for injury to the head from falling objects. Purchase helmets that reduce electrical shock hazard when exposed to electrical conductors that could contact the head. It should also meet the requirements of ANSI Z89.1 for head protection.

Foot protection

Ensure affected employees use protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, and where such employees' feet are exposed to electrical hazards. Make sure protective footwear meets ANSI Z41 standard for protective footwear.

Hand and finger protection

Select and require employees to use appropriate hand protection when their hands are exposed to hazards such as those from skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns and harmful temperature extremes.

References
29 CFR 1910.132 through .138
OAC 4123:1-5-17 ANSI Z41 Protective Footwear
ANSI Z87.1 Eye & Face Protection
ANSI Z89.1 Industrial Head Protection

M. Emergency action and fire prevention plans

The emergency action plan should be in writing and cover designated actions employers and employees must take to ensure employee safety in case of fire and other emergencies.

Include these elements, at a minimum, in the plan:

- Emergency escape procedures and emergency escape route assignments;
- Procedures for employees to follow who remain to operate critical plant operations before they evacuate;
- Procedures to account for all employees after emergency evacuation's complete;
- Rescue and medical duties for those employees who perform critical operations;
- The preferred means of reporting fires and other emergencies;
- Names, job titles of persons or departments to contact for further information or explanation of duties under the plan.

Establish an employee alarm system that complies with appropriate regulations. If the employee alarm system is used for alerting fire brigade members, or for other purposes, use a distinctive signal for each purpose.

Establish in the emergency action plan the types of evacuation to use in emergency circumstances. Before implementing the emergency action plan, designate and train a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees.

Review the plan with each employee covered by the plan under the following circumstances:

- When the plan is developed;
- Whenever the employee's responsibilities or designated actions under the plan change;
- Whenever the plan is changed.

Review with employees upon initial assignment those parts of the plan that they must know to protect themselves in an emergency. Keep the

written plan at the workplace and make it available for employee review. Employers with 10 or fewer employees may orally communicate the plan to employees.

Means of egress
- Identify all exits.
- Provide emergency lighting in accordance with local building codes.
- Never lock or block exit access or exits.
- Identify all non-exit doors.

Place lighting as to reduce glare and prevent too much contrast between work areas and adjacent areas. Provide sufficient lighting for general safety and ordinary visual needs. Locate and guard lighting fixtures so there will be no hazard to persons should accidental breakage of the lamp or fixture occur. Where failure of primary lighting can result in hazards to any person, provide emergency lighting.

Fire-prevention plan
Maintain a written fire-prevention plan and communicate the plan to employees.

Include these elements, at a minimum, in the fire prevention plan:

- A list of the major workplace fire hazards, proper handling and storage procedures, potential ignition sources such as welding, smoking and others and their control procedures, and the type of fire-protection equipment or systems;
- Names or regular job titles of those personnel responsible for maintenance of equipment and systems installed to prevent or control ignitions or fires;
- Names or job titles of personnel responsible for control of fuel source hazards.

Control accumulations of flammable and combustible waste materials and residues so they do not contribute to a fire emergency. Include housekeeping procedures in the written fire-prevention plan.

Apprise employees of the fire hazards of the materials and processes to which they are exposed. Review with employees, upon initial assignment, those parts of the fire-prevention plan they must know to protect themselves in an emergency. Keep the written plan in the workplace and make it available for employee review.

Regularly and properly maintain, according to established procedures, equipment and systems installed on heat producing equipment to prevent accidental ignition of combustible materials. Include maintenance procedures in the written fire prevention plan. Identify fire extinguishers and free them from obstruction. Inspect extinguishers visually in-house on a monthly basis and annually by an outside service company. Train any employee designated to use a fire extinguisher on an annual basis.

References
29 CFR 1910.33 through .39

N. Powered industrial trucks

All new powered industrial trucks must meet the design and construction requirements established in the American National Standard for Powered Industrial Trucks, Part II, ANSI B56.1. A label or other identifying mark on approved trucks must indicate approval by the testing laboratory.

Any modifications and additions that affect capacity and safe operation performed by the customer or user must have the manufacturer's prior written approval. Change capacity, operation and maintenance instruction plates, tags or decals, accordingly.

Do not use powered industrial trucks in atmospheres containing hazardous concentration of chemicals or dusts. Refer to appropriate standards for a specific list of hazards and for the types (designations) of powered industrial trucks that you can use.

Store and handle liquid fuels, such as gasoline and diesel fuel, in accordance with NFPA Flammable and Combustible Liquids Code (NFPA No. 30) and liquefied petroleum gas fuel in accordance with NFPA Storage and Handling of Liquefied Petroleum Gases (NFPA No. 58).

Designate battery charging installations in areas designed for that purpose. Provide facilities for flushing and neutralizing spilled electrolyte for fire protection, protecting charging apparatus from damage by trucks and adequate ventilation for dispersal of fumes from gassing batteries. Provide a conveyor, overhead hoist or equivalent material-handling equipment for handling batteries.

Properly position and secure reinstalled batteries in the truck. Provide a carboy tilter or siphon for handling electrolyte. When charging batteries, pour acid into water, not water into acid.

Properly position the truck and apply the brakes before attempting to change or charge batteries. Take care to ensure the vent caps function. Open the battery (or compartment) cover(s) to dissipate heat. There is no smoking in the charging area.

Take precautions to prevent open flames, sparks or electric arcs in battery-charging areas. Keep tools and other metallic objects away from the top of uncovered batteries. Provide adequate lighting.

Make sure concentration levels of carbon monoxide gas created by powered industrial truck operations do not exceed the specified levels.

Set the brakes of highway trucks and place wheel chocks under the rear wheels to prevent the trucks from rolling during the loading of powered industrial trucks. Use fixed jacks if necessary to support a semi-trailer and prevent upending during the loading or unloading when the trailer is not coupled to a tractor.

Provide wheel stops or other recognized positive protection to prevent railroad cars from moving during loading or unloading operations. Provide protection to prevent railroad cars from being moved while dock boards or bridge plates are in position.

Operators must be competent to operate a powered industrial truck safely as demonstrated by completing of training and evaluations. Trainees may operate a powered industrial truck only:

- Under the direct supervision of persons who have the knowledge, training and experience to train operators and evaluate competence;
- Where such operation does not endanger the trainee or other employees.

Industrial truck training

Training must consist of a combination of formal instruction (lecture, discussion, interactive computer learning, video tape, written material), practical training (demonstrations the trainer performs and practical exercises trainees perform) and evaluating of the operator's performance in the workplace.

Powered industrial truck operators receive initial training in truck-related topics and workplace-related topics, except in topics the employer can demonstrate are not applicable to safe-truck operation in the employer's workplace.

Truck-related topics include:

- Operating instructions, warnings and precautions for the truck types the operator will be authorized to operate;
- Differences between the truck and the automobile;
- Where truck controls and instrumentation are located, what they do and how they work;
- Engine or motor operation;
- Steering and maneuvering;
- Visibility (including restrictions due to loading);
- Fork and attachment adaptation, operation and use limitations;
- Vehicle capacity and stability;

- Any vehicle inspection and maintenance that you will require the operator to perform;
- Refueling and/or recharging of batteries;
- Operating limitations;
- Any other operating instructions, warnings or precautions listed in the operator's manual for the types of vehicle the employee is training to operate.

Workplace-related topics include:

- Surface conditions where the vehicle will be operated;
- Load composition and load stability;
- Load manipulation, stacking and unstacking;
- Pedestrian traffic in areas where employees will operate the vehicle;
- Narrow aisles and other restricted places where employees will operate the vehicle;
- Hazardous (classified) locations where employees will operate the vehicle;
- Ramps and other sloped surfaces that could affect the vehicle's stability;
- Closed environments and other areas where insufficient ventilation or poor vehicle maintenance can cause a build up of carbon monoxide or diesel exhaust;
- Other unique or potentially hazardous environmental conditions in the workplace that might affect safe operation.

Conduct refresher training, including an evaluation of the training's effectiveness to ensure the operator has the knowledge and skills needed to safely operate the powered industrial truck.

Provide refresher training in relevant topics when:

- The operator is observed operating the vehicle in an unsafe manner;
- The operator is involved in an accident or near-miss incident;
- The operator receives an evaluation that reveals he or she is not operating the truck safely;
- The operator is assigned to drive a different type of truck;
- A workplace condition changes in a manner that could affect safe operation of the truck.

Conduct an evaluation of each powered industrial truck operator's performance at least once every three years or if an employee is involved in an accident or a near miss.

If an operator received training in a topic previously specified, and the training is appropriate to the truck and working conditions encountered, no additional training in that topic is required if the operator is evaluated and competent to operate the truck safely.

Employers certify each operator is trained and evaluated as required. The certification includes the name of the operator, date of the training, date of the evaluation and identity of the person(s) performing the training or evaluation.

General rules

- Do not drive trucks toward anyone standing in front of a bench or other fixed object.
- Do not allow anyone to stand or pass under the elevated portion of any truck, whether loaded or empty.
- Do not permit unauthorized personnel to ride on powered industrial trucks; provide a safe place to ride where riding of trucks is authorized.
- Keep arms or legs from between the uprights of the mast or outside the running lines of the truck.

When a powered industrial truck is left unattended, fully lower load-engaging means, neutralize controls, shut off power and set brakes. Block the wheels if the truck is parked on an incline. A powered industrial truck is unattended when the operator is more than 25 feet away from the vehicle, but remains in his view, or whenever the operator leaves the vehicle and it is not in his or her view.

Maintain a safe distance from the edge of ramps or platforms while on any elevated dock, platform or freight car. Do not use trucks for opening or closing freight doors.

Set brakes and put wheel blocks in place to prevent movement of trucks, trailers or railroad cars while loading or unloading. You may need fixed jacks to support a semi-trailer during loading or unloading when the trailer is not coupled to a tractor. Check the flooring of trucks, trailers and railroad cars for breaks and weakness.

Ensure there is sufficient headroom under overhead installations, lights, pipes, sprinkler system and other overhead obstructions.

Use an overhead guard as protection against falling objects. This guard offers protection from the impact of small packages, boxes, bagged material and other objects the operator might encounter. The guard will not protect employees from the impact of a falling capacity load.

Use a load-backrest extension whenever necessary to minimize the possibility of the load or part of it from falling rearward.

Use only approved industrial trucks in hazardous locations.

Whenever a truck is equipped with vertical only, or vertical and horizontal controls that you can elevate with the lifting carriage, or forks for lifting personnel, take these additional precautions:

- Use a safety platform firmly secured to the lifting carriage and/or forks;
- Provide means to allow personnel on the platform to shut off power to the truck;
- Provide protection from falling objects as indicated being necessary by the operating conditions.

Keep fire aisles, access to stairways and fire equipment clear.

Observe all traffic regulations, including authorized plant-speed limits. Maintain a safe distance, approximately three truck lengths, from the truck ahead. Keep the truck under control at all times.

Yield the right of way to ambulances, fire trucks or other vehicles in emergency situations. Do not pass other trucks traveling in the same direction at intersections, blind spots or other dangerous locations. Slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, travel with the load trailing.

Cross railroad tracks diagonally wherever possible. Do not park closer than 8 feet from the center of railroad tracks.

Look in the direction of and keep a clear view of the path of travel. Ascend or descend grades slowly. When ascending or descending grades in excess of 10 percent, drive loaded trucks with the load upgrade. Tilt back the load and load-engaging means on all grades if applicable, and raise the load only as far as necessary to clear the road surface.

Under all travel conditions, operate the truck at a speed that will permit you to stop safely. Stunt driving and horseplay is not permitted. Slow down for wet and slippery floors.

Properly secure dock boards or bridge plates before driving over them. Drive over dock boards and bridge plates carefully and slowly, and do not exceed the rated capacity. Approach elevators slowly and then enter squarely after the elevator car is properly leveled. Once on the elevator, neutralize the controls, shut off the power and set the brakes. Enter elevators or other confined areas in motorized hand trucks with the load end forward. Avoid running over loose objects on the roadway surface.

Reduce speed to a safe level while negotiating turns by turning the hand-steering wheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, turn the hand-steering wheel at a moderate, even rate. Handle only stable or safely arranged loads. Exercise caution when handling off-center loads. Handle only loads within the truck's rated capacity. Adjust the long or high (including multiple-tiered)

loads that may affect capacity. Operate trucks equipped with attachments as partially-loaded trucks when not handling a load.

Place a load-engaging means under the load as far as possible; carefully tilt the mast backward to stabilize the load.

Use extreme care when tilting the load forward or backward, particularly when the load is high. Do not tilt forward with load-engaging means elevated, except to pick up a load. Do not tilt an elevated load forward, except when the load is in a deposit position over a rack or stack. When stacking, use only enough backward tilt to stabilize the load.

If a powered industrial truck needs repair, is defective or is in any way unsafe, take it out of service until restored to a safe-operating condition.

Turn the engine off while filling fuel tanks. Avoid spillage, but if you do spill any fuel or oil, carefully wash it away or make sure it has completely evaporated, and replace the fuel tank cap before restarting the engine. Do not operate a truck until repairing any leaks in the fuel system. Do not use open flames to check the electrolyte level in storage batteries or the gasoline level in fuel tanks.

Remove from service any powered industrial truck in unsafe operating condition. Have authorized personnel make all repairs. Repair problems with the fuel and ignition systems of industrial trucks that involve fire hazards only in locations designated for such repairs. If a truck needs repairs to the electrical system, disconnect the battery prior to repairing.

Replace all parts of any industrial truck with parts equivalent to those used in the original design. Do not alter industrial trucks so the relative positions of various parts are different from when they were originally received from the manufacturer. Do not add extra parts not provided by the manufacturer or eliminate parts, except as provided in the appropriate standard.

Do not add counterweights to fork trucks unless approved by the truck manufacturer.

Examine industrial trucks before placing them in service. If the examination shows any condition affecting the vehicle's safety, keep it out of service. Make these examinations at least daily. If using industrial trucks on a round-the-clock basis, examine them after each shift. Immediately report and correct any defects found.

Materials handling and storage

If using mechanical handling equipment, allow sufficient safe clearances for aisles, at loading docks, through doorways and wherever turns or passage must be made. Keep aisles and passageways clear and in good repair with no obstruction across or in aisles that could create a hazard. Appropriately mark permanent aisles and passageways.

Do not allow storage of material to create a hazard. If you stock bags, bundles and other containers, stack, block and interlock in tiers with limited height so they are stable and secure against sliding or collapse.

Keep storage areas free from accumulation of materials that constitute hazards from tripping, fire, explosion or pest refuge. Control vegetation when necessary.

Provide signs to warn of clearance limits.

Provide derail and/or bumper blocks on spur railroad tracks where a rolling car can contact other cars being worked on, entering a building or working in traffic area.

Provide covers and/or guardrails to protect personnel from the hazards of open pits, tanks, vats, ditches and other hazards.

References
29 CFR 1910.178 OAC 4123:1-5-13
ANSI B56.1 Low Lift & High Lift Trucks

O. Overhead and gantry cranes

A crane is a machine for lifting and lowering a load and moving it horizontally with the hoisting mechanism an integral part of the machine. Cranes, whether fixed or mobile, are driven manually or by power. An overhead crane has a movable bridge carrying a movable or fixed-hoisting mechanism and traveling on an overhead fixed runway structure. A hoist is an apparatus that may be a part of a crane, exerting a force for lifting or lowering. Rope refers to wire rope, unless otherwise specified.

All overhead and gantry cranes constructed and installed on or after Aug. 31, 1971, have to meet the design specifications of the American National Standard Safety Code for Overhead and Gantry Cranes, ANSI B30.2.

You may modify or re-rate cranes if a qualified engineer or the equipment manufacturer checks the modifications and the supporting structure thoroughly for the new rated load. Test the crane in accordance with appropriate standards. Typically, you must load test the crane at 125 percent of designed capacity after completing equipment modifications.

Mark the crane's rated load plainly on each side of the crane and, if the crane has more than one hoisting unit, have its rated load marked on each hoist or its load block. Make sure this marking is clearly legible from the ground or floor.

Maintain a minimum clearance of 3 inches overhead and 2 inches laterally between crane and obstructions in conformity with the Crane Manufacturers' Association of America Inc.'s Specification No. 61.

Inspect all cranes regularly. Prior to initial use, inspect all new and altered cranes to insure compliance with provisions of federal and state safety requirements. Primarily, there are two types of inspections: frequent and periodic.

Perform frequent inspections on daily to monthly intervals. Inspect the following items for defects. Carefully examine all deficiencies and determine whether they constitute a safety hazard.

- Inspect all functional operating mechanisms for maladjustments interfering with proper operation daily.
- Inspect deterioration or leakage in lines, tanks, valves, drain pumps and other parts of air or hydraulic systems daily.
- Inspect hooks with deformation or cracks visually on a daily basis. Perform a documented monthly inspection.
- Inspect hoist chains and wire ropes visually on a daily basis. Perform a documented monthly inspection.

Conduct periodic inspections on one-to-12 month intervals. The periodic inspection should include all items identified in the frequent inspection and also include the following:

- Deformed, cracked or corroded members;
- Loose bolts or rivets;
- Cracked or worn sheaves and drums;
- Worn, cracked or distorted parts, such as pins, bearings, shafts, gears, locking and clamping devices;
- Excessive wear on brake system parts, linings, pawls and ratchets;
- Load, wind and other indicators over full range for any significant inaccuracies;
- Gasoline, diesel, electrical or other power plants for improper performance or noncompliance with applicable safety requirements;
- Excessive wear of chain-drive sprockets and excessive chain stretch.

Allow only designated personnel to operate a crane. Locate all operating handles within convenient reach of the operator when he or she is facing the area the load hook will serve or while facing the direction of travel of the cab. The operator needs a full view of the load hook in all positions and should see clearly enough to perform his or her work with light within the cab. Locate the cab to afford a minimum of 3 inches clearance from all fixed structures within its area of possible movement.

Use a conveniently placed fixed ladder, stairs or platform requiring no step over any gap exceeding 12 inches to access the cab and/or bridge walkway. Make sure fixed ladders conform to the ANSI Safety Code for Fixed Ladders, ANSI A14.3.

If sufficient headroom (a minimum of 48 inches) is available on cab-operated cranes, provide a foot walk on the drive side, along the entire length of the bridge, of all cranes having the trolley running on the top of the girders.

Make sure foot walks can sustain a distributed load of at least 50 pounds per square foot, and have an anti-slip walking surface, toeboards and handrails in compliance with appropriate standards.

Gantry cranes require ladders or stairways extending from the ground to the foot walk or cab platform with stairways equipped with rigid and substantial metal handrails and anti-slip walking surfaces. Ladders must be permanently and securely fastened in place and comply with standards.

Provide cranes with bumpers or other automatic means with equivalent effect, unless the crane:

- Travels at a slow rate of speed and has a faster deceleration rate-sleeve bearings;
- Is not operated near the ends of bridge and trolley travel;
- Is restricted to a limited distance by the nature of the crane operation, and there is no hazard of striking any object in this limited distance;
- Is used in similar operating conditions.

Mount the bumper so there is no direct shear on bolts, and design and install the bumpers to minimize parts falling from the crane in case of breakage.

Provide trolleys with bumpers or other automatic means of equivalent effect, unless the trolley:

- Travels at a slow rate of speed;
- Is not operated near the ends of bridge and trolley travel;
- Is restricted to a limited distance of the runway and there is no hazard of striking any object in this limited distance;
- Is used in similar operating conditions.

When operating more than one trolley on the same bridge, equip each with bumpers or the equivalent on the adjacent ends. In case of age, design and install bumpers or their equivalent parts falling from the trolley.

Equip bridge trucks with sweeps extending below the top of the rail and project in front of the truck wheels.

If hoisting ropes run near enough to other parts that make fouling or chafing possible, install guards to prevent this. Provide a guard to prevent contact between bridge conductors and hoisting ropes if they can come into contact.

Guard exposed moving parts, such as gears, setscrews, projecting keys, chains, chain sprockets and reciprocating components that can constitute a hazard under normal, operating conditions. Securely fasten the guards. Guards should support without permanent distortion the weight of a 200-pound person, unless the guard is located where it is impossible for a person to step on it.

Equip each crane's independent hoisting unit with at least one self-setting brake or holding brake applied directly to the motor shaft or some part of the gear train. In addition, outfit each crane independent hoisting unit with control braking means to prevent speeding. An exception is worm-geared hoists, the angle of whose worm is such that it prevents the load from accelerating in the lowering direction.

Make sure holding brakes for hoist motors have not less than the following percentage of the full-load hoisting torque at the point where the brake is applied:

- 125 percent when used with a control braking means other than mechanical;
- 100 percent when used in conjunction with a mechanical control braking means;
- 100 percent each if two holding brakes are provided.

References
29 CFR 1910.179
ANSI B30.2 Overhead & Gantry Cranes

P. Slings

A sling is an assembly that connects the load to the material-handling equipment. Whenever any sling is used, observe these practices:

- Do not use damaged or defective slings;
- Do not shorten slings with knots or bolts or other makeshift devices;
- Do not kink sling legs;
- Do not load slings in excess of rated capacities;
- Balance the loads to prevent slippage when slings are used in a basket hitch;
- Securely attach slings to the loads;
- Pad or protect slings from the sharp edges of the loads;
- Keep suspended loads clear of all obstructions;
- Keep all employees clear of loads about to be lifted and of suspended loads;
- Do not place hands or fingers between the sling and its load while the sling is being tightened around the load;
- Do not perform shock loading;
- Do not pull a sling from under a load when the load is resting on the sling.

Each day before using a sling, have a competent person designated by the employer inspect it, all fastenings and attachments for damage or defects. Perform additional inspections during sling use, where service conditions warrant. Remove damaged or defective slings from service immediately.

Permanently affix durable identification stating size, grade, rated capacity and reach on alloy steel chain slings.

Make sure hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links or other attachments have a rated capacity at least equal to that of the alloy steel chain with which they are used. Do not use the sling in excess of the rated capacity of the weakest component.

Do no use makeshift links or fasteners formed from bolts or rods, or other such attachments.

In addition to the required inspection, make a thorough periodic inspection of alloy steel chain slings in use regularly. Base the timetable on frequency of sling use, severity of service conditions, nature of lifts being made, and experience gained on the service life of slings used in similar circumstances. Make inspection intervals no longer than once every 12 months.

Make and maintain a record of the most recent month in which each alloy steel chain sling was thoroughly inspected and have the record available for examination.

Make sure you designate a competent person to perform a thorough inspection of alloy steel chain slings, including wear, defective welds, deformation and increase in length. If defects or deterioration are present, immediately remove the sling from service.

Ensure before use, each new, repaired or reconditioned alloy steel chain sling, including all welded components in the sling assembly, is proof tested by the sling manufacturer or equivalent entity, in accordance with paragraph 5.2 of the American Society of Testing and Materials Specification A391.

Do not use alloy steel chain slings with loads in excess of the rated capacities prescribed. Use slings not included in tables only in accordance with the manufacturer's recommendations.

Permanently remove alloy-steel chain slings from service if they are heated above 1,000 degrees Fahrenheit (F). When the slings are exposed to service temperatures in excess of 600 degrees F, reduce the maximum working load limits permitted in accordance with the chain or sling manufacturer's recommendations.

Do not use worn or damaged alloy-steel chain slings or attachments. When welding or heat testing is performed, do not use slings unless repaired, reconditioned and proof tested by the sling manufacturer or an equivalent entity.

Do not use mechanical-coupling links or low carbon steel repair links to repair broken lengths of chain.

If the chain size at any point of any link is less than that stated in appropriate tables, remove the sling from service.

Remove from service alloy-steel chain slings with cracked or deformed master links, coupling links or other components.

Immediately remove wire rope slings from service if any of these conditions are present:

- Five broken wires in one strand in one rope lay or 10 randomly distributed broken wires in one rope lay;
- Wear or scraping of one-third the original diameter of outside individual wires;
- Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure;
- Evidence of heat damage;
- Cracked, deformed or worn end attachments;
- Hooks that have been opened more than 15 percent of the normal throat opening, measured at the narrowest point or twisted more than 10 degrees from the plane of the unbent hook;
- Corrosion of the rope or end attachments.

Metal mesh slings

Permanently affix to each metal mesh sling a durable marking or tag stating the rated capacity for both the vertical basket hitch and choker hitch loads.

Make sure handles have a rated capacity at least equal to the metal fabric and exhibit no deformation after proof testing.

Join the fabric and handles so that:

- The rated capacity of the sling is not reduced;
- The load is evenly distributed across the width of the fabric;
- Sharp edges will not damage the fabric.

Do not apply coatings that diminish the sling's rated capacity.

Do not use new and repaired metal mesh slings, including handles, unless proof tested by the manufacturer or equivalent entity at a minimum of one and one-half times the rated capacity. Proof test elastomer-impregnated slings before coating.

Do not use metal-mesh slings to lift loads in excess of the rated capacities as prescribed. Use slings not included in tables only in accordance with the manufacturer's recommendations.

You may use metal-mesh slings not impregnated with elastomers in a temperature range from minus 20 degrees F to plus 550 degrees F without decreasing the working load limit. You may use metal-mesh slings impregnated with polyvinyl chloride or neoprene in a temperature range from zero degrees F to plus 200 degrees F. For operations outside these temperature ranges or for metal-mesh slings impregnated with other materials, follow the sling manufacturer's recommendations.

Do not use repaired metal-mesh slings unless a metal mesh sling manufacturer or an equivalent entity repairs them. Once repaired, permanently mark or tag each sling, or maintain a written record to indicate the date and nature of the repairs and the person or organization that

performed the repairs. Make records of repairs available for examination.

Immediately remove metal-mesh slings from service if any of these conditions are present:

- A weld or brazed joint is broken along the sling edge;
- A reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion;
- A lack of flexibility due to distortion of fabric;
- A distortion of the female handle so that the depth of the slot is increased more than 10 percent;
- A distortion of either handle so that the width of the eye is decreased more than 10 percent;
- A 15-percent reduction of the original cross sectional area of metal at any point around the handle eye;
- A distortion of either handle out of its plane.

Natural and synthetic fiber rope slings

Do not use fiber-rope slings made from conventional three-strand construction fiber rope with loads in excess of the rated capacities prescribed. Fiber-rope slings require a diameter of curvature meeting at least the minimums specified. Use slings not included in tables only in accordance with the manufacturer's recommendations.

You may use natural and synthetic fiber-rope slings, except for wet frozen slings, in a temperature range from minus 20 degrees F to 180 degrees F without decreasing the working load limit. For operations outside this temperature range, and for wet frozen slings, follow the sling manufacturer's recommendations.

Do not use spliced fiber-rope slings unless they are spliced in accordance with the following minimum requirements and in accordance with any additional recommendations of the manufacturer:

- In manila rope, eye splices consist of at least three full tucks, and short splices consist of at least six full tucks, three on each side of the splice center line;
- In synthetic fiber rope, eye splices consist of at least four full tucks, and short splices consist of at least eight full tucks, four on each side of the center line.

Do not trim strand-end tails flush with the rope surface immediately adjacent to the full tucks. This applies to all types of fiber rope and both eye and short splices. For fiber rope less than 1 inch in diameter, make sure the tail projects at least six rope diameters beyond the last full tuck. For fiber rope 1 inch in diameter and larger, make sure the tail projects at least 6 inches beyond the last full tuck.

If a projecting tail interferes with the use of the sling, taper the tail and splice it into the rope body using at least two additional tucks. This will require a tail length of approximately six rope diameters beyond the last full tuck.

Fiber-rope slings need a minimum clear length of rope between eye splices equal to 10 times the rope diameter.

Do not use knots in place of splices. For splicing, use clamps designed specifically for fiber ropes. For all eye splices, make sure the eye provides an included angle of not greater than 60 degrees at the splice when the eye is placed over the load or support.

Do not use fiber rope slings if end attachments in contact with the rope have sharp edges or projections.

Immediately remove natural and synthetic fiber rope slings from service if any of these conditions are present:

- Abnormal wear;
- Powdered fiber between strands;
- Broken or cut fibers;
- Variations in the size or roundness of strands;

- Discoloration or rotting;
- Distortion of hardware in the sling.

Use only fiber-rope slings made from new rope. Do not use repaired or reconditioned fiber rope slings.

Synthetic web slings

Mark or code each sling to show the rated capacities for each type of hitch and type of synthetic web material.

Make sure synthetic webbing is of uniform thickness and width, and selvage edges are not split from the webbing's width.

Make sure fittings have a minimum breaking strength equal to that of the sling and are free of all sharp edges that could in any way damage the webbing.

The only method to attach end fittings to webbing and to form eyes is stitching. Make sure the thread is in an even pattern and contains a sufficient number of stitches to develop the full breaking strength of the sling.

Do not use synthetic-web slings with loads in excess of the rated capacities specified. If slings are not listed in rating charts or tables, use them only in accordance with the manufacturer's recommendations.

When using synthetic web slings, do not use:

- Nylon web slings where fumes, vapors, sprays, mists or liquids of acids or phenolics are present;
- Polyester and polypropylene web slings where fumes, vapors, sprays, mists or liquids of caustics are present;
- Web slings with aluminum fittings where fumes, vapors, sprays, mists or liquids of caustics are present.

Do not use synthetic web slings of polyester and nylon at temperatures in excess of 180 degrees F or polypropylene web slings at temperatures in excess of 200 degrees F.

Do not use repaired synthetic web slings unless repaired by a sling manufacturer or an equivalent entity. The manufacturer or equivalent entity should proof test each repaired sling to twice the rated capacity prior to its return to service. Retain a certificate of the proof test and make it available for examination. Do not use slings, including webbing and fittings that have been repaired temporarily.

Immediately remove synthetic web slings from service if any of these conditions are present:

- Acid or caustic burns;
- Melting or charring of any part of the sling surface;
- Snags, punctures, tears or cuts;
- Broken or worn stitches;
- Distortion of fittings.

References
29 CFR 1910.184
OAC 4123:1-5-15
ANSI B30.9 Slings

Q. Portable ladders

Ladders come in different styles, including step, straight and extension, and they also vary in construction. They may consist of wood, aluminum or fiberglass. Choose the correct type and size ladder for the job. Type I or IA ladders are required in the work environment.

All ladders sold within the U.S. are rated as:

- Type I or IA: Heavy-duty industrial ladder rated to hold up to 250 or 300 pounds, respectively;
- Type II: Medium-duty commercial ladder rated to hold up to 225 pounds;
- Type III: Light-duty household ladder rated to hold up to 200 pounds.

Safety guidelines

- Always inspect a ladder before you climb it. Make sure the steps are sturdy and the locking mechanisms are functional.

- Carry ladders horizontally with the front end slightly higher than the back end.
- To open a stepladder, make sure the spreader is locked and the pail shelf is in position. To open an extension ladder, brace the bottom end and push the rungs out.
- Place ladders on a solid, level surface to ensure safety.
- Watch for overhead obstructions and power lines.
- To prevent ladders from sinking into soft ground, use a large board under the feet of the ladder.
- Position a straight or extension ladder so the ladder's base is 1 foot away from the vertical support for every 4 feet of working-ladder height. For example, if you are working with 8 feet of ladder, place the base of the ladder 2 feet from the wall.
- Do not place the top of a ladder against a window or an uneven surface.
- Tie the top of a straight or extension ladder to supports when possible. Stake and tie the feet of the ladder.
- An extension ladder used for access to a roof must extend at least 3 feet beyond the support point.
- Use a wooden or fiberglass ladder if you must work near electrical sources.
- Do not place a ladder in front of a door unless you lock and barricade the door. Post a warning sign on the opposite door's side.
- Use good judgment when climbing or working on ladders.
- Wear shoes with slip-resistant soles and make sure they are dry before climbing.
- Never allow more than one person on a ladder.
- Face the ladder and firmly grip the rails, not the rungs, with both hands when climbing or descending.
- Keep your body between the rails at all times. Do not shift your weight to one side.
- Have somebody steady the ladder if it cannot be secured otherwise.
- Do not stand on the top four rungs of an extension ladder or the top two rungs of a stepladder.
- Keep two feet and one hand on the ladder at all times when working on a ladder.
- Do not stand on the ladder's bucket shelf.
- Carry small tools on a tool belt when working on a ladder. Use a rope to raise and lower heavy tools.
- Never leave a raised or open ladder unattended.
- Store ladders away from heat and moisture. Destroy damaged or unsafe ladders.

References
29 CFR 1910.25 through .27
OAC 4123:1-5-03
ANSI A14.1 Ladders – Wood
ANSI A14.2 Portable Metal Ladders
ANSI A14.3 Fixed Ladders
ANSI A14.5 Portable Reinforced Plastic Ladders

R. Recommended and required written and training programs

Training is an important part of any good safety program. It is also an area that most employers have trouble maintaining. This chapter includes some key points that you want to consider in training your employees, as well as a sample form that you can use to document training. One of the largest areas that employers fail at when it comes to keeping up with training is they do not maintain records. No matter what type of training you conduct in your facility, it is a good idea to properly document it. The list below gives you key points that you want to consider when training.

- Develop training outlines covering what to communicate to employees.
- Have sign-in sheets for all training. If you can't provide sign-in sheets, you haven't done training.
- Compile files of sign-in sheets and outlines for each training class conducted.
- Develop a training schedule to ensure all required training is done during the time period required.

- Review training schedules annually for any changes you might need to make.
- Document training of new employees.
- Make a check list of training and other topics for new employees to ensure you cover everything.

Below is a list of programs and safety issues an employer may have to address in a sheet metal or a metal stamping facility. These programs should be site-specific. Many of these have been covered in prior chapters and some are highlighted below. In an effort to assist employers with developing these programs, BWC provides on-site program evaluation. Also, BWC's Ohio Center for Occupational Safety and Health in Pickerington offers many of these classes.

Training log

Training topic: _____

Key points covered: _____

Outline or other handout material attached: **Yes** **or** **No**

Instructor: _____ **Date:** _____

Name printed or typed	Signature	Date

- Lockout/tagout program (see section E)
- Electrical safe work practices (see section F)
- Hot work permits (see section I)
- Hazard communications program (see section K)
- PPE (see section L)
- Respiratory-protection program (see section L)
- Hearing-conservation program (see section L)
- Emergency action plans (see section M)
- Fire-prevention plans (see section M)
- Powered industrial trucks/forklifts (see section N)
- Cranes/hoist inspection program (see section O)
- Sling-inspection program (see section P)
- Housekeeping
- First-aid training
- Confined space entry program
- OSHA recordkeeping
- Accident analysis
- Safety committees/work teams
- Bloodborne pathogens
- Transitional work program
- Spill-response plans

Training log

See the table on the previous page for an example of what a training log should contain.

Housekeeping

Keep all places of employment, passageways, storerooms and service rooms clean and orderly and in a sanitary condition. Maintain every workroom floor in a clean and, so far as possible, a dry condition. When using wet processes, maintain drainage and provide false floors, platforms, mats or other dry, standing places where practicable. To facilitate cleaning, keep every floor, working place and passageway free from protruding nails, splinters, holes or loose boards. When using mechanical handling equipment, allow sufficient safe clearances (a minimum of 3 feet) for aisles, at loading docks, through doorways and wherever turns or passage must be made. Keep aisles and passageways clear and in good repair, with no obstruction across or in aisles that could create a hazard. Appropriately mark permanent aisles and passageways. Provide covers and/or guardrails to protect personnel from the hazards of open pits, tanks, vats, ditches, etc.

References
29 CFR 1910.22, .23 & .176

First-aid equipment

Make first-aid equipment available at all times. Report injuries as soon as possible for medical attention. Provide first aid until medical attention can be provided. A first-aid responder should be on-site unless the company is within close proximity to emergency medical facilities.

References
29 CFR 1910.151

Confined space entry

The following list covers items that you should consider as part of your written confined space program and training of your staff.

- Post a sign, such as Danger — permit-required confined space. Do not enter, by the confined space; or inform all employees by an equally effective means, such as written communication of the existence and location of the dangers posed by the permit-required confined space.
- Post the completed permit at the entry portal or inform all authorized entrants by an equally effective manner such as holding a meeting with all authorized entrants before entry and review the completed permit with them.
- Ensure the entry permits contain the 15 required elements:
  - Permit space to be entered;
  - Purpose of the entry;
  - Date and authorized duration of the permit;
  - Names of all authorized entrants in the space;
  - Names of the attendants;
  - Name of entry supervisor and signature or initials of person who originally authorized the entry;

- Hazards of the permit space;
- Specific measures used to isolate the permit space and to control or eliminate the hazards before entry;
- Acceptable entry conditions;
- Results of initial and periodic tests with times and name or initials of tester;
- Available rescue and emergency services and how to notify these services;
- Communication procedures used between entrants and attendants;
- Required confined space equipment;
- Additional needed information based on the permit space;
- Any additional permits needed (that is, hot work).

• Properly train all employees entering or acting as standbys on confined spaces.

References
29 CFR 1910.146
OAC 4123:1-5-22

OSHA recordkeeping

Employers must maintain OSHA logs for each calendar year for five years, plus the current year. Post the summary each year on Feb. 1 where employees would normally see postings. You must log all work-related injuries/illnesses on the log that are considered OSHA recordable within seven calendar days of receiving notice. For recordkeeping assistance, refer to the OSHA recordkeeping Web page at www.osha.gov.

References
29 CFR 1904

Accident reporting

A supplementary record — OSHA's Accident Report form, BWC's *First Report of an Injury, Occupational Disease or Death* or other acceptable reports such as Accident Investigation Reports — is required and must be available for inspection within seven calendar days of a recordable illness or injury. You can obtain OSHA forms from your local OSHA office or download them from OSHA's Web site, www.osha.gov.

References
29 CFR 1904

Safety committees or work teams

A safety committee provides an important means of employee participation in the safety program. Employees can share their knowledge and experience to correct potential workplace hazards, find ways to eliminate or reduce those hazards and monitor shop safety rules which, if not followed, may contribute to an accident. It encourages a closer relationship and understanding between employees and management relating to on-thejob safety by providing the opportunity for members to bring their ideas to management. A successful safety committee must encourage each employee to willingly accept responsibility for his or her own safety.

Bloodborne pathogens

You should write a bloodborne pathogens program identifying those persons that are at risk of exposure, as well as what means they should use to protect themselves. All employees that are at risk should receive annual training on how to identify bloodborne pathogens and the risk associated with them. Also, offer those at risk the hepatitis B vaccine at no cost.

References
29 CFR 1910.1030

Transitional work program

A transitional work program uses real job duties that accommodate an injured worker's medical restrictions for a specific time period to gradually return the worker to his or her original job. Injured workers may recover more quickly and participate in work activities as soon as they are medically able. They also may experience a smoother transition back to regular duty and have improved self-esteem in spite of their medical conditions.

Spill response plans

Put a written plan in place to assist you and your employees with handling chemical spills. This plan should cover required equipment, PPE and all procedures that you should follow to clean

up any spilled material that could be hazardous to your employees.

References
29 CFR 1910.120

S. Industrial hygiene issues

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

Today, due to the Occupational Safety and Health Act of 1970, nearly every employer is required to implement the elements of an industrial hygiene and safety, occupational health or hazard communication program.

Work-site analysis

A work-site analysis is an essential first step that helps an industrial hygienist determine what jobs and workstations are the sources of potential problems. The industrial hygienist can anticipate potential problems based on the industry type. During the work-site analysis, the industrial hygienist measures and identifies exposures, problem tasks and risks. The industrial hygienist inspects, researches, or analyzes how the particular chemicals or physical hazards at that work site affect worker health. If a situation hazardous to health is discovered, the industrial hygienist recommends the appropriate corrective actions.

Control of hazards

Industrial hygienists recognize that engineering, work practice and administrative controls are the primary means of reducing employee exposure to occupational hazards. Engineering controls minimize employee exposure by either reducing or removing the hazard at the source or isolating the worker from the hazards. Engineering controls include eliminating toxic chemicals and replacing harmful toxic materials with less hazardous ones, enclosing work processes or confining work operations, and installing general and local ventilation systems.

Work practice controls alter the manner in which a task is performed. Fundamental and easily implemented work practice controls include:

- Following proper procedures that minimize exposures while operating production and control equipment;
- Inspecting and maintaining process and control equipment on a regular basis;
- Implementing good housekeeping procedures;
- Providing good supervision;
- Mandating that eating, drinking, smoking, chewing tobacco or gum, and applying cosmetics in regulated areas are prohibited.

Administrative controls include controlling employees' exposure by scheduling production and workers' tasks, or both, in ways that minimize exposure levels. For example, the employer might schedule operations with the highest exposure potential during periods when the fewest employees are present.

When effective work practices and/or engineering controls are not feasible to achieve the permissible exposure limit, or while you are instituting such controls, and in emergencies, you must use appropriate respiratory equipment. In addition, the job may require PPE such as gloves, safety goggles, helmets, safety shoes and protective clothing. To be effective, PPE must be individually selected, properly fitted and periodically refitted, conscientiously and properly worn, regularly maintained and replaced as necessary.

Examples of job hazards

To be effective in recognizing and evaluating on-the-job hazards and recommending controls, industrial hygienists must be familiar with the hazards' characteristics. Major job risks can

include air contaminants, and chemical and physical hazards.

Air contaminants

These are commonly classified as either particulate or gas and vapor contaminants. The most common particulate contaminants include dusts, fumes, mists, aerosols and fibers. Dusts are solid particles that form or generate from solid organic or inorganic materials by reducing their size through mechanical processes such as crushing, grinding, drilling, abrading or blasting.

Fumes form when material from a volatilized solid condenses in cool air. In most cases, the solid particles resulting from the condensation reaction with air to form an oxide.

Mist is a finely divided liquid suspended in the atmosphere. Liquids condensing from a vapor back to a liquid or by breaking up a liquid into a dispersed state, such as by splashing, foaming or atomizing generate mists. Aerosols are also a form of a mist characterized by highly respirable, minute liquid particles.

Fibers are solid particles whose length is several times greater than their diameter.

Gases are formless fluids that expand to occupy the space or enclosure in which they are confined. Examples are welding gases such as acetylene, nitrogen, helium and argon, and carbon monoxide generated from the operation of internal combustion engines or by its use as a reducing gas in a heat treating operation. Another example is hydrogen sulfide, which form wherever there is decomposition of materials containing sulfur under reducing conditions.

Liquids change into vapors and mix with the surrounding atmosphere through evaporation. Vapors are the gaseous form of substances, which are normally in the solid or liquid state at room temperature and pressure. They form by evaporation from a liquid or solid. You can find them where parts cleaning and painting takes place, and where solvents are used.

Chemical hazards

Harmful chemical compounds in the form of solids, liquids, gases, mists, dusts, fumes and vapors exert toxic effects by inhalation (breathing), absorption (through direct contact with the skin) or ingestion (eating or drinking). Airborne chemical hazards exist as concentrations of mists, vapors, gases, fumes or solids. Some are toxic through inhalation and some of them irritate the skin on contact. Also, some can be toxic by absorption through the skin or through ingestion, and some are corrosive to living tissue.

The degree of worker risk from exposure to any given substance depends on the nature and potency of the toxic effects and the magnitude and duration of exposure.

Information on the risk to workers from chemical hazards can be obtained from the MSDS that OSHA's Hazard Communication Standard requires be supplied by the manufacturer or importer to the purchaser of all hazardous materials. The MSDS is a summary of the important health, safety and toxicological information on the chemical or the mixture's ingredients. Other provisions of the Hazard Communication Standard require that all containers of hazardous substances in the workplace have appropriate warning and identification labels.

Physical hazards

These include excessive levels of ionizing and nonionizing electromagnetic radiation, noise, vibration, illumination and temperature.

In occupations where there is exposure to ionizing radiation, time, distance and shielding are important tools in ensuring worker safety. Danger from radiation increases with the amount of time one is exposed to it. Hence, the shorter the time of exposure the smaller the radiation danger.

Distance also is a valuable tool in controlling exposure to both ionizing and non-ionizing radiation. Radiation levels from some sources can

be estimated by comparing the squares of the distances between the worker and the source. For example, at a reference point of 10 feet from a source, the radiation is 1/100 of the intensity as it is to 1 foot from the source.

Shielding also is a way to protect against radiation. The greater the protective mass between a radioactive source and the worker, the lower the radiation exposure. Non-ionizing radiation also is dealt with by shielding workers from the source.

Sometimes limiting exposure times to non-ionizing radiation or increasing the distance is not effective. Laser radiation, for example, cannot be controlled effectively by imposing time limits. An exposure can be hazardous that is faster than the blinking of an eye. Increasing the distance from a laser source may require miles before the energy level reaches a point where the exposure would not be harmful.

You can control noise, another significant physical hazard, by various measures. Reduce noise by:

- Installing equipment and systems that have been engineered, designed and built to operate quietly;
- Enclosing or shielding noisy equipment;
- Making certain that equipment is in good repair and properly maintained with all worn or unbalanced parts replaced;
- Mounting noisy equipment on special mounts to reduce vibration;
- Installing silencers, mufflers or baffles.

Substituting quiet work methods for noisy ones is another significant way to reduce noise. For example, welding parts rather than riveting them results in a quieter work area. Also, treating floors, ceilings and walls with acoustical material can reduce reflected or reverberant noise. In addition, erecting sound barriers at adjacent workstations around noisy operations will reduce worker exposure to noise generated at adjacent workstations.

It is also possible to reduce noise exposure by increasing the distance between the source and the receiver, by isolating workers in acoustical booths, limiting workers' exposure time to noise and by providing hearing protection. OSHA requires that you periodically test workers in noisy surroundings as a precaution against hearing loss.

T. Ergonomics issues

Ergonomics is the science of designing the work environment to fit within workers' capabilities. Good ergonomic design can positively impact safety and quality. Furthermore, poor workplace design can increase the risk of cumulative trauma disorders (CTDs) such as tendinitis, carpal tunnel syndrome and back injuries.

CTD risk factors are workplace conditions that increase the likelihood of developing CTDs. Workplace CTD risk factors include:

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

By reducing worker exposure to these risk factors, you also reduce the risk of CTDs. You can reduce exposure through engineering and administrative controls. In sheet metal stamping facilities, ergonomic design principles are particularly important when applied to hand tools, materials handling systems and workstation layout.

Hand tool design guidelines

Force requirements

- Use counterbalance mechanisms for heavy tools (weight > 2 pounds)
- Spring-loaded to eliminate manual exertion necessary to open handles

Shape, size and orientation

- Avoid ridges or flues

- Length of handle — minimum of 4 inches
- Handle diameter — minimum of 1.6 inches
- Handle span — maximum of 3 inches
- When using bent handles, consider direction of motion and force exertion and take into account the work station layout.

Handle material
- Must provide padding
- Should be non-porous
- Must provide good coefficient of friction
- Should be non-conductive

Power tools
- Should use whenever feasible
- Trigger design
- Thumb-activated is preferred over use of other fingers
- If finger-activated, use two or more fingers
- Vibration must be isolated or dampened
- Must provide protection from exhaust and from heat generated by motor or tool bit

Grasping force
- Minimize grip forces
- Power grips are preferred over pinch grips
- Use properly sized tool grips
- Use two-handed grips to distribute force exertions

Posture
- Wrists should be in line with hand and forearm

Materials handling

Material flow
- Eliminate unnecessary materials handling by combining operations or shortening the distances that you must move materials.
- Look for crossing paths, loops, backtracking, and unorganized flow as materials move from start to finish. Short, direct distances allow workstations to be linked by conveyors and reduce the carrying distances.
- Never work and/or store materials in aisles. Safe passage is necessary in the event of an emergency.

Job design
- Use mechanized assists, such as conveyors, hoists, cranes and carts whenever possible to minimize stresses on the body.
- Minimize reaching requirements. Long reaches lower a worker's lifting capabilities. Design the operation for the smallest person's reach.
- Avoid needless material stacking, storing, or placement of work-in-process materials.
- Simplify tasks by combining operations and steps.

The load
- Plan for incoming materials to arrive in suitable containers, so parts do not require unloading or re-stacking.
- Ensure that loads are easy to grip by providing handles, cutouts or straps.
- Stabilize contents in containers by using vertical baffles or dividers to balance the weight and avoid shifting.

Workstation layout and design

Reduce repetitive motions
- Reduce physical exertions by letting the tool perform the work.
- Design for motion efficiency by keeping movement within an acceptable range of motion.
- Place more frequently used tools and controls closer to the center of the body.
- Layout tools and materials so they can be used by either hand.
- Use administrative controls, such as job rotation or job enlargement to rest muscle groups.

Reduce awkward postures and static loading
- Provide adjustable-height work surfaces so that work can be performed without bending the trunk.
- Place buttons and controls so that they can be easily reached.
- Allow workers to alternate postures by allowing them to switch between sitting and standing.

Resources

Resources and references applicable for metal stamping and sheet metal employers.

Resources available at the BWC library

Books

National Institute for Occupational Safety and Health (NIOSH). Health and safety guide for metal stamping operations. June 1975.

NIOSH. Occupational exposure to metalworking fluids (criteria for a recommended standard). 1988.

National Safety Council. Power press safety manual. 5th ed., 2002.

Articles

Russell, John W. "Developing a comprehensive approach to press safety." Metalforming, December 1993, 28-34.

Welch, Laura S. "Work-related musculoskeletal symptoms among sheet metal workers." American Journal of Industrial Medicine 27: 783-791 (1995).

Organizations

American Iron and Steel Institute
1140 Connecticut Ave. NW
Washington, DC 20036
Phone 202-452-7100
www.steel.org

Its mission is to promote steel as the material of choice and to enhance the competitiveness of the North American steel industry and its member companies.

American Welding Society (AWS)
550 NW LeJeune Road
Miami, FL 33126
Phone 800-443-9353
Phone 305-443-9353
www/aws/prg

Founded in 1919 as a multifaceted, nonprofit organization with a goal to advance the science, technology and application of welding and related joining disciplines. There are several AWS secctions in Ohio.

Metals Service Center Institute
4201 Euclid Ave.
Rolling Meadows, IL 60008
Phone 847-485-3000
www.ssci.org

An international trade association representing more than 400 member companies with more than 1,100 locations in North America. Service centers add value and help manufacturers remain internationally competitive by inventorying metals and processing them to specific sizes, shapes and strengths.

There are three chapters, which cover Ohio: Northern Ohio, Detroit, Mich., and Cincinnati.

National Federation of Independent Business (NFIB)
10 W. Broad St., Suite 2450
Columbus, OH 43215
Phone 614-221-4107
www.nfib.com

The largest advocacy organization representing small and independent businesses in Washington, D.C., and all 50 state capitals. The Ohio chapter of NFIB has more than 36,000 members, making it the largest business association in the state.

National Tooling and Machining Association
9300 Livingston Road
Washington, MD 20744
Phone 800-248-6826
www.ntma.org

This association represents more than 2,700 U.S. companies in the $30 billion precision custom manufacturing industry. Members are predominantly family-owned businesses of less than 50 employees that design and build tools, dies, molds and special machines used by the entire manufacturing sector to mass produce automotive, aerospace, agricultural, medical, industrial equipment, and consumer appliances and electronics.

Ohio Chapters
Akron Chapter
Cleveland Chapter
Toledo Chapter

Tri-State Tooling & Machine Association
www.tristatetma.org

This association serves the precision custom machining industry in southwestern Ohio.

Ohio Manufacturers Association (OMA)
33 N. High St.
Columbus, OH 43215
Phone 800-662-4463
Phone 614-224-5111
www.ohiomfg.com

The OMA is the only statewide association exclusively serving manufacturers. More than 2,600 manufacturers in Ohio are OMA members.

Precision Metalforming Association (PMA)
6363 Oak Tree Blvd.
Independence, OH 44131-2500
Phone 216-901-8800
www.metalforming.com

The PMA is the full-service trade association representing the $41 billion metalforming industry of North America — the industry that creates precision metal products using stamping, fabricating and other value-added processes. Its nearly 1,600 member companies include metal stampers, fabricators, spinners, slide formers and roll formers, as well as suppliers of equipment, materials and services to the industry.

There are three local groups, called districts, in Ohio — Cleveland, Northwest Ohio and Ohio Valley. Officers, calendar of activities and member manufacturers are listed for each district.

Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
4201 Lafayette Center Drive
Chantilly, VA 20151-1209
Phone 703-803-2980
www.smacna.org

An international association of union contractors, SMACNA members perform work in industrial, commercial, institutional and residential markets. They specialize in heating, ventilating and air conditioning; architectural sheet metal, industrial sheet metal, kitchen equipment, specialty stainless steel work, manufacturing, siding and decking, testing and balancing, service, and energy management and maintenance.

Training

International Training Institute for the Sheet Metal & Air Conditioning Industry (ITI)
601 N. Fairfax St., Suite 240
Alexandria, VA 22314
Phone 703-739-7200
www.sheetmetal-iti.org

In collaboration with the Sheet Metal Workers' International Association (SMWIA) and the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), ITI provides a

number of opportunities to labor union members in the sheet metal and air conditioning industries. These include comprehensive training programs for journeyman and apprentices, anticipation and implementation of changing technology; assistance and enhancement to local training programs.

National Institute for Metalworking Skills (NIMS)
10565 Fairfax Blvd., Suite 203
Fairfax, VA 22030
Phone 703-352-4971
www.nims-skills.org

A nonprofit organization formed in 1995 to support the development of a skilled work force for the metalworking industry. Through the NIMS credentialing program, individuals — both workers and students — can certify their skills against industry standards. These standards are benchmarks of excellence for metalworkers and their employers.

Precision Metalforming Association Educational Foundation
6363 Oak Tree Blvd.
Independence, Ohio 44131-2500
Phone 216-901-8800
www.pma.org/edufound

Established in 1996 to help develop a trained, motivated work force by initiating and supporting training, education and image building. Also, facilitates partnerships to meet the industry's training and education needs.

Labor unions

The International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)
This is one of the largest and most diverse unions in North America, with members in virtually every sector of the economy.

UAW Region 2B (Oho)
Headquarters:
1691 Woodlands Drive
Maumee, OH 43537
Phone 419-893-4677
www.uaw.org

Metal Trades Dept. of the AFL-CIO
815 16th St. NW
Washington, DC., 20006
Phone 202-508-3705
www.metaltrades.org

The Metal Trades Department (MTD) is a division of the AFL-CIO. It was chartered in 1908 to coordinate negotiating, organizing and legislative efforts of affiliated metalworking and related crafts and trade unions. Twenty national and international unions with a membership of more than 5 million are affiliated with the MTD today. More than 100,000 workers in private industry and federal establishments work under contracts negotiated by MTD Councils. Workers retain membership in their own trade unions.

Sheet Metal Workers' International Association (SMWIA)
1750 New York Ave. NW
Washington, DC., 20006
Phone 202-783-5880
www.smwia.org

SMWIA represents 150,000 skilled crafts persons in the unionized sheet metal industry throughout the United States and Canada.

Directory of SMWIA Locals in Ohio:
Avon Lake — Local 368
Dayton — Local 24
Cleveland — Local 33
Cincinnati — Local 183
Columbus — 287

Notes