

INJURY & ILLNESS PREVENTION PROGRAM

for

Pyro Combustion & Controls Inc.

2969 South Highland Drive

Las Vegas, Nevada 89109

The designated safety coordinator for Pyro Combustion & Controls Inc. is:

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PROVIDED BY:

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How to Use This Manual

This manual does not ensure a safe workplace. The only way to create an accident-free and healthy work environment is through the employees of *Pyro Combustion & Controls Inc.*. A vibrant culture of safety relies on consistent concern for safer, healthier work habits and continual improvement of *Pyro Combustion & Controls Inc.*'s injury and illness prevention program through cooperation and commitment throughout the organization.

Aside from being required by law, a sensible commitment to safety and health can reduce the cost of business by cutting workers' compensation claims and reducing time workers spend away from work; it also impacts productivity by drawing attention to the continual improvement of management systems and work processes. Further, and perhaps most importantly, a commitment to safety and health reflects care for employees.

The chapters in this manual detail some of the regulatory requirements *Pyro Combustion & Controls Inc.* may be obliged to fulfill during daily operations. However, awareness of the hazards in the workplace and how to control them demand insight only personnel in your organization have. This manual reflects industry best practices and is in compliance with federal and state regulations.

OSHA published the following list as a summary of the most important responsibilities for employers under the Occupational Safety and Health Act of 1970:

- Provide a workplace free from serious recognized hazards and comply with standards, rules and regulations issued under the OSHA Act.
- Examine workplace conditions to make sure they conform to applicable OSHA standards.
- Make sure employees have and use safe tools and equipment and properly maintain this equipment.
- Use color codes, posters, labels or signs to warn employees of potential hazards.
- Establish or update operating procedures and communicate them so that employees follow safety and health requirements.
- Provide medical examinations and training when required by OSHA standards.
- Post, at a prominent location within the workplace, the OSHA poster (or the state-plan equivalent) informing employees of their rights and responsibilities.
- Report to the nearest OSHA office within 8 hours any fatal accident or one that results in the hospitalization of three or more employees.
- Keep records of work-related injuries and illnesses.
(Note: Employers with 10 or fewer employees and employers in certain low-hazard industries are exempt from this requirement.)
- Provide employees, former employees and their representatives access to the Log of Work-Related Injuries and Illnesses (OSHA Form 300).
- Provide access to employee medical records and exposure records to employees or their authorized representatives.
- Provide to the OSHA compliance officer the names of authorized employee representatives who may be asked to accompany the compliance officer during an inspection.
- Not discriminate against employees who exercise their rights under the Act.
- Post OSHA citations at or near the work area involved. Each citation must remain posted until the violation has been corrected, or for three working days, whichever is longer. Post abatement verification documents or tags.
- Correct cited violations by the deadline set in the OSHA citation and submit required abatement verification documentation.

In addition to OSHA standards, there may be state, local or other safety requirements that may not be covered in this manual, but for which *Pyro Combustion & Controls Inc.* nevertheless remains accountable.

Practicing safety requires planning and action within a systematic framework that encourages participation and prioritizes worker education and training. Each chapter in this manual outlines the responsibilities of management, the safety committee and all employees for a given safety topic and specifies elements of training that need to be covered. While they may require considerable effort to complete and incorporate into a comprehensive safety program for *Pyro Combustion & Controls Inc.*, the forms included with each chapter provide a starting place for documentation needed for various aspects of the health and safety program.

If *Pyro Combustion & Controls Inc.* is happy with the safety system in place, this manual can provide support and serve as a reference for those responsible for safety. If not, this manual can help establish such a system by providing information about safety management frameworks proven successful in preventing occupational injuries and illnesses. This manual also provides safety tips for a variety of topics that may be of value for employees at *Pyro Combustion & Controls Inc.*.

The policies and forms offered in this manual can help you create and maintain a safety and health system that works in conjunction with other management systems already in place to ensure a safe and healthy workplace. Ultimately, it is upon management and safety leaders to know and understand the standards, regulations and best practices that apply to the business. Equally, it is upon employees to follow policy and supervision and use their best judgment to stay safe and healthy.

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1 Safety & Health Program Summary

1.1 Safety & Health Policy Statement

The safety and health of employees is the first consideration in operating this business. Without question, it is every employee's responsibility at all levels.

It is the practice of this company to comply with all laws and prevent workplace injuries and illnesses. To do this, we must be aware of conditions that can result in injury or illness in every work area. No employee is required to work at a job they know is unsafe or unhealthy. Companywide cooperation in detecting hazards and, in turn, controlling them, is a condition of employment. Employees will inform their supervisor immediately of any hazardous situation beyond their ability or authority to correct.

Prevention of occupationally-induced injuries and illnesses is given precedence over operating productivity when necessary. To the greatest degree possible, management will provide safeguards for personal safety and health, in keeping with the highest standards.

We strive to maintain an occupational injury and illness prevention program conforming to best industry practices of organizations of this type. To be successful, such a program must embody proper attitudes toward injury and illness prevention on the part of both supervisors and employees. It also requires cooperation in all safety and health matters, not only between supervisor and employee, but also among coworkers.

Our objective is an injury and illness prevention program that reduces the number of injuries and illnesses to an absolute minimum, not merely in keeping with, but surpassing the best experience of operations similar to ours. Our goal is zero accidents and injuries.

1.2 Safety & Health Program Components

Our injury and illness prevention program includes the following:

- Communicating with employees about safety issues and workplace hazards through a range of avenues including a safety training program, a safety committee, and meetings to exchange ideas about workplace safety and health among employees;
- Providing and maintaining mechanical, physical and administrative safeguards to control risks presented by workplace hazards to the maximum possible extent;
- Conducting a program of safety and health inspections to find and eliminate unsafe working conditions or practices, to control health hazards, and to comply with safety and health regulations and standards;
- Providing necessary personal protective equipment and instructions for proper use and care;
- Developing and enforcing safety and health rules and requiring employees to cooperate with these rules as a condition of employment;

Safety & Health Program Summary

- Investigating promptly and thoroughly every accident, safety incident, and near miss to determine root causes and make appropriate changes to remedy those causes;
- Creating a culture of safety that encourages employees to identify workplace hazards, recommend changes to reduce the risks they pose, and otherwise work proactively for a safer workplace; and
- Periodic review of all elements of the injury and illness prevention program to ensure continued efficacy.

We recognize the responsibilities for occupational safety and health are shared:

Pyro Combustion & Controls Inc. will see that all employees are properly instructed and supervised in safe operation of machinery, tools, equipment, processes, and practices while at work.

This employer accepts responsibility for the leadership, effectiveness and improvement of the injury and illness prevention program and for providing the safeguards required to ensure safe work conditions.

Supervisors are responsible for encouraging proper attitudes toward safety and health and for ensuring operations are performed with the utmost regard for the safety and health of all personnel.

Employees are responsible for wholehearted, genuine implementation of all aspects of the injury and illness prevention program — including compliance with all rules and regulations — and for continuously following best safety and health practices while performing their duties.

1.3 Program Goals

The goal of *Pyro Combustion & Controls Inc.* is to continue operating a profitable business while protecting employees from injuries or illness. This can be achieved by delegating responsibility and accountability to all involved in this company's operation.

Responsibility: Having to answer for activities and results.

Accountability: The actions taken by management to ensure the performance of responsibilities.

To reach our goal of a safe workplace, everyone needs to take responsibility and be held accountable.

Owner Name

Signature

Date

2

General Safety Rules

Gary Pfizenmayer is responsible for the implementation and enforcement of safety rules.

2.1 Following Safety Rules

Pyro Combustion & Controls Inc. employees will follow these rules and all elements of the Safety and Health Program, render every possible aid to safe operations, and report unsafe conditions or practices that cannot be immediately remedied to a supervisor as soon as safely possible. The compliance of all employees with *Pyro Combustion & Controls Inc.*'s Injury and illness prevention program is a condition of employment.

The failure of an employee to adhere to safety policies and procedures can have a serious impact on coworkers and the public, and may result in disciplinary action up to and including termination.

Supervisors will insist employees observe and obey rules, regulations, processes and procedures necessary to complete work safely. If employees are unsure of the safe method to do a job, they must STOP and ask a supervisor.

If any employee sees an unsafe workplace situation, he or she has the authority to stop work to address the hazard. There is always time for safety. Ensuring safe and healthy work practices is every employee's first priority.

2.1.1 Discipline

Employees will be disciplined for infractions of safety rules and unsafe work practices that are observed, not just those that result in an injury. Care will be taken to ensure discipline does not discriminate. While safety rules will be enforced rigorously, no one will be punished for reporting unsafe work practices or for reporting illness or injury. In any disciplinary action, discipline is given to the employee only for violation of safe work policy, not because the employee was injured or filed a workers' compensation claim.

Discipline for safety violations will be administered in a manner consistent with *Pyro Combustion & Controls Inc.*'s system of progressive discipline.

As in all disciplinary actions, each situation is to be carefully evaluated and investigated. The steps taken in the disciplinary process, up to and including termination, will depend on the severity of the violation, employee history, and overall consideration for the well-being of the company, its employees and its customers.

Each department or supervisor may have additional safety rules and policies specific to operations. In following these rules, employees are expected to exercise sound judgment and work in a manner to ensure the safety of themselves and coworkers.

Consistency in the enforcement of safety rules will be exercised at all times.

2.1.2 Safety Incentive Programs

Although strict adherence to safety policies and procedures is required of all employees, *Pyro Combustion & Controls Inc.* may periodically provide recognition of safety-conscious employees and acknowledge safety-conscious work habits through a safety incentive program. Safety incentive programs must not discourage reporting of injuries and illnesses.

Programs that reward positive safety activities and initiatives (e.g. completing a training program, finding and correcting hazards), are more effective and less likely to involve unlawful discrimination.

2.2 Training & Safety Communication

OSHA requires employers to train employees in the safe methods of performing their job. *Pyro Combustion & Controls Inc.* is committed to instructing all employees in safe, healthy work practices. Awareness of potential hazards and knowledge of how to control them is critical to maintaining a safe, healthy work environment and preventing injuries. *Pyro Combustion & Controls Inc.* will provide training to each employee on general safety issues and safety procedures specific to that employee's work assignment.

Training provides the following benefits:

- Makes employees aware of job hazards;
- Teaches employees to perform jobs safely;
- Promotes two way communication;
- Fulfills legal requirements;
- Encourages safety suggestions; and
- Creates additional interest in the safety program.

Pyro Combustion & Controls Inc. will only use training material appropriate in content and vocabulary to the educational level, literacy, and language of employees, and will offer retraining as needed to ensure safe practices.

2.2.1 Training Program

Actual demonstration of proper task performance will be used whenever possible to instruct new workers. Workers must provide evidence of topic mastery before training is complete. Trainers will rely on the following training techniques:

- Tell them how to do the job safely;
- Show them how to do the job safely;
- Have them tell you how to do the job safely; and
- Have them show you how to do the job safely.

Training topics will reflect the hazards of the workplace and may include the following:

- Employee's safety responsibilities;
- General safety rules;
- Injury and illness prevention program contents;
- Safe job procedures;
- Mandatory and optional personal protective equipment;
- Safe lifting and material handling practices;
- Emergency procedures;
- Use of equipment; and
- Use of hazardous materials.

2.2.2 New Employees

Every new employee will be given instruction by their supervisor or appropriate member of management in the general safety requirements of their job. New employees will not begin a job until they have demonstrated or otherwise confirmed awareness of safe practices for their tasks and general workplace safety rules and guidelines. A copy of the general safety rules will be provided to each new employee, and each new employee will be given access to any element of the safety program that pertains to the work he or she will be expected to do.

2.2.3 Documentation of Training

All employee safety training will be documented. Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

2.2.4 Retraining

Employees observed performing unsafe acts or not following safe work procedures will be retrained by their supervisor or an appropriate safety trainer. A safety contact report may be completed by the supervisor to document the training. If multiple employees are involved, additional safety meetings will be held.

2.2.5 Safety Communication

Pyro Combustion & Controls Inc. will advise employees of changes relating to the safety program. Employee safety communication procedures are designed to develop and maintain employee involvement and interest in workplace safety and health. These activities help ensure effective communication between management and employees on safety-related issues and nurture a culture of safety.

The following are some of the safety communication methods that may be used:

- Frequent accident prevention instructions and periodic practice drills;
- The distribution of articles, memos, payroll stuffers and other communication concerning workplace safety and health;
- Regular safety meetings with employees that encourage participation and open, two-way communication;
- Employee bulletin boards or other displays discussing safety issues, accidents, and general safety suggestions; and
- New employee safety orientation and training.

2.2.5.1 Safety Suggestion Program

Pyro Combustion & Controls Inc. encourages all employees to become involved in the development and implementation of the safety and health program. Management will request opinions and comments from workers at all levels and respond to them respectfully and appropriately.

All employee-initiated safety related suggestions will be channeled to the appropriate authority by the safety committee or a supervisor, either verbally or in writing. Unresolved issues may be relayed to Gary Pfizenmayer, the safety coordinator.

Pyro Combustion & Controls Inc. will not discriminate against any employee for raising concern over safety issues, and will establish and maintain a system whereby employees may share safety or health concerns anonymously.

2.3 Rules

The following rules are a selection of safety practices to help prevent work-related injury and illness. It is not comprehensive; employees are expected to adhere to any safe work practice necessary to complete their job safely.

2.3.1 Drug- and Alcohol-Impaired Workers

- *Pyro Combustion & Controls Inc.* encourages employees to discuss personal and interpersonal problems with their supervisor; supervisors will handle all such contacts with appropriate confidentiality and refer employees who may benefit from outside assistance to appropriate resources.
- No employee may work while his or her ability or alertness is impaired by fatigue, illness, prescription drugs, or over-the-counter drugs.
- Anyone known to be under the influence of alcohol or drugs will not be allowed on the job while in that condition.
- Notify a supervisor of any coworker demonstrating signs of impairment that may present a safety or health hazard.

2.3.2 General Safety

- Take time to do every job safely.
- Refrain from horseplay, scuffling, pranks and similar acts that may have an adverse influence on the safety and well-being of employees.
- Walk; don't run, in the workplace.
- Smoking, eating and storage of personal items are permitted only in designated areas.
- Maintain awareness of potential hazards when walking about the workplace.
- Use tools only for their intended purpose, and always use the right tool for the job.
- Listen to instructions. If you don't understand them, ask before starting work.
- Inspect all safeguards before beginning work; ensure proper functioning of protective devices and report any known deficiencies immediately.
- Only operate equipment you can operate safely. Hazardous equipment should only be operated after training for that equipment
- Refrain from handling or tampering with equipment, machinery, or lines in a manner not within the scope of your duties.
- Report all injuries to the appropriate supervisor so arrangements can be made for medical or first-aid treatment and appropriate reporting may be completed.
- Ensure clothing and footwear are appropriate to the hazards of the job. If you are unsure, ask your supervisor.
- Always wear approved protective equipment in work areas that demand such equipment.
- Workers will heed signs, posters, or hazard bulletins posted on company premises.
- Only enter hazardous areas after they are made safe to enter.

Pyro Combustion & Controls Inc. strictly prohibits possession of firearms, weapons, illegal drugs or alcoholic beverages on *Pyro Combustion & Controls Inc.* property, customer property or other location while on the job.

2.3.3 Housekeeping

- All exits, fire doors, aisles, and areas around fire extinguishers, first aid kits, emergency equipment, electrical panels and traffic lanes will be kept clear.
- Keep tools, materials or other objects off the floor to prevent trips and falls. Remove waste from the work area promptly.
- Keep work areas clean and free of debris, electrical cords and other hazards; immediately clean spilled liquids.
- Keep stairways, passageways, exits and sidewalks clean and clear of obstructions.
- Sharp wires or protruding nails must be bent or capped to prevent accidental injury.
- Place tools and equipment so they will not fall from elevated areas.
- Only use approved cleaning agents.

2.3.4 Fire Prevention

- Firefighting equipment will be inspected on a regular basis.
- Discharged, damaged or missing equipment must be reported immediately to a supervisor. Tampering with fire equipment is prohibited.
- Take precautions to prevent fires, particularly from oily waste, rags, gasoline, flammable liquids, acetylene torches, improperly installed electrical equipment and trash.
- Access to fire extinguishers must be kept clear at all times. Make note of the location of firefighting equipment in your work area.
- In case of fire, employees will consider the safety of themselves and other individuals before saving property.
- Never use gasoline or flammable solvents to clean.
- Smoking is prohibited within 20 feet of flammable substances.

2.3.5 Lifting and Material Handling

- Think before lifting.
- Find a better way. If at all possible, use mechanical help from a pushcart or handtruck.
- If the load is heavy or awkward to lift alone, get help. Team lifting cuts the load in half and reduces likelihood of injury.
- Break the load down into smaller lifts if possible. It is better to make two or more light trips than one heavy trip.
- If possible, bring the load up between the knees and waist before lifting.
- Do not lift on slippery surfaces.
- Test the load before doing the lift; determine how heavy it is by giving it a shove.
- Ensure a good handhold on the load before attempting to lift.
- Keep the load close. Walk as closely as possible to the load.
- Do not jerk the load or speed up. Lift the load in a smooth and controlled manner.
- Do not lift in an awkward position or twist while lifting (especially with a heavy load). Turn and take a step.
- Avoid long forward reaches and bending your back. Use a step stool or platform if necessary.
- Back injury claims are painful for workers and expensive for the company. Lift safely!
- Make sure you have plenty of room to lift and to set down the object.
- If you are lifting an object above your head, get a ladder or step stool.

2.3.6 Ladder Safety

- Keep portable stairways, ladders, and step stools in good condition and use them only in a safe manner.
- Inspect the ladder before using it. If it is broken, remove it from service.
- Use the proper ladder for the job.
- Do not use “A” frame self-supporting ladders as straight ladders.
- Make sure the ladder is tall enough to reach the work area.
- Do not use metal ladders for electrical work.
- Avoid temporary ladders. Always use a commercially made ladder of the proper length and strength for the work being performed.
- Ladder rungs must be kept free of grease, oil, mud, or other slippery substances.
- Do not place ladders in passageways, doorways, or any location where they might be hit or jarred, unless protected by barricades or guards.
- Ladders should be placed only on hard, level surfaces. Make sure ladder feet are not placed on sandy, slippery, or sloping surfaces. Clean or sweep the area where the ladder feet will be and make sure the rubber feet are in good shape.
- Arrange work so you can face the ladder and use both hands while climbing. Do not carry tools or equipment in your hands while climbing. If tools or equipment cannot be safely stowed on your person, as with a belt or vest, climb the ladder, and then hoist them with a line or hoisting device.
- Secure portable ladders in place and at a pitch so the leveling indicator is in alignment or the distance from the wall to the base of the ladder is at least 1’ away from the wall for every 4’ of ladder height.
- Straight ladders will be tied off at the top of the ladder to prevent slipping.
- Be aware of objects below you; move or cover sharp objects in case you fall.
- Do not stand on or work from the 2nd rung from the top or above.
- Do not reach too far from the ladder, and keep your center of gravity as close to the center of the ladder as possible.
- Extension ladders need to extend at least 36" above the level being accessed.
- On all ladders, do not step on cross bracing not intended to be used for climbing.
- Do not use a ladder as a brace, workbench or for any other purpose than climbing.

2.3.7 Electrical Safety

- Only trained, qualified, and authorized employees may work on or repair electrical equipment.
- Report exposed wires and damaged electrical equipment or wires immediately.
- Extension and temporary power cords must be appropriate to the task and grounded, but should be used only as a last resort. Frayed or defective cords will not be used.

General Safety Rules

- Never overload an outlet or circuit. Use approved power strips and extension cords in accordance with company policy and best safety practices.
- All energized equipment and installations will be de-energized before work. If the equipment or installation must be energized, special precautions will be taken to protect against the hazards of electric shock.
- All equipment will be locked out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. Do not attempt to operate any switch, valve, or other energy-isolating device bearing a lock.
- Safety grounds will always be used where there is a danger of shock from backfeeding or other hazards.
- Suitable attire and personal protective equipment must be worn at all times while working on electrical equipment.
- Always exercise caution when energizing electrical equipment or installations. Take steps to protect against arc flash and exploding equipment in the event of a fault.
- All power tools will be grounded or double insulated. Tools with defective cords or wiring will not be used.
- Metal jewelry should not be worn around energized circuits.
- Suitable temporary barriers or barricades will be installed when access to opened enclosures containing exposed energized equipment is not under the control of an authorized person.
- Enclosures or tight fitting covers must protect electrical installations from accidental contact.
- Metal measuring tapes, fish tapes, ropes or other metal devices are prohibited where they may contact energized parts of equipment or circuits.

2.3.8 Company Vehicles

- Only authorized employees are permitted to operate *Pyro Combustion & Controls Inc.* vehicles.
- Company vehicles are to be used for *Pyro Combustion & Controls Inc.* business only. Personal, off duty and family use is prohibited.
- Drive defensively and obey all traffic and highway laws.
- Always wear a seat belt, whether driver or passenger.
- Report all accidents to a supervisor as soon as possible, and obtain a police report.
- Keys must be removed from all unattended vehicles, and vehicles must be locked.
- Inspect the vehicle before operation and report any defects or operating problems to the appropriate supervisor so repairs can be made.
- Smoking is prohibited while inside the vehicle and during vehicle refueling.

- If your driver's license is revoked or expired, immediately notify your supervisor and do not drive. If you receive a moving violation or any citation that may affect your eligibility to drive a company vehicle, inform your supervisor immediately.

2.3.9 Hazardous Materials and Chemicals

- Ask a supervisor about any unfamiliar material, chemical or substance.
- Store all hazardous materials in suitable containers that are properly labeled.
- Use chemicals that produce fumes or vapors only in well-ventilated areas.
- Read all warning labels and Safety Data Sheets (SDSs) before using any chemicals. SDSs contain a wealth of safety information and are available to employees.
- Hazardous materials will be handled in accordance with the SDS and label. If protective equipment is required, use it.
- Eye protection must be worn when working with hazardous materials or chemicals.
- Mixing of chemicals is prohibited at all times unless required by the label. Before you mix, review all SDSs.
- Never use solvents for hand cleaning.
- Practice appropriate hygiene after handling hazardous substances, and follow special instructions from authorized sources. Wash hands thoroughly after handling chemicals and before eating or smoking, even if wearing protective gloves.

2.3.10 Personal Protective Equipment (PPE)

- Use the correct PPE for any job assignment that requires it. If you do not know, ask.
- PPE will be maintained in good condition and cleaned regularly.
- PPE will be stored properly when not in use to protect it from damage.
- Damaged or broken PPE must be returned for replacement.
- Protective clothing may not hamper or restrict freedom of movement due to improper fit.

2.4 Forms and Attachments

On the following pages, please find the following document:

- General Safety Rules Receipt

This form may be reproduced freely by *Pyro Combustion & Controls Inc.* for the purposes of implementing and maintaining a safety and health program.

General Safety Rules Receipt

This is to certify that I have received a copy of the general safety rules.

- I have read these instructions, understand them, and will comply with them while working for *Pyro Combustion & Controls Inc.*
- I understand that failure to follow the company injury and illness prevention program may result in disciplinary action and possible termination of my employment with this company.
- I understand that I am to report any injury to my supervisor and report all safety hazards as soon as safely possible.
- I further understand that I have the following safety rights:
 - I am not required to work in any area I feel is not safe.
 - I am entitled to receive information about all hazards I am exposed to while working.
 - I am entitled to see a copy of the company safety and health manual.
 - I will not be discriminated against for reporting safety concerns.

Employee Name

Signature

Date

Supervisor Name

Signature

Date

cc: Employee File

3

Safety Committee Policy

3.1 Policy Statement

Pyro Combustion & Controls Inc. maintains its commitment to protect the safety and health of all employees. To support a workplace culture that prioritizes the prevention of illness and injury, a committee of stakeholders representing management and workers will plan and implement safety policies and ensure best safety practices are followed throughout the workplace.

Pyro Combustion & Controls Inc. Safety Committee members at the time this manual was created are:

Gary Pfizenmayer, Lacy Page, and Rob Abraham.

The safety committee will meet a minimum of 12 times per year.

The safety committee includes employer and employee representatives who are responsible for recommending safety and health improvements in the workplace. The committee is also responsible for identifying hazards and unsafe work practices, removing obstacles to incident prevention, and helping the company evaluate the injury and illness prevention program.

3.2 Responsibilities

The safety committee is an essential element of the injury and illness prevention program at *Pyro Combustion & Controls Inc.*. It requires the cooperation of all employees.

3.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Ensure every employee receives training on their roles regarding the safety committee;
- Support and encourage active employee involvement in creating and supporting a culture of safety;
- Establish the authority of the *Pyro Combustion & Controls Inc.* safety committee;
- Support the safety committee and respond to its recommendations promptly;
- Establish the size of the safety committee;
- Accurately communicate the time and effort commitment level expected of safety committee members; and
- Fund and allow time for safety committee activities.

3.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Meet 12 times a year;
- Identify hazards and unsafe work practices, remove obstacles to incident prevention, and help the company evaluate the accident and illness prevention program;
- Write bylaws to document the committee's purpose, activities, and processes;
- Report employee safety and health concerns to the committee;
- Suggest items to include in the monthly meeting agenda;
- Encourage other employees to report workplace hazards and suggest how to control them;
- Deliver safety training when appropriate;
- Establish procedures for conducting regular workplace inspections and for making recommendations to management to eliminate or control hazards;
- Make or assist in safety inspections and accident investigations;
- Work safely and encourage others to do likewise;
- Help management evaluate safety programs and recommend improvements;
- Establish procedures for investigating the causes of accidents and near-miss incidents;
- Plan and document every official meeting;
- Establish committee offices and elect officers;
- Communicate and build consensus over safety and health issues in meetings;
- Follow a written agenda at every meeting;
- Record minutes at every safety committee meeting and post them for employees;
- Plan for emergencies;
- Create and maintain documents related to *Pyro Combustion & Controls Inc.*'s safety and health program;
- Follow bylaws established by the committee; and
- Review the *Pyro Combustion & Controls Inc.* injury and illness prevention program annually.

3.2.3 Employee Responsibilities

Pyro Combustion & Controls Inc. employees are expected to:

- Recommend safety solutions to the safety committee;
- Participate in the selection of members and consider volunteering to join the committee;
- Cooperate and provide input during workplace inspection, job hazard analysis and accident investigation; and
- Attend all required safety meetings.

3.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on their roles regarding the safety committee. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material appropriate in content and vocabulary to the educational level, literacy and language of employees.

3.3.1 Training Components

Gary Pfizenmayer will ensure that all employees at *Pyro Combustion & Controls Inc.* are informed and trained in the following minimum elements for safety committees:

- The role of the safety committee in ensuring companywide safety and health; and
- How to participate in the safety committee.

Safety committee members will complete training in the following minimum elements:

- The purpose of the safety committee;
- How to apply safety rules;
- How to conduct safety committee meetings;
- Hazard identification;
- The principles of accident investigation;
- Whom to contact for information or for help on workplace safety and health matters; and
- Company safety policy and occupational safety and health principles.

All safety committee officers will be trained to fulfill their responsibilities as officers.

3.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions.
- The contents or a summary of the training sessions.
- The names and qualifications of persons conducting the training.
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

3.4 Policy

3.4.1 Planning

3.4.1.1 Bylaws

The *Pyro Combustion & Controls Inc.* Safety Committee will define its purpose, activities, and processes in its bylaws. The document will define the scope and nature of the committee's activities, and serve as a guide to provide stability as representatives to the committee change. The complexity of the document depends on the safety and health needs of *Pyro Combustion & Controls Inc.* and the decisions of the committee. However, topics documented in the bylaws should include the following.

Name, Purpose and Constituency

In its bylaws, the safety committee will establish the worksite from which committee members are drawn, why the committee has been formed, and the committee's goals and objectives.

Committee Composition, Officers and Terms

The bylaws will establish the size of the committee as well as what proportion of the committee will be reserved for members of management and labor. The bylaws also need to establish the officers the committee will appoint and how. The length of terms also needs to be determined for officers and members of the committee.

Duties, Responsibilities and Training

In the document, the safety committee will outline the duties of each officer and members, both in terms of their obligations to the safety committee and in terms of fulfilling their role in the workplace. Safety committee members will need additional training, not only in how the committee functions, but also to competently perform their responsibilities of emergency response, inspections, etc.

Meetings, Elections and Attendance

The safety committee bylaws should specify the frequency of meetings as well as how an absence should be handled. A portion of the document should address the number of representatives needed to form a voting quorum as well as how the committee will resolve issues it cannot resolve with a vote.

Agendas, Minutes and Recordkeeping

The safety committee will plan and document every official meeting. Each meeting will have a predetermined order of business, and there needs to be a system in place to record what happened in the meeting and document the recommendations and findings brought to the committee during meetings.

Investigations, Inspections and Evaluations

Bylaws describe the role of the committee in investigating near misses and accidents, as well as how the committee will conduct workplace inspections. In the bylaws, the committee needs to establish how it and management will communicate regarding safety concerns and recommendations. It also needs to describe how it will assess the overall injury and illness prevention program and its own activities to establish a means of ongoing evaluation and improvement.

Please see the example of safety committee bylaws at the end of this chapter.

3.4.1.2 Buy-in

During planning for the safety committee, the support of both management and labor is critical. Management will consistently support and encourage active employee involvement in creating and supporting a culture of safety at *Pyro Combustion & Controls Inc.*. Management is responsible for establishing the authority of the *Pyro Combustion & Controls Inc.* safety committee and after its creation will support the committee and respond to its recommendations promptly.

3.4.1.3 Membership

Only *Pyro Combustion & Controls Inc.* employees may serve on the safety committee. The committee will have at least as many non-management members as management members; however, the number of managers and non-managers on the committee should be approximately equal. If possible, the safety committee should include representatives from a range of departments, work operations and shifts. This helps make sure all groups of workers feel represented and contributes to effective communication between the safety committee and the rest of the workforce.

Members of the committee should be volunteers. Elections for members can be a helpful way to encourage involvement in the committee's activities.

Number of Committee Members

Gary Pfizenmayer will establish the size of the safety committee. The number of members who will serve on the safety committee depends on the number of employees *Pyro Combustion & Controls Inc.* has at the time. A workplace with up to 20 employees may only need two safety committee members. Beyond that, however, having more members encourages wide participation and helps fill all the committee's roles. Somewhere between five and ten members is sufficient for almost any safety committee.

Membership terms of one to three years work well for safety committee members and officers. The committee will establish term length when it establishes the bylaws. Regardless of length, terms should be staggered so at least one experienced committee member remains on the committee at any given time.

Safety Committee Policy

Officers

A safety committee can have a number of officers, depending on its size. The most important two are the chairperson, who is “in charge” of safety meetings, and a recorder who takes minutes. A vice-chair can serve in case the chair is unable to perform his or her duties.

Chair

It is beneficial to allow the committee to elect its chair, though the safety committee chair may be appointed by *Gary Pfizenmayer*. The chairperson has the responsibility to ensure meetings occur and are productive. The safety committee chairperson’s duties need to include, but are not limited to:

- Scheduling monthly meetings;
- Developing agendas for meetings;
- Coordinating and conducting meetings;
- Establishing timeframes and deadlines for safety committee projects;
- Following up on the recommendations of committee;
- Acting as liaison between committee and management; and
- Promoting safety by personal example.

Vice-Chair

The vice-chair assumes the chair’s responsibilities when he or she isn’t available. This officer should take an active role in the committee’s activities and assist in the coordination and direction of the committee. In some safety committees, this role is filled by the recorder.

Recorder or Secretary

The recorder’s role is to support accurate and thorough recordkeeping for the committee’s activities. The safety committee recorder’s duties include, but are not limited to:

- Taking minutes at meetings;
- Distributing minutes to committee members;
- Posting minutes for other employees to review;
- Maintaining safety committee file;
- Keeping minutes and agendas on file for at least three years; and
- Promote safety by personal example and communication between and among employees and supervisors.

Other Members

The duties of all members of the safety committee include, but are not limited to:

- Reporting employee safety and health concerns to the committee;
- Attending all safety meetings;
- Reporting accidents, near miss incidents and unsafe workplace conditions to the committee
- Suggesting items to include in the monthly meeting agenda;
- Encouraging other employees to report workplace hazards and suggest how to control them;
- Delivering safety training when appropriate;
- Establishing procedures for conducting workplace inspections and for making recommendations to management to eliminate or control hazards;

- Making or assisting in safety inspections and accident investigations;
- Working safely and encouraging others to do likewise;
- Helping management evaluate safety programs and recommending improvements; and
- Establishing procedures for investigating the causes of accidents and near-miss incidents.

3.4.2 Meetings

Regular, productive meetings are essential to success for the *Pyro Combustion & Controls Inc.* safety and health committee. Safety committee meetings will be a time to communicate and build consensus over safety and health issues.

Meetings will begin on time, and safety committee team members will be paid for time spent on safety committee business, including meetings and meeting preparation. The chair is responsible for moving the meeting along according to the established agenda. Meetings do not have to follow strict parliamentary procedures, but they do require order to be successful. The committee will set its own ground rules for meetings.

3.4.2.1 Frequency

Safety committee meetings should occur regularly and frequently. The frequency of meetings should be established in the committee bylaws. Most committees find monthly meetings or quarterly meetings are sufficient, depending on the size of the organization and the severity of risk in the workplace.

Pyro Combustion & Controls Inc. safety committee meetings occur 12 times a year.

Subcommittees and working groups can meet more frequently as needed.

3.4.2.2 Agenda

The committee will follow a written agenda at every meeting. This agenda will outline the topics of discussion and needs to be distributed to members well in advance of the meeting for review. A committee member who requests an item to add to the agenda should give the chair ample notice. The agenda will include the date, time and location of the meeting, and any special group or individual who is expected to be in attendance. A safety committee meeting may only extend beyond the time established in the agenda with committee approval. The needs of the committee at a given meeting will shape the agenda, but a standard order of business helps.

Opening

The chair will bring the meeting to order before a roll call of members. The opening of the meeting is when introductions of new representatives or guests occur. This is also when the committee should review minutes from the previous meeting for additions or corrections as needed.

Unfinished Business

If there was discussion about issues not resolved or for which no activity was planned from previous meetings, the committee should address them toward the beginning of the meeting.

The committee needs to review recommendations it has already made and report on actions being taken. If recommendations are not acted upon, management will provide the committee with an explanation of the status of the issue, including whether corrections are to be delayed and when they will be carried out.

New Business

If new business items are on the agenda, discussion about them should happen after unfinished business has been resolved. Discuss new inspections and reports or to discuss safety concerns that have otherwise emerged in the time since the last meeting.

Suggestions

The *Pyro Combustion & Controls Inc.* safety committee will solicit input in the form of feedback or suggestions from employees. Every meeting will include time to discuss suggestions from employees or to allow employees to address the committee about safety concerns.

Goals/Planning/Training

It is a good idea to take some time in each meeting to address progress on safety goals and celebrate successes. If there is action to be taken before the next meeting, the committee will assign these steps to responsible parties or create subcommittees as necessary.

Also, it is useful to use some time to provide additional safety training to safety committee members. This training can be specific to running an effective safety committee, or it can be general training for committee members to share with coworkers later. This element of the safety committee meeting does not need to be very long and is a good time for guest speakers.

Establish Next Meeting

The chair will thank those in attendance and the committee will establish when the next meeting will occur before the meeting is adjourned.

3.4.2.3 Minutes

Minutes serve as the official record of a safety committee meeting. Minutes need to be concise, clear and thorough. The recorder or secretary is responsible for writing minutes for each meeting and posting them where they will be easily available to all employees. Minutes remain on file for at least three years and must include the following:

- Date, time and place of the meeting;
- Names of attendees and a list of committee members who were unable to attend;
- Summary of agenda items discussed during the meeting;
- Suggestions from employees and any hazards reported during the meeting;
- Recommendations from the committee to management; and
- Management's response to committee recommendations.

3.4.3 Responsibilities

3.4.3.1 Management Commitment and Employee Involvement

The safety committee is a collaborative, consensus-focused organization within the workplace. Its success depends not only on the ability of the committee to work toward a culture of safety, but on the efforts of the other employees and the support of managers and supervisors.

Pyro Combustion & Controls Inc. supports the safety committee and its efforts to strengthen safety in the workplace. Managers and supervisors will encourage employee involvement and support a workplace culture where honest communication about safety issues is encouraged. Employees should feel confident when sharing suggestions or concerns that their views will be handled seriously and with respect.

3.4.3.2 Workplace Inspections

A comprehensive injury and illness prevention program demands a hazard assessment for most jobs and regular inspections of all work areas. The safety committee's role in performing these assessments and inspections is integral to a safe workplace. Walkthroughs and inspections should be documented and performed along with employees and supervisors who work in the area being inspected. Thorough workplace inspections occur *daily*, and hazard assessments will be as frequent as changes to the workplace or safety situations demand.

The safety committee shares responsibility for *Pyro Combustion & Controls Inc.*'s hazard assessment and control system. The safety committee is responsible for:

- monitoring the workplace for hazards;
- encouraging employees to report hazards;
- implementing appropriate controls; and
- ensuring corrective action is taken promptly.

A task that presents a high degree of risk to an employee demands special planning and more frequent inspections.

Please see the "Job Hazard Analysis" chapter for more detail.

3.4.3.3 Recommendations

The safety committee should include at least one member of high-level management who can authorize next steps for action items of the committee; however, not every issue can be dealt with immediately. When additional authority is needed for the committee to fulfill its other responsibilities, the committee needs to make a formal recommendation in writing to *Pyro Combustion & Controls Inc.* management.

The safety committee will draft recommendations to *Pyro Combustion & Controls Inc.* when a management representative on the committee can't sufficiently respond to an issue the safety committee determines needs attention.

An effective recommendation to management should include:

- the issue;
- background information;
- all available options; and
- a suggested timeline for action.

3.4.3.4 Accidents

Accidents and near misses point to weaknesses in the safety and health program. Investigations serve an important role in preventing accidents in the future by determining how and why the incident occurred.

The safety committee's role in accident investigations should be determined by the safety committee, but the committee is responsible for ensuring accident investigations take place and establishing how. Investigations gather information about the incident, but may require thoughtful analysis to determine the root causes of an incident and how to control them. Investigations will focus on correcting problems, not placing blame. Please see the "Accident Investigation" chapter for more detail.

3.4.3.5 Emergencies

The safety committee plays a vital role in planning for emergencies, and members of the safety committee may need to assume additional responsibilities during emergencies. Depending on the Emergency Action Plan, safety committee members may serve as evacuation wardens, be designated to fight incipient-stage fires with a fire extinguisher, and/or provide first-aid. Training will reflect the job requirements assigned to safety team members. Please see the "Fire Protection and Emergency Planning" chapter for more detail.

3.4.3.6 Training

The safety committee can play an important role in training workers about safety and supporting a general culture of safety. Because of this, members of the safety committee will need additional training to support their activities.

Training will be built into safety committee meetings, and safety committee members and officers will receive training for any task they are asked to perform above regular duties. Representatives must understand the purpose of the safety committee, how to apply OSHA's safety rules and how to conduct safety committee meetings. They also must have training in hazard identification and the principles of accident investigation.

Members should know whom to contact for information or for help on workplace safety and health matters.

The safety committee will establish and implement training programs for safety topics and hazard awareness in the workplace. The committee will need to establish procedures to deliver necessary training, coordinate safety meetings, and keep track of training verification documents.

3.4.3.7 Recordkeeping

The safety committee is responsible for creating and maintaining documents that are related to *Pyro Combustion & Controls Inc.*'s safety and health program. This includes but is not limited to:

- A log of work-related injuries and illnesses (OSHA's Form 300);
- Injury and illness incident reports (OSHA's Form 301);
- A yearly summary of work-related injuries and illnesses (OSHA's Form 300A);
- Safety training records
- Committee recommendations;
- Workplace hazard assessments; and
- Any required safety log.

3.4.4 Evaluation

A crucial aspect of the safety committee's activities is an annual review of the *Pyro Combustion & Controls Inc.* safety and health program. This review can be undertaken over the course of a number of weeks or throughout the year, depending on how the committee decides to handle the evaluation. This evaluation should be recorded and provided to management along with recommendations as appropriate.

In addition to a review of the overall safety and health program, the *Pyro Combustion & Controls Inc.* safety committee will evaluate its own activities on a yearly basis to determine changes to procedures that may be needed.

3.5 Forms & Attachments

On the following pages, please find the following documents:

- Safety Committee Bylaws
- Safety Committee Checklist
- Safety Committee Agenda
- Safety Committee Meeting Minutes
- Safety Committee Training Record Sheet

These forms may be reproduced freely by *Pyro Combustion & Controls Inc.* for the purposes of implementing and maintaining a safety and health program.

Safety Committee Bylaws

Name

The name of the committee is the _____ Safety Committee.

Purpose

The purpose of the _____ Safety Committee is to bring all _____ employees together to achieve and maintain a safe, healthful workplace.

Goal

The goal of the _____ Safety Committee is to eliminate workplace injuries and illnesses by involving employees and managers in identifying hazards and suggesting how to prevent them.

Objectives

The Safety Committee has four objectives:

- Involve employees in achieving a safe, healthful workplace.
- Promptly review all safety-related incidents, injuries, accidents, illnesses, and deaths.
- Conduct quarterly workplace inspections, identify hazards, and recommend methods for eliminating or controlling the hazards.
- Annually evaluate the _____ workplace safety-and-health program and recommend to management how to improve the program.

Representatives

The _____ Safety Committee will have _____ voting representatives. _____ of the representatives will represent employees and _____ will represent management. Employee representatives can volunteer or their peers can elect them. Management representatives will be selected by management.

Each representative will serve a continuous term of at least one year. Terms will be staggered so that at least one experienced representative always serves on the committee.

Chair and Vice-chair

The _____ Safety Committee will have two officers: chair and vice-chair. One officer will represent labor and one officer will represent management.

Terms of Service

Chair and vice-chair will each serve a one-year term.

Duties of the Chair

- Schedule regular committee meetings.
- Approve committee correspondence and reports.
- Develop written agenda for conducting meeting.
- Supervise preparation of meeting minutes.
- Conduct the committee meeting.

Duties of the Vice-chair

- In the absence of the chair, assume the duties of the chair.
- Perform other duties as directed by the chair.

Election of Chair and Vice-chair

The election of a new chair or vice-chair will be held during the monthly committee meeting before the month in which the incumbent's term expires.

If the chair or vice-chair leaves office before the term expires, an election will be held during the next scheduled safety-committee meeting; the elected officer will serve for the remainder of the term.

Training

New representatives will receive training in safety-committee functions, hazard identification, and accident-investigation procedures.

Meetings

Monthly schedule — The _____ Safety Committee will meet the _____ of each month, except when the committee conducts quarterly workplace safety inspections.

Safety Committee Bylaws (Pg. 2)

Attendance and Alternates

Each representative will attend regularly scheduled safety committee meetings and participate in quarterly workplace inspections and other committee activities. Any representative unable to attend a meeting will appoint an alternate and inform the chair before the meeting. An alternate attending a meeting on behalf of a regular representative will be a voting representative for that meeting.

Agenda

The agenda will prescribe the order in which the _____ Safety Committee conducts its business. The agenda will also include the following when applicable:

- Review of new safety and health concerns
- Status report of employee safety and health concerns under review
- Review of near misses, accidents, illness, or deaths occurring since the last committee meeting.

Minutes

Minutes will be recorded at each committee meeting and posted & distributed to all employees.

The committee will submit a copy of the minutes to the _____ personnel office; the office will retain the copy for three years. All reports, evaluations, and recommendations of the committee will be included in the minutes. The minutes will also identify representatives who attended monthly meeting, and representatives who were absent.

Voting Quorum

_____ voting representatives constitute a quorum. A majority vote of attending representatives is required to approve all safety-committee decisions. Issues not resolved by majority vote will be forwarded to management for resolution.

Employee Involvement

The _____ Safety Committee will encourage employees to identify workplace-health-and-safety hazards. Concerns raised by employees will be presented to the committee in writing; the committee will review new concerns at the next regularly-scheduled monthly meeting.

Safety Log

The committee will maintain a log of all employee concerns, including the date received, recommendations to management, and the date the concern was resolved.

Response

The committee will respond to employee concerns in writing and work with management to resolve them. The committee will present written recommendations for resolving concerns to management. Within 60 days of receipt of the written recommendations, management will respond in writing to the committee indicating acceptance, rejection, or modification of the recommendations.

Incident and Accident Investigation

The _____ Safety Committee will review new safety- or health-related incidents at its next regularly-scheduled meeting. Safety-related incidents include work-related near misses, injuries, illnesses, and deaths. When necessary, the committee will provide written recommendations to management for eliminating or controlling hazards.

Workplace Inspections

The _____ Safety Committee will conduct quarterly workplace inspections of all Company facilities in March, June, September, and December.

Written Report

The committee will prepare a written report for management that documents the location of all health or safety hazards found during inspection. The report will recommend options for eliminating or controlling the hazards.

Within 60 days of receipt of the written report, management will respond in writing to the committee, indicating acceptance, rejection, or proposed modification of the recommendations.

Evaluation

The _____ Safety Committee will evaluate the Company's workplace-safety-and-health program annually and provide a written evaluation of the program to management. The committee will also evaluate its own activities each December and use the evaluation to develop an action plan for the next calendar year.

Safety Committee Checklist

Done	To Do	
		Our safety committee is composed of an equal number of employer and employee representatives.
		Employee representatives are volunteers or are elected by their peers.
		There are at least four representatives on the committee if the workplace has more than 20 employees – at least two representatives if the workplace has 20 or fewer employees.
		The representatives elect the committee chairperson.
		Representatives are paid their regular wages during safety committee training and meetings.
		Employee representatives serve on the committee for at least one year.
		Representatives' terms of service are staggered so that at least one experienced representative is always on the committee.
		Reasonable efforts are made to ensure that committee representatives represent the firm's major work activities.
		The committee meets monthly except when representatives schedule quarterly workplace inspections.
		Committee meetings follow a written agenda.
		The minutes for each meeting are maintained for at least three years.
		Minutes are available to all employees to read.
		All reports, evaluations, and recommendations are included in the minutes.
		Management has a reasonable time to respond, in writing, to the committee's recommendations.
		The committee has a method for collecting and reviewing employees' safety-related suggestions and reports of hazards.
		The committee assists management in evaluating and improving the workplace safety and health program.
		The inspection team conducts workplace inspections at least quarterly.
		The committee's quarterly inspection team follows a standard procedure for identifying safety-and-health hazards during its inspections.
		The inspection team includes employer and employee representatives.
		The inspection team documents, in writing, the location and identity of workplace hazards.
		The inspection team – or other persons designated by the committee – does quarterly inspections of satellite locations.
		The committee has a procedure for reviewing the team's quarterly inspection reports.
		The committee recommends to management ways to control hazards and unsafe work practices.
		The committee makes recommendations to ensure all employees are accountable for following safe work practices.
		The committee has a procedure for investigating workplace accidents, illnesses, and deaths.
		Representatives understand the purpose of their safety committee and know how it functions.
		Representatives have access to applicable OSHA safety and health rules.
		Representatives have received safety training for identifying workplace hazards and investigating accidents.

Safety Committee Agenda

Date: _____ To: All committee members, alternates, bulletin board

Meeting Date and Time: _____

Place: _____

Agenda Items

Person Responsible

1. Old business

a. Review last month's recommendations _____

b. Follow-up on last quarterly inspection _____

2. New business

a. Hazard reports All

b. Accident investigation reviews _____

c. Recommendations review _____

d. _____

e. _____

f. _____

3. Safety Committee Members Training

a. _____

b. _____

Notes:

Chair Person's Signature

Date

Safety Committee Meeting Minutes

Chairperson: _____ Date: _____

Department: _____ Time meeting started: _____

PRESENT

ABSENT

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Previous meeting minutes from _____ were read.

Date

Old Business

Review of last month's recommendations

Recommendation	Description	Completed	Incomplete	Date
R-_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____
R-_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____
R-_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____
R-_____	_____	<input type="checkbox"/>	<input type="checkbox"/>	_____

Follow-up on last quarterly inspection: _____

New Business

Hazard (inspection) reports reviewed: _____

Hazard	Description	Recommendation
H-_____	_____	R-_____
H-_____	_____	R-_____
H-_____	_____	R-_____
H-_____	_____	R-_____

Safety Committee Meeting Minutes (pg.2)

Accident/incident investigation reviews:

Accident Number	Near Miss	Recommendation Description	Number
A-_____	<input type="checkbox"/>	_____	R-_____
A-_____	<input type="checkbox"/>	_____	R-_____
A-_____	<input type="checkbox"/>	_____	R-_____
A-_____	<input type="checkbox"/>	_____	R-_____
A-_____	<input type="checkbox"/>	_____	R-_____

Safety Committee Members Training Report: _____

Miscellaneous New Business: _____

Activity/Assignment Report:

Description	Person Assigned
_____	_____
_____	_____
_____	_____
_____	_____

Committee Remarks: _____

Meeting adjourned: _____ Next meeting: _____
Time/date Time/date

Chair Person Signature

Secretary Signature

Safety Committee Training Record Sheet

Trainer <i>(include qualifications):</i>	
Date:	
Content of Training:	
Attendees	
Print Name	Signature

(Retain at least 3 years)

4

Job Hazard Analysis

4.1 Policy Statement

Pyro Combustion & Controls Inc. is committed to providing a safe, healthy workplace by eliminating or controlling all workplace hazards. Job hazard analysis systematically investigates a job process, equipment, and the workplace environment to identify hazards and reduce risk. The Lead Technician is responsible for seeing that facilities and workplaces are inspected for hazards at least *daily* and will do so with support and assistance from employees.

4.2 Responsibilities

Job hazard analysis is a responsibility shared between *Pyro Combustion & Controls Inc.* and its employees.

4.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Ensure safety inspections of the facility occur at least *daily*;
- Train personnel in how to perform a job hazard analysis;
- Respond quickly to control workplace hazards;
- Ensure all equipment is kept in good repair;
- Ensure employees follow safe job procedures; and
- Repeat job hazard analysis whenever there is a significant change to any element of the job or there has been an injury or illness.

4.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Assist in job hazard analyses as necessary;
- Assist in training employees to recognize and control workplace hazards;
- Monitor the workplace for hazards;
- Encourage employees to report hazards;
- Implement appropriate controls; and
- Ensure corrective action is taken promptly.

4.2.3 Employee Responsibilities

Pyro Combustion & Controls Inc. employees are expected to:

- Assist in job hazard analyses;
- Follow safe job procedures; and
- Report hazards to a supervisor immediately.

4.3 Training

Pyro Combustion & Controls Inc. will ensure every manager, supervisor and safety team member participates in a job hazard analysis training program. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to educational level, literacy, and language of employees.

4.3.1 Training Components

Gary Pfizenmayer will ensure that every employee will be trained in the following minimum elements:

- The importance of involving employees in job safety analyses;
- How to review safety records to identify areas that present hazards;
- How to analyze a job to determine the level of risk it presents;
- How to prioritize job hazard analysis and hazard control activities;
- The basic steps of a job hazard analysis, including: breaking the job into steps, analyzing risks, and determining controls;
- How much detail to include when listing the steps of a job for a JHA;
- What kinds of workplace hazards might exist and what types of risk they pose;
- The hierarchy of hazard controls and the advantages of certain types of controls;
- How to review a job hazard analysis and how to write a safe job procedure; and
- When to reanalyze a job for hazards.

The person conducting the training will be knowledgeable in the subject matter of the training program as it relates to the workplace the training addresses.

All employees will be trained in basic hazard identification and will be trained in their jobs according to safe job procedures, which will be informed by the job safety analysis.

4.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

4.4 Policy

4.4.1 Prepare

4.4.1.1 Employee Involvement

No one knows how to do a job better than the person currently doing that job. Employees who are included in a Job Hazard Analysis (JHA) provide valuable insight and knowledge into work procedures that is valuable in identifying hazards and controlling them. This insight can help prevent potentially dangerous oversights.

Further, soliciting employee input demonstrates that management values everyone's involvement in creating a safer workplace and provides an opportunity for employees' active involvement in the job hazard analysis process.

4.4.1.2 Preliminary Review

Reviewing the worksite's accident history with employees draws attention to failures in hazard controls and deficiencies in work processes, which in turn suggests opportunities for safety program growth. A thorough review of recorded accidents, illnesses and near misses points to jobs, processes and tasks that require more careful consideration. It also indicates the most immediate actions necessary to control risks that are present.

A discussion with employees about hazards they already know to exist also provides an opportunity to discuss ideas to control them.

If there is a hazard that poses an immediate danger, do not wait until after the JHA is complete to establish controls. Easy problems need to be corrected quickly. This demonstrates a commitment to safety and permits more time and thought for more complicated work safety issues.

4.4.1.3 Prioritize Hazardous Jobs

Understanding the risk posed by a job requires consideration of two main factors: the likely severity or impact of the injury or illness caused by a hazard and the likelihood injury or illness will actually occur (see Table 1). It is important, when assessing the overall risk of a job to determine the number of people exposed to a hazard who could be affected by an incident. Hazards that affect the whole worksite present much more risk than hazards that affect only one worker.

Risk Assessment Matrix		Probability of Harm		
		Not Likely	Likely	Very Likely
Severity of Harm	Serious Harm	Moderate Risk	High Risk	Very High Risk
	Significant Harm	Low Risk	Moderate Risk	High Risk
	Minor or no harm	Low Risk	Low Risk	Moderate Risk

Table 1

Jobs that present unacceptable risk should take priority. Place priority on jobs:

- With exceptionally high injury or illness rates;
- Where there already have been close calls;
- Where violations of standards already have occurred;
- With potential to cause serious harm; and
- Where simple human error could lead to severe accident or injury.

Severity

Factors that increase risk because they increase the severity of an injury or illness often rely on chance. However, certain job elements and behaviors intensify the severity of possible incidents:

- Using high-powered machinery and heavy equipment;
- Working at elevation;
- Working around hazardous chemicals;
- Moving heavy or cumbersome loads;
- Working around or with electrically energized equipment; and
- Working in a confined space.

Probability

Factors that increase risk because they increase the likelihood of an injury or illness include:

- Number of employees exposed to a hazard;
- Frequency of exposure;
- Duration of exposure;
- Proximity to “point of danger;”
- Unreasonable workload;
- Working under stress; and
- Environment.

4.4.2 Identify

To analyze a job’s hazards and potential hazards and determine how best to control them, it is important to identify all significant hazards accurately and understand each within the context of the entire job being analyzed.

4.4.2.1 Break Job Into Steps

Every job requires several steps. Each has its share of hazards that puts workers at risk.

To complete a job hazard analysis, first there must be a clear understanding of the steps required to complete the job. The observer will watch the worker perform the job and list the steps the worker takes to complete it.

When breaking a job into its constituent steps, it is important to balance between too much detail and too little. Too much detail will make the analysis needlessly long, and too little will not cover the basic steps.

Each step is one action. Some actions may not be observable, and some steps may involve specifically **not** doing things.

The observation for the JHA is focused on neither the employee's performance, nor individual unsafe acts. It should focus on the task itself. All phases of the analysis benefit from employee insight and feedback, and extensive employee involvement is strongly encouraged.

OSHA recommends video recording or photographing the worker performing the job and having them explain each step and why they do it that way. These visual records can be handy references when doing a more detailed assessment of the work.

When all the steps are documented, the observer will review them with the employee to ensure nothing is missed.

4.4.2.2 Identify Hazards

The JHA requires answers to the following:

- What can go wrong?
- What are the consequences?
- How could the hazard arise?
- What are the other contributing factors?
- How likely is it that the hazard will result in an incident?

A good description of a possible hazard scenario will reveal the answers to those questions by describing the hazard in terms of the environment in which it occurs, the trigger that would precipitate an incident, how a worker faces exposure to the hazard, and the worst-case consequences.

Again, workers provide excellent insight into the hazards they work with as well as suggestions for how to control risks presented by hazards where they work.

The JHA should not only include actual hazards, but also potential hazards that could arise while performing the job:

- Is there danger of striking against, being struck by, or otherwise making harmful contact with an object?
- Can the worker be caught in, by, or between objects?
- Is there potential for a slip or trip?
- Can the employee fall from one level to another or even on the same level?

- Can pushing, pulling, lifting, lowering, bending, or twisting cause strain?
- Is the work environment hazardous to safety or health?
- Are there concentrations of toxic gas, vapor, fumes, or dust?
- Are there potential exposures to heat, cold, noise, or ionizing radiation?
- Are there flammable, explosive, or electrical hazards?

Please see the table of Workplace Hazards at the end of this chapter for reference.

A list of hazards must accompany each step of the job. This provides a framework pointing to controls already in place and controls needed to prevent hazards from causing injuries or illnesses.

4.4.3 Control

Though awareness and thoughtfulness are excellent ways to reduce risk in the workplace, it is not enough simply to identify workplace hazards. Hazards in the workplace that are identified must be controlled if possible to minimize their risk. The JHA provides a systematic way to approach hazards and their controls. To control a hazard, it is important to remember two very basic principles. First, either eliminate the hazard itself or control worker exposure to the hazard. Second, eliminating a hazard is more effective than controlling exposure to a hazard.

These two principles shape a hierarchy of hazard control strategies (see Figure 1). When considering how to address the hazards in each step of a given job, controls at the top of the hierarchy need to be considered before controls toward the bottom of the hierarchy. The more reliable and less likely a hazard control can be circumvented, the better.

A good hazard control plan often includes a mixture of different things, such as the following:

- priority given to high-risk hazards;
- cheap, easy improvements and temporary solutions until more reliable controls are in place;
- long-term solutions to risks most likely to cause accidents or ill health;
- long-term solutions to risks with the worst potential consequences;
- arrangements for training workers on the main risks that remain and how they are to be controlled; and
- regular checks to make sure the control measures stay in place, and clear responsibilities. Who will lead on what action, and by when?

4.4.3.1 Controlling the Hazard

The most effective strategy is to "engineer the hazard out" by using control methods that physically remove or change a hazardous machine, work environment condition or other hazard. If, during the JHA, you discover a hazard that can be engineered out, do it. Turn the dangerous step into a safe step that doesn't require safety precautions.

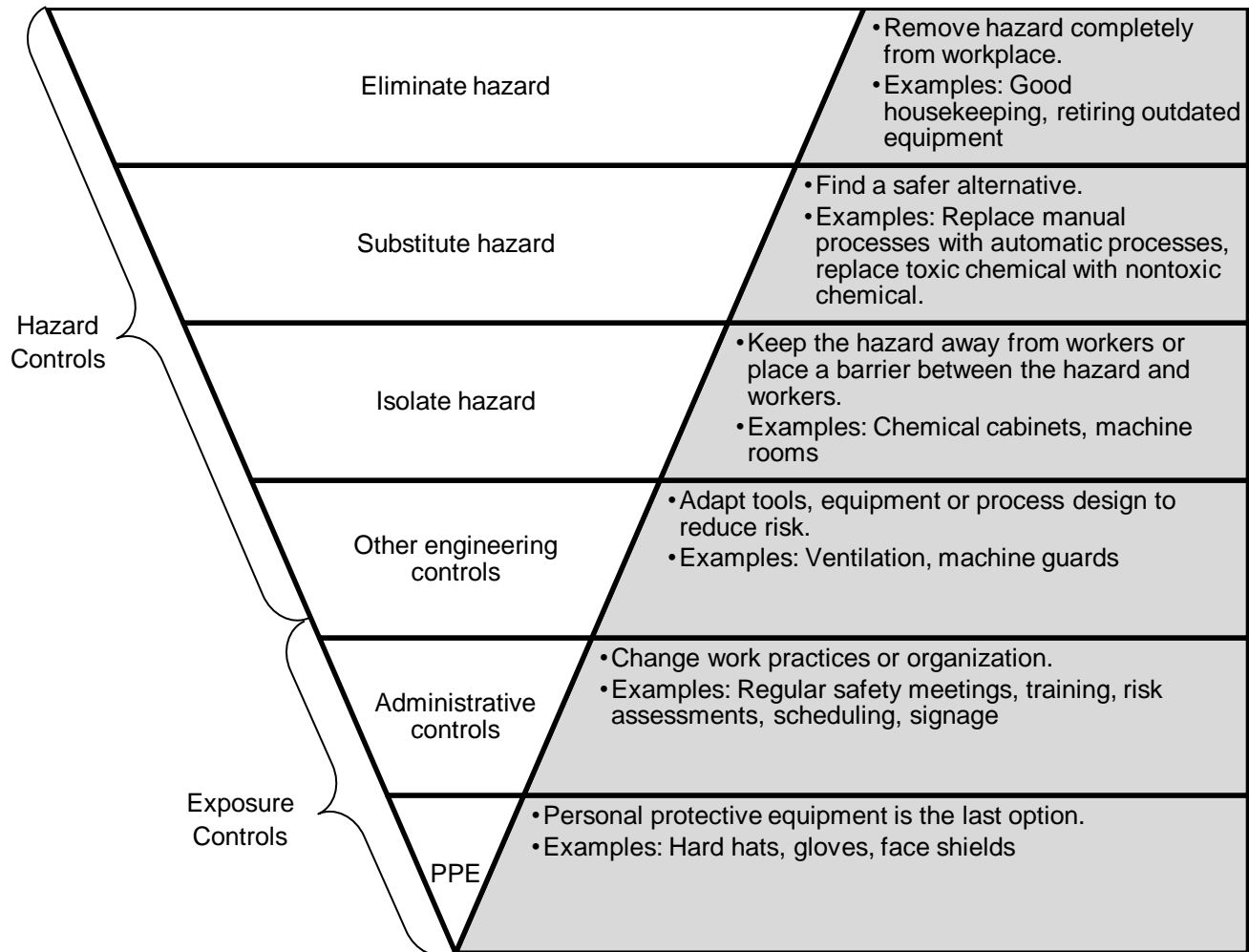


Figure 1 — Hierarchy of Hazard Controls

Elimination

If there are hazards that can be removed from the worksite, do this first. Good housekeeping procedures keep many hazards under control. Removing redundant or unnecessary equipment, materials or processes also rids the workplace of any risks associated with them.

Substitution

There may be alternative chemicals, machines, or processes to accomplish the job but pose fewer hazards to workers. Explore ways to incorporate these alternatives into the job.

Isolation and Other Engineering Approaches

Creating a boundary between a hazard and workers can reduce risk almost as effectively as removing the hazard from the workplace altogether. Limit access to hazards with enclosures, machine guards and physical barriers that reduce the likelihood of exposure to a hazard before turning to controls that rely on a person.

Redesigning equipment and installing new guards (within manufacturer specifications) can remove or redirect hazards away from workers to prevent exposure.

4.4.3.2 Controlling Exposure

Some jobs and processes demand a level of exposure to some workplace hazards. If this is the case, controlling risk means controlling or eliminating the exposure and the negative effects of exposure.

Administrative or Management Controls

Administrative hazard controls are far-reaching and varied when implemented. These controls rely on appropriate human behavior, which is why they are lower on the hazard control hierarchy than engineering controls. Administrative controls include:

- Policies, procedures and practices to reduce exposure;
- Modifying work schedules to reduce exposure;
- Monitoring the use of hazardous materials;
- Alarms, signs and warnings;
- The buddy system; and
- Training.

Personal Protective Equipment

Personal protective equipment (PPE) is the least effective way to control hazards, but is necessary for some hazardous jobs. The following are examples of when PPE is acceptable:

- When engineering controls are not feasible or do not totally eliminate the hazard;
- While engineering controls are being developed;
- When safe work practices do not provide sufficient additional protection; and
- During emergencies when engineering controls may not be feasible.

PPE needs to be chosen carefully to address the hazard, and fitted to the person using it.

4.4.4 Document and Evaluate

By the end of the JHA, there will be a document that clearly outlines the steps to perform the job, the hazards encountered in each step, and appropriate controls that need to be in place to reduce the risk posed by those hazards. This will paint a picture of a process that takes safety into account from the start to end of the job.

However, unsafe habits have a way of introducing themselves into a process as workers find their “own way” of performing tasks — ways that may not take into account the safety measures identified in the JHA. Further, there may be risks that were not identified or were left insufficiently controlled that may only become evident after the JHA is complete. Monitoring and periodic reviews help ensure the JHA remains current to prevent accidents and injuries.

4.4.4.1 Document the Safe Job Procedure

Once the analysis is complete, communicate the results to all workers who are, or will be, performing that job. The side-by-side format used in JHA worksheets is not an ideal one for instructional purposes. Use a narrative-style communication format to create a safe job procedure that is easy to understand:

- **Write in step-by-step format:** Each step needs its own paragraph that describes the step as one action.

- **Point out the hazard:** If the step involves exposure to a hazard, point out the hazard in the step. Include the possible injury or illness that could result from unprotected exposure to the hazard.
- **Identify safety precautions:** If the step involves exposure to a hazard, also point out the safety precautions to stay safe and healthy.
- **Paint a 'word picture':** Write the procedure in a way that someone unfamiliar with the task could perform it safely. The safe job procedure can serve as a training document as well as a safety document. Avoid jargon and technical terms so new employees can easily understand the process.
- **Write in the second person, present tense:** Treat the safe job procedure as a set of instructions. Tell the person who is doing the job exactly how to do it.
- **Write clearly:** While it is important to be concise, it is more important to be clear and accurate. Keep sentences short. Clear writing helps make sure all workers can understand the instructions and follow them. If employees speak a language other than English, translate the job procedure into the language they speak so there is as little confusion as possible.

4.4.4.2 Monitor and Review

Periodically reviewing your JHA ensures it is current and continues to prevent workplace accidents and injuries. Even if the job does not change, unnoticed hazards may become apparent. It is particularly important to review job hazard analyses if an illness or injury occurs.

Based on the circumstances, the job procedure may need to change to prevent similar incidents in the future. If an employee's failure to follow proper job procedures results in a "close call or near miss," discuss the situation with all employees who perform the job and remind them of proper procedures. Any time you revise a job hazard analysis, it is important to train all employees affected by the changes in the new job methods, procedures, or protective measures.

Hazard identification, and risk assessment and control are ongoing processes. Make sure to undertake a hazard identification and risk control analysis whenever there is a change to the workplace, including when work systems, tools, machinery or equipment change, or when the existing process is otherwise potentially out of date or no longer valid.

4.5 Forms & Attachments

On the following pages, please find the following documents:

- Workplace Hazards
- Job Hazard Analysis Worksheet
- Safe Job Procedure Form
- Job Hazard Analysis Training Documentation

Workplace Hazards		
Hazard	Description	
Slips/Trips/Falls	Conditions that result in falls (impacts) from height or walking surfaces (such as slippery floors, poor housekeeping, uneven walking surfaces, exposed ledges, etc.)	
Mechanical	Failure	Self-explanatory; typically occurs when devices exceed designed capacity or are inadequately maintained.
	Caught-in/ Caught-on/ Crush	Skin, muscle, or body part exposed to crushing, caught-between, cutting, tearing, shearing items or equipment.
Impact	Struck By	Accelerated mass that strikes the body causing injury or death. (Examples are falling objects and projectiles.)
	Struck Against	Injury to a body part as a result of coming into contact of a surface in which action was initiated by the person. (An example is when a screwdriver slips.)
Chemical	Toxic	A chemical that exposes a person by absorption through the skin, inhalation, or through the blood stream that causes illness, disease, or death. The amount of chemical exposure is critical in determining hazardous effects. Check Safety Data Sheets (SDS), and/or OSHA 1910.1200 for chemical hazard information.
	Flammable	A chemical that, when exposed to a heat ignition source, results in combustion. Typically, the lower a chemical's flash point and boiling point, the more flammable the chemical. Check SDS for flammability information.
	Corrosive	A chemical that, when it comes into contact with skin, metal, or other materials, causes damage. Acids and bases are examples of corrosives.
Explosion	Chemical Reaction	Self-explanatory.
	Pressurization	Sudden and violent release of a large amount of gas/energy due to a significant pressure difference such as rupture in a boiler or compressed gas cylinder.
Temperature Extreme	Temperatures that result in heat stress, exhaustion, or metabolic slow down such as hypothermia or hyperthermia.	

Electrical	Shock/ Short Circuit	Contact with exposed conductors or a device that is incorrectly or inadvertently grounded, such as when a metal ladder comes into contact with power lines. 60Hz alternating current (common house current) is very dangerous because it can stop the heart.
	Fire	Use of electrical power that results in electrical overheating or arcing to the point of combustion or ignition of flammables, or electrical component damage.
	Static / ESD	The moving or rubbing of wool, nylon, other synthetic fibers, and even flowing liquids can generate static electricity. This creates an excess or deficiency of electrons on the surface of material that discharges (spark) to the ground resulting in the ignition of flammables or damage to electronics.
	Loss of Power	Safety-critical equipment failure as a result of loss of power.
Ergonomics	Strain	Damage of tissue due to overexertion (sprains and strains) or repetitive motion.
	Human Error	A system design, procedure, or equipment that is likely to cause error. (A switch goes up to turn something off).
	Vibration	Vibration that can cause damage to nerve endings, or material fatigue that results in a safety-critical failure. (Examples are abraded slings and ropes, weakened hoses and belts.)
Radiation	Ionizing	Alpha, Beta, Gamma, neutral particles, and X-rays that cause injury (tissue damage) by ionization of cellular components.
	Non-Ionizing	Ultraviolet, visible light, infrared, and microwaves that cause injury to tissue by thermal or photochemical means.
	Noise	Noise levels that result in hearing damage (an 8-hour time-weighted average greater than 85 decibels) or inability to communicate safety-critical information.
	Visibility	Lack of lighting or obstructed vision that results in an error or other hazard.
	Weather Phenomena	Self-explanatory.

Job Hazard Analysis Worksheet		
Department/Project:		Date:
Job/Activity:		Created By:
Step	Hazard(s)	Controls
1)		
2)		
3)		
4)		
5)		
6)		
7)		

Job Hazard Analysis Worksheet (pg. 2)

Step	Hazard(s)	Controls
8)		
9)		
10)		
11)		
12)		
Required Training:		
Required Personal Protective Equipment:		
Special Inspection Requirements:		

Please attach any diagrams, flowcharts or photographs that may be helpful in hazard assessment.

Job Hazard Analysis








Safe Job Procedure

DO NOT undertake this job unless a supervisor has instructed you in the safe use of all equipment and appropriate safety precautions for work processes associated with the job. Any employee who undertakes this job must have explicit supervisor permission to do so.

Job Performed _____

Potential Hazards: _____

Personal Protective Equipment

						
<input type="checkbox"/> Hand Protection	<input type="checkbox"/> Respiratory Protection	<input type="checkbox"/> Eye Protection	<input type="checkbox"/> Face Protection	<input type="checkbox"/> Special Footwear	<input type="checkbox"/> Hearing Protection	<input type="checkbox"/> Special Clothing

Other (Specify): _____

Safe Work Procedures

(Attach additional sheets if necessary)

Pre-Operation

Operation

Post-Operation

Competent Personnel

These individuals are permitted to perform the job and supervise others learning to do this job

Name:	Title:	Contact:

5

Accident Investigation

5.1 Policy Statement

Safety incidents indicate the failure of safety control systems and demand changes to prevent future harm. In order to implement necessary changes and prevent future harm, *Pyro Combustion & Controls Inc.* will investigate accidents and near-misses to identify causes and make safety recommendations.

The purpose of workplace accident investigations at *Pyro Combustion & Controls Inc.* is to find facts to guide future actions, not to find fault or assign blame.

Fatalities and catastrophes, defined as an event that requires inpatient hospitalization of three or more employees, must be reported to OSHA within 8 hours. Serious accidents where an employee is admitted to a hospital for treatment or observation as a result of injuries suffered from a workplace accident, must be reported to OSHA within 24 hours.

If an employee with an occupational injury or illness receives a medical emergency procedure, *Gary Pfizenmayer* or designate will document the incident on OSHA's Form 301 "Injury and Illness Incident Report" and record the injury or illness on the OSHA's Form 300 "Log of Work Related Injuries and Illnesses". See "29 CFR 1904.7 — Recordkeeping Forms and Recording Criteria".

5.2 Responsibilities

Accident investigations are a responsibility shared between *Pyro Combustion & Controls Inc.* and its employees.

5.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Provide accident investigation training to supervisors and safety committee members;
- Ensure that every accident is investigated to find and remedy the root causes;
- Respond promptly to any recommendation following an accident;
- Ensure all corrective actions have been taken to prevent the recurrence of an accident;
- Avoid blaming individuals in incident investigations for safety purposes;
- Report to the appropriate authority, as required by law, any catastrophe, fatality, injury or work-related illness; and
- Share with employees the findings of accident investigations.

5.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Help establish and maintain an accident investigation procedure that encourages employee involvement, management support, and company-wide accountability;
- Provide support to respond to recommendations and implement changes to prevent future incidents; and
- Review workplace safety incidents to identify areas of concern and recommend necessary actions.

5.2.3 Employee Responsibilities

Every *Pyro Combustion & Controls Inc.* employee is expected to:

- Immediately report any work-related accident, injury or near-miss to the appropriate supervisor;
- Actively cooperate with investigators during accident investigations; and
- Participate in recommending changes to processes, systems and the workplace, and help implement changes as necessary, to prevent future accidents.

5.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on their role in the accident investigation process. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to educational level, literacy, and language of employees.

5.3.1 Training Components

Gary Pfizenmayer will ensure that all employees at *Pyro Combustion & Controls Inc.* are informed and trained in the following minimum elements for accident investigation:

- What an accident is and why accidents occur;
- What a near-miss is and why it is as important to understand the causes of near-misses as the causes of accidents;
- How to report an accident;
- A general overview of the accident investigation process;
- Why accident investigations are important and the purpose of them; and
- Different levels of causes for accidents.

Managers, Supervisors and Safety Committee Members will complete training in the following minimum elements for accident investigation:

- Legal requirements of accident reporting;
- Securing an accident scene;
- Planning an accident investigation;
- Collecting information from an accident scene;
- Conducting interviews as part of an accident investigation;
- Photographing and sketching an accident;
- Creating a timeline of an accident;
- Root cause analysis techniques;
- Accident investigation reports; and
- Recommending change to prevent accidents.

5.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

5.4 Policy

5.4.1 Background

It is easy to think of an accident simply as a single event that results in injury or illness to an employee and possibly property damage. In reality, an accident is the culmination of a series of events. Accidents are the end of an unplanned, unintended and undesired process. They are complex and in some industries exceedingly rare, often with several events that can be identified as causes.

It is also easy to think of accidents as being the result of poor chance or fate. However, a competent person can examine workplace conditions, behaviors and underlying systems to predict what kind of accidents will occur. There is certainly an element of chance that precipitates an incident, however all accidents can be prevented by eliminating and controlling workplace hazards.

A serious accident may result in disability, severe property damage or even death; a minor accident may only cause an inconvenience; near misses may not harm anyone or anything. However, accidents of any kind and near misses all point to failures in safety systems that demand a closer look to prevent more harm in the future.

5.4.1.1 Investigations

An accident investigation may have different purposes, including:

- Identifying and describing the actual course of events;
- Identifying the direct and root causes / contributing factors of the accident;
- Identifying risk reducing measures to prevent future, comparable accidents;
- Investigating and evaluating the basis for potential criminal prosecution;
- Fulfilling legal requirements or processing workers' compensation claims; and
- Evaluating the question of guilt in order to assess the liability for compensation.

Police, insurance investigators or safety regulators may investigate an accident for other reasons, but *Pyro Combustion & Controls Inc.* accident investigations emphasize finding the root causes of the accident to prevent future accidents from happening again.

Investigators are interested not only in individual harmful events, but also the events, systems and processes that led to the accident. Accident investigations need to determine exactly what happened, but more importantly must look for deeper causes — the how and why.

Incidents that involve no injury or property damage should still be investigated to determine which hazards should be corrected. The same principles apply to a quick inquiry of a minor incident and to the more formal investigation of a serious event.

5.4.1.2 Procedures for Accident Investigations

The best time to develop accident investigation procedures is before the accident occurs.

The plan should include procedures that determine:

- Who to notify when an accident occurs;
- Who may notify outside agencies (fire, police, etc.);
- Who will conduct investigations;
- Who will maintain recordkeeping documents;
- What training is required for accident investigators;
- Who receives and acts on investigation reports; and
- Timetables for conducting hazard correction.

At *Pyro Combustion & Controls Inc.*, pre-accident investigation planning is a team effort between the safety committee and *Gary Pfizenmayer*. Nevertheless, there are some key steps to help ensure an accident investigation will accomplish its goal of preventing future incidents. See Figure 1 for an outline of the general steps of an accident investigation.

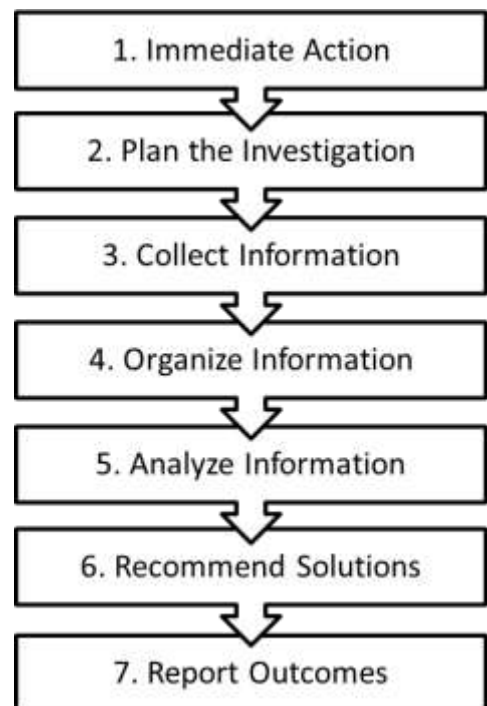


Figure 1

5.4.1.3 Reporting accidents

Pyro Combustion & Controls Inc. will investigate all lost-time injuries. Any fatality or the hospitalization of three or more employees must be reported to OSHA within 8 hours. Serious accidents must be reported to OSHA within 24 hours.

Employees will report all accidents and near miss incidents that result in personal injury, property damage, chemical spill, or other emergency situation to the assigned supervisor at the time of the event, and Emergency Medical Service, Fire Department, or Hazmat Services will be immediately summoned as needed.

5.4.2 Immediate Action

5.4.2.1 Secure Accident Scene

The first action to take at an accident scene is to prevent further injuries and make the area safe. Administer first aid (or ensure it is administered) or summon appropriate emergency responders as necessary.

Sometimes, an investigation can begin while the victim is being assisted by emergency responders. However, the priority is always taking care of the victim, and usually investigations don't begin until emergency response is completed. Material evidence will most likely not be in its original location, but effective interviews can shed light on the scene at the time of the accident.

In either situation, at this point gathering as much pertinent information as possible for later analysis takes priority over figuring out the cause of the accident, but **the top priority should always be the safety and well-being of workers and the public.**

5.4.2.2 Preliminary Investigation

It is important to start the investigation as soon as possible. Time between the accident and the investigation can lead to a deterioration of evidence and undermine the accuracy of the investigation.

Material Evidence

There is a temptation to immediately clean up the accident scene so people can get back to work, but an effective procedure will protect material evidence for the investigation.

Securing the scene of an accident is important to do quickly. Tape, rope, cones, or even personnel can secure the accident scene.

Memory

Memories are not nearly as reliable as most people think. Further, trauma from the accident can impact how the memory of an incident is retained. Over time and through conversations with other workers, distortions of what people believe they saw and heard begin to emerge or grow. Moving quickly to investigate an accident helps ensure memories an investigator hears about an incident are as reliable as possible.

5.4.2.3 Plan Investigation

Most investigation planning should happen well in advance of an accident. However, some details of the investigation can only be seen after the fact. The nature of the accident will determine the extent of the investigation, the resources that will be needed, what types of investigative processes will be required, who will need to be interviewed, etc.

Build Team

Ideally, someone experienced in accident causation and investigative techniques will conduct accident investigations. An investigator who is also fully knowledgeable of the work processes, procedures, peoples, and general work environment of a particular situation will be able to shed some light on the causes of the accident.

In most cases, the supervisor should help investigate, together with at least one employee representative from the safety committee, the safety coordinator and/or whoever is in charge of worksite inspections. Other members of the team can include:

- employees with knowledge of the work;
- a union representative, if applicable;
- employees with experience in investigations; or
- an impartial expert from outside the company.

It is important the team represents a variety of expert perspectives on workplace safety and the job being performed when the accident happened. However, everyone on the team should be trained in appropriate investigative techniques and not be involved in any disciplinary proceedings that might emerge out of the incident if at all possible.

It is important to keep the investigation for safety purposes separate from any possible disciplinary action. Accident investigations will always focus on identifying safety failures and remedying them promptly.

5.4.3 Collect Information

The next step is to gather useful information about what directly and indirectly contributed to the accident. When collecting information to better understand an incident or accident, consider all possible sources.

5.4.3.1 Photograph and Video

Photographs and video recording can help in the preparation of a report as well as in analyzing conditions at the site of the incident. Photographic evidence should be taken as soon as safely possible. Following are some techniques useful in taking photographs at incident scenes:

- Photograph the overall area before moving to detail the precise incident site.
- Take photos from different perspectives and angles; close up and from a distance.
- Use witnesses to help you decide what to shoot; note their comments.
- Record what photos you take in a log that includes details like when the shot was taken, by whom, where, what the shot contains, identifying number on a sketch of the area, and a brief description of what the photograph is trying to identify.
- Keep the photos in a safe place along with notes, evidence and sketches from the accident investigation.
- Narrate video with details like those above.

5.4.3.2 Sketch Scene

Sketches complement information in photo or video, indicating distances among elements of the accident scene.

It is important to be as precise as possible when making sketches. Following are some things to remember:

- Make sketches large and clear.
- Include basic facts (Date, time, location, identity of objects, victims, etc.)
- Define spatial relationships with identifiable points of reference and compass directions
- Include important measurements and note key concepts.
- Indicate what has been included in photographs.
- Mark where people were standing.

Eventually, a precise diagram can reflect the information in a sketch, but it is important to get as much information as possible immediately after the accident.

5.4.3.3 Interview Witnesses

Witnesses are the easiest way to gather an understanding of how the accident occurred and the conditions that led to the accident. Witnesses include people who saw the incident, the injured person and people whose behavior, actions and/or inactions — either intentionally or unintentionally — contributed to the incident. This can include supervisors and trainers, maintenance personnel, and anyone else tied to the investigation.

When interviewing, it is important to remember emotions can run high in the wake of an accident, especially a catastrophic one. The accident investigation is a cooperative effort to create a safer workplace by gathering and understanding information. Keep an open mind and listen with a calm, relaxed, unhurried demeanor.

- Only use a tape recorder with permission; offer a copy of the tape to the interviewee.
- Express to the individual that the information given is important, but put the person at ease. Explain the purpose and your role. Sincerely express concern regarding the accident and desire to prevent a similar occurrence.
- Interview witnesses separately and ensure witnesses can discuss the incident with you in relative privacy where possible. Don't promise confidentiality though.
- Take the witness to the scene if it is comfortable. If you can't conduct a private interview at the location, find an office or meeting room that the interviewee considers a "neutral" location.
- Allow witnesses to have a support person present but ensure the support person is not directly linked to the incident and is not a witness. If there is a collective bargaining agreement, and a worker requests union representation, do not continue the interview until representation has been secured.
- Direct an eyewitness to "explain what happened." If you don't ask them to explain, you may be left with a simple "no," and that's that. Open-ended questions elicit much more information than close-ended questions, but "why" questions can put an interviewee on guard. Look for facts and observations, ignore speculation.
- Take notes casually, but with care. Allow the interviewee to review notes of the interview to ensure accuracy and help bring details to mind. Give the interviewee a copy of the notes you take to help reduce any thought that you're trying to conceal information.
- Repeat the facts and sequence of events back to the person to avoid misunderstandings and establish the correct version of events.
- Request interviewees offer their own suggestions as to how the incident could have been avoided.
- Conclude interviews by thanking interviewees for their contribution. Ask them to contact you if they think of anything else. If possible, tell witnesses personally of the outcome of the investigation before it becomes public knowledge.

5.4.3.4 Consult Records

When searching for information, investigations should not stop at the scene of the accident, physical evidence or the people involved. Documents related to the incident can provide incredible insight into the causes of an accident, especially root causes. Some examples of useful documents follow:

- technical data sheets;
- health and safety committee minutes;
- inspection reports;
- company policies;
- maintenance reports;
- past accident reports;
- job hazard analyses and safe-work procedures;
- training records and reports;
- work schedules;
- injury and illness logs; and
- any other document that may shed light on the safety-related systems in place where the accident took place.

Finding the causes of the accident based on available information may be difficult because events must be analyzed not only to identify direct causes for the accident, but also related root

causes. Surface causes can be obvious. However, it may take a great deal more time to unearth weaknesses in management systems, or root causes, that contributed to the conditions and practices associated with the accident (see Figure 2).

5.4.4 Organize and Analyze the Facts

5.4.4.1 Develop Sequence of Events

When all the evidence is collected and all the interviews are complete, a timeline of the accident should emerge. Each event on the timeline describes an actor and an action. The actor effects change through action or inaction. Actors do not have to be personnel. Equipment or processes can impact the system to precipitate an accident.

When developing the sequence of events, do not hesitate to stretch the timeline further back as deeper causes begin to emerge. Accidents often result from long-term oversights and failures that have taken some time to have a negative impact.

If gaps in the timeline are apparent, they need to be filled in. If re-interviewing witnesses or investigating the evidence fails to fill the gaps, develop a “best guess” supported by the rest of the timeline and available evidence.

The sequence of events should describe what happened in such a way that someone unfamiliar can understand what likely happened.

5.4.4.2 Determine the Causes

When the timeline is established the next step is to determine the causes of the accident. The key question for an investigator to establish cause is “Why?” Why did an unsafe condition emerge in the workplace? Why did the worker end up exposed to the unsafe condition? However, to dig to root causes of an accident requires asking “Why?” over and again.

5.4.5 Implement Solutions

While an accident investigation is partly a reactive safety process, if it ends in recommendations for effective control strategies and system improvements, the investigation helps prevent similar accidents in the future.

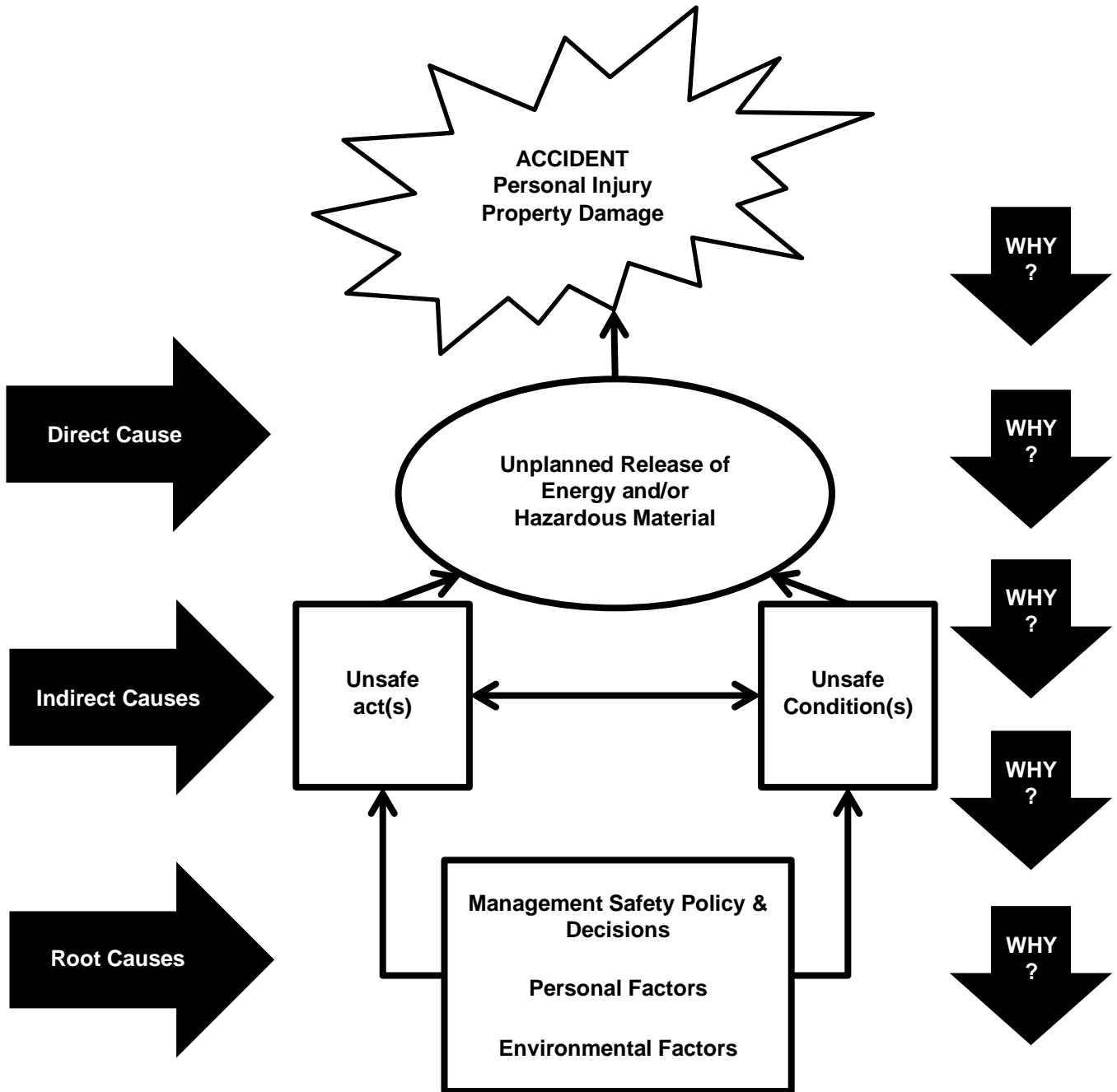


Figure 2

5.4.5.1 Write the Report

An accident or incident investigation aims to create systemic change and ensure everyday safeguards remain in place to reduce risk and promote safety in the workplace. However, the information uncovered in the investigation and recommendations that come from the investigation need to be available to people with authority. A report that includes the pertinent information about the causes of an incident and concrete recommendations helps the investigation to positively impact the safety culture of *Pyro Combustion & Controls Inc.*

Please see the “Accident/Incident Report” at the end of this chapter for an example template for an incident report.

Background: This section of the report covers the basic information about the accident: when the accident occurred, where and who was involved.

Description: The description of the incident should be a timeline of the incident — a step-by-step narrative of what occurred. How far before and after the incident itself the narrative should stretch will depend on the incident and the findings of the investigation. Include enough information to give a person who was not there a clear understanding of the accident. Be specific. Include a diagram of the event.

Findings: Report results of the root-cause analysis with complete thoughts, not short notes. Remember to describe both hazardous conditions and unsafe actions. Findings need to include direct and indirect surface causes. Findings should also clearly outline the root causes of the accident and frame recommendations. Remember, the point of the investigation is not to assign blame. Findings will describe unsafe actions of individuals, but any lack of hazard controls or deficient safety systems at the organizational level is what the report aims to remedy.

Recommendations: Recommendations can be only as effective as the findings on which they are based. In the report, recommendations need to be specific and help those in authority take the first steps to implement the recommendations. Include who will be responsible to implement the recommendations, a timeline and estimated cost if that can be determined.

Summary: Review the causes of the accident and the corrective steps that were recommended.

Review and Follow-up: This can be included as part of the recommendations. Necessary changes require a system of accountability. Suggesting a specific timeframe and specific individuals with appropriate authority to enact recommendations will drive the needed changes. Incorporating accident follow-up and accountability into safety committee activities is a useful way to build widespread accountability for the types of safety system changes workplace accidents often demand.

Attachments: Be sure to include the notes from interviews, photographs and any other pertinent information and evidence from the investigation with the report.

5.4.6 Policy evaluation and recordkeeping

Accident investigation procedure and this policy will be evaluated annually and revised as necessary.

5.4.6.1 Reporting Catastrophes and Fatalities

Fatalities and catastrophes — defined as an event that requires inpatient hospitalization of three or more employees — must be reported to OSHA within 8 hours. Serious accidents where an employee is admitted to a hospital for treatment or observation as a result of injuries suffered from a workplace accident, must be reported to OSHA within 24 hours. **1-800-321-OSHA (1-800-321-6742)**

5.4.6.2 OSHA's Form 300, 300A and 301

Unless in a low-hazard industry (list to right) or employing 10 or fewer individuals, all recordable injuries and illnesses will be recorded appropriately. See "1904.7 — Recordkeeping Forms and Recording Criteria."

If an employee with an occupational injury or illness receives a medical emergency procedure, *Gary Pfizenmayer* or designate will document the incident on OSHA's Form 301 "Injury and Illness Incident Report" and record the injury or illness on the OSHA's Form 300 "Log of Work Related Injuries and Illnesses".

Yearly, OSHA's form 300A "Summary of Work-Related Injuries and Illnesses" will be completed based on the information in form 300 and posted from **February 1 to April 30** of the year following the year covered by the form.

See "29 CFR 1904.7 — Recordkeeping Forms and Recording Criteria."

5.5 Forms & Attachments

On the following pages, please find the following documents:

- 29 CFR 1904.7 — Recording and Reporting Occupational Injuries and Illness
- Accident/Incident Report
- Accident Investigation Training Documentation

These forms may be reproduced freely by *Pyro Combustion & Controls Inc.* for the purposes of implementing and maintaining a safety and health program.

SICs of recordkeeping-exempt industries

525	Hardware Stores
542	Meat and Fish Markets
544	Candy, Nut, and Confectionary Stores
545	Dairy Products Stores
546	Retail Bakeries
549	Miscellaneous Food Stores
551	New and Used Car Dealers
552	Used Car Dealers
554	Gasoline Service Stations
557	Motorcycle Dealers
56	Apparel and Accessory Stores
573	Radio, Television, and Computer Stores
58	Eating and Drinking Places
591	Drug Stores and Proprietary Stores
592	Liquor Stores
594	Miscellaneous Shopping Goods Stores
599	Retail Stores, Not Elsewhere Classified
60	Depository Institutions (Banks and Savings Institutions)
61	Nondepository Institutions (Credit Institutions)
62	Security and Commodity Brokers
63	Insurance Carriers
64	Insurance Agents, Brokers, and Services
653	Real Estate Agents and Managers
654	Title Abstract Offices
67	Holding and Other Investment Offices
722	Photographic Studios, Portrait
723	Beauty Shops
724	Barber Shops
725	Shoe Repair and Shoeshine Parlors
726	Funeral Service and Crematories
729	Miscellaneous Personal Services
731	Advertising Services
732	Credit Reporting and Collection Services
733	Mailing, Reproduction, and Stenographic Services
737	Computer and Data Processing Services
738	Miscellaneous Business Services
764	Reupholstery and Furniture Repair
78	Motion Picture
791	Dance Studios, Schools, and Halls
792	Producers, Orchestras, Entertainers
793	Bowling Centers
801	Offices and Clinics of Medical Doctors
802	Offices and Clinics of Dentists
803	Offices of Osteopathic Physicians
804	Offices of Other Health Practitioners
807	Medical and Dental Laboratories
809	Health and Allied Services, Not Elsewhere Classified
81	Legal Services
82	Educational Services (Schools, Colleges, Universities, and Libraries)
832	Individual and Family Services
835	Child Day Care Centers
839	Social Services, Not Elsewhere Classified
841	Museums and Art Galleries
86	Membership Organizations
87	Engineering, Accounting, Research, Management, and Related Services
899	Services, Not Elsewhere Classified

29 CFR 1904.7 — Recording and Reporting Occupational Injuries and Illness

- a) **Basic requirement.** You must consider an injury or illness to meet the general recording criteria, and therefore to be recordable, if it results in any of the following: death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, or loss of consciousness. You must also consider a case to meet the general recording criteria if it involves a significant injury or illness diagnosed by a physician or other licensed health care professional, even if it does not result in death, days away from work, restricted work or job transfer, medical treatment beyond first aid, or loss of consciousness.
- b) **Implementation.**
- 1) **How do I decide if a case meets one or more of the general recording criteria?** A work-related injury or illness must be recorded if it results in one or more of the following:
 - i) Death. See § 1904.7(b)(2).
 - ii) Days away from work. See § 1904.7(b)(3).
 - iii) Restricted work or transfer to another job. See § 1904.7(b)(4).
 - iv) Medical treatment beyond first aid. See § 1904.7(b)(5).
 - v) Loss of consciousness. See § 1904.7(b)(6).
 - vi) A significant injury or illness diagnosed by a physician or other licensed health care professional. See § 1904.7(b)(7).
 - 2) **How do I record a work-related injury or illness that results in the employee's death?** You must record an injury or illness that results in death by entering a check mark on the OSHA 300 Log in the space for cases resulting in death. You must also report any work-related fatality to OSHA within eight (8) hours, as required by § 1904.39.
 - 3) **How do I record a work-related injury or illness that results in days away from work?** When an injury or illness involves one or more days away from work, you must record the injury or illness on the OSHA 300 Log with a check mark in the space for cases involving days away and an entry of the number of calendar days away from work in the number of days column. If the employee is out for an extended period of time, you must enter an estimate of the days that the employee will be away, and update the day count when the actual number of days is known.
 - i) **Do I count the day on which the injury occurred or the illness began?** No, you begin counting days away on the day after the injury occurred or the illness began.
 - ii) **How do I record an injury or illness when a physician or other licensed health care professional recommends that the worker stay at home but the employee comes to work anyway?** You must record these injuries and illnesses on the OSHA 300 Log using the check box for cases with days away from work and enter the number of calendar days away recommended by the physician or other licensed health care professional. If a physician or other licensed health care professional recommends days away, you should encourage your employee to follow that recommendation. However, the days away must be recorded whether the injured or ill employee follows the physician or licensed health care professional's recommendation or not. If you receive recommendations from two or more physicians or other licensed health care professionals, you may make a decision as to which recommendation is the most authoritative, and record the case based upon that recommendation.
 - iii) **How do I handle a case when a physician or other licensed health care professional recommends that the worker return to work but the employee stays at home anyway?** In this situation, you must end the count of days away from work on the date the physician or other licensed health care professional recommends that the employee return to work.
 - iv) **How do I count weekends, holidays, or other days the employee would not have worked anyway?** You must count the number of calendar days the employee was unable to work as a result of the injury or illness, regardless of whether or not the employee was scheduled to work on those day(s). Weekend days, holidays, vacation days or other days off are included in the total number of days recorded if the employee would not have been able to work on those days because of a work-related injury or illness.
 - v) **How do I record a case in which a worker is injured or becomes ill on a Friday and reports to work on a Monday, and was not scheduled to work on the weekend?** You need to record this case only if you receive information from a physician or other licensed health care professional indicating that the employee should not have worked, or should have performed only restricted work, during the weekend. If so, you must record the injury or illness as a case with days away from work or restricted work, and enter the day counts, as appropriate.
 - vi) **How do I record a case in which a worker is injured or becomes ill on the day before scheduled time off such as a holiday, a planned vacation, or a temporary plant closing?** You need to record a case of this type only if you receive information from a physician or other licensed health care professional indicating that the employee should not have worked, or should have performed only restricted work, during the scheduled time off. If so, you must record the injury or illness as a case with days away from work or restricted work, and enter the day counts, as appropriate.

Accident Investigation

- vii) **Is there a limit to the number of days away from work I must count?** Yes, you may "cap" the total days away at 180 calendar days. You are not required to keep track of the number of calendar days away from work if the injury or illness resulted in more than 180 calendar days away from work and/or days of job transfer or restriction. In such a case, entering 180 in the total days away column will be considered adequate.
 - viii) **May I stop counting days if an employee who is away from work because of an injury or illness retires or leaves my company?** Yes, if the employee leaves your company for some reason unrelated to the injury or illness, such as retirement, a plant closing, or to take another job, you may stop counting days away from work or days of restriction/job transfer. If the employee leaves your company because of the injury or illness, you must estimate the total number of days away or days of restriction/job transfer and enter the day count on the 300 Log.
 - ix) **If a case occurs in one year but results in days away during the next calendar year, do I record the case in both years?** No, you only record the injury or illness once. You must enter the number of calendar days away for the injury or illness on the OSHA 300 Log for the year in which the injury or illness occurred. If the employee is still away from work because of the injury or illness when you prepare the annual summary, estimate the total number of calendar days you expect the employee to be away from work, use this number to calculate the total for the annual summary, and then update the initial log entry later when the day count is known or reaches the 180-day cap.
- 4) **How do I record a work-related injury or illness that results in restricted work or job transfer?** When an injury or illness involves restricted work or job transfer but does not involve death or days away from work, you must record the injury or illness on the OSHA 300 Log by placing a check mark in the space for job transfer or restriction and an entry of the number of restricted or transferred days in the restricted workdays column.
- i) **How do I decide if the injury or illness resulted in restricted work?** Restricted work occurs when, as the result of a work-related injury or illness:
 - (A) You keep the employee from performing one or more of the routine functions of his or her job, or from working the full workday that he or she would otherwise have been scheduled to work; or
 - (B) A physician or other licensed health care professional recommends that the employee not perform one or more of the routine functions of his or her job, or not work the full workday that he or she would otherwise have been scheduled to work.
 - ii) **What is meant by "routine functions"?** For recordkeeping purposes, an employee's routine functions are those work activities the employee regularly performs at least once per week.
 - iii) **Do I have to record restricted work or job transfer if it applies only to the day on which the injury occurred or the illness began?** No, you do not have to record restricted work or job transfers if you, or the physician or other licensed health care professional, impose the restriction or transfer only for the day on which the injury occurred or the illness began.
 - iv) **If you or a physician or other licensed health care professional recommends a work restriction, is the injury or illness automatically recordable as a "restricted work" case?** No, a recommended work restriction is recordable only if it affects one or more of the employee's routine job functions. To determine whether this is the case, you must evaluate the restriction in light of the routine functions of the injured or ill employee's job. If the restriction from you or the physician or other licensed health care professional keeps the employee from performing one or more of his or her routine job functions, or from working the full workday the injured or ill employee would otherwise have worked, the employee's work has been restricted and you must record the case.
 - v) **How do I record a case where the worker works only for a partial work shift because of a work-related injury or illness?** A partial day of work is recorded as a day of job transfer or restriction for recordkeeping purposes, except for the day on which the injury occurred or the illness began.
 - vi) **If the injured or ill worker produces fewer goods or services than he or she would have produced prior to the injury or illness but otherwise performs all of the routine functions of his or her work, is the case considered a restricted work case?** No, the case is considered restricted work only if the worker does not perform all of the routine functions of his or her job or does not work the full shift that he or she would otherwise have worked.
 - vii) **How do I handle vague restrictions from a physician or other licensed health care professional, such as that the employee engage only in "light duty" or "take it easy for a week"?** If you are not clear about the physician or other licensed health care professional's recommendation, you may ask that person whether the employee can do all of his or her routine job functions and work all of his or her normally assigned work shift. If the answer to both of these questions is "Yes," then the case does not involve a work restriction and does not have to be recorded as such. If the answer to one or both of these questions is "No," the case involves restricted work and must be recorded as a restricted work case. If you are unable to obtain this additional information from the physician or other licensed health care professional who recommended the restriction, record the injury or illness as a case involving restricted work.

- viii) **What do I do if a physician or other licensed health care professional recommends a job restriction meeting OSHA's definition, but the employee does all of his or her routine job functions anyway?** You must record the injury or illness on the OSHA 300 Log as a restricted work case. If a physician or other licensed health care professional recommends a job restriction, you should ensure that the employee complies with that restriction. If you receive recommendations from two or more physicians or other licensed health care professionals, you may make a decision as to which recommendation is the most authoritative, and record the case based upon that recommendation.
- ix) **How do I decide if an injury or illness involved a transfer to another job?** If you assign an injured or ill employee to a job other than his or her regular job for part of the day, the case involves transfer to another job. Note: This does not include the day on which the injury or illness occurred.
- x) **Are transfers to another job recorded in the same way as restricted work cases?** Yes, both job transfer and restricted work cases are recorded in the same box on the OSHA 300 Log. For example, if you assign, or a physician or other licensed health care professional recommends that you assign, an injured or ill worker to his or her routine job duties for part of the day and to another job for the rest of the day, the injury or illness involves a job transfer. You must record an injury or illness that involves a job transfer by placing a check in the box for job transfer.
- xi) **How do I count days of job transfer or restriction?** You count days of job transfer or restriction in the same way you count days away from work, using § 1904.7(b)(3)(i) to (viii), above. The only difference is that, if you permanently assign the injured or ill employee to a job that has been modified or permanently changed in a manner that eliminates the routine functions the employee was restricted from performing, you may stop the day count when the modification or change is made permanent. You must count at least one day of restricted work or job transfer for such cases.
- 5) **How do I record an injury or illness that involves medical treatment beyond first aid?** If a work-related injury or illness results in medical treatment beyond first aid, you must record it on the OSHA 300 Log. If the injury or illness did not involve death, one or more days away from work, one or more days of restricted work, or one or more days of job transfer, you enter a check mark in the box for cases where the employee received medical treatment but remained at work and was not transferred or restricted.
- i) **What is the definition of medical treatment?** "Medical treatment" means the management and care of a patient to combat disease or disorder. For the purposes of Part 1904, medical treatment does not include:
- (A) Visits to a physician or other licensed health care professional solely for observation or counseling;
 - (B) The conduct of diagnostic procedures, such as x-rays and blood tests, including the administration of prescription medications used solely for diagnostic purposes (e.g., eye drops to dilate pupils); or
 - (C) "First aid" as defined in paragraph (b)(5)(ii) of this section.
- ii) **What is "first aid"?** For the purposes of Part 1904, "first aid" means the following:
- (A) Using a non-prescription medication at nonprescription strength (for medications available in both prescription and non-prescription form, a recommendation by a physician or other licensed health care professional to use a non-prescription medication at prescription strength is considered medical treatment for recordkeeping purposes);
 - (B) Administering tetanus immunizations (other immunizations, such as Hepatitis B vaccine or rabies vaccine, are considered medical treatment);
 - (C) Cleaning, flushing or soaking wounds on the surface of the skin;
 - (D) Using wound coverings such as bandages, Band-Aids™, gauze pads, etc.; or using butterfly bandages or Steri-Strips™ (other wound closing devices such as sutures, staples, etc., are considered medical treatment);
 - (E) Using hot or cold therapy;
 - (F) Using any non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc. (devices with rigid stays or other systems designed to immobilize parts of the body are considered medical treatment for recordkeeping purposes);
 - (G) Using temporary immobilization devices while transporting an accident victim (e.g., splints, slings, neck collars, back boards, etc.);
 - (H) Drilling of a fingernail or toenail to relieve pressure, or draining fluid from a blister;
 - (I) Using eye patches;
 - (J) Removing foreign bodies from the eye using only irrigation or a cotton swab;
 - (K) Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means;
 - (L) Using finger guards;
 - (M) Using massages (physical therapy or chiropractic treatment are considered medical treatment for recordkeeping purposes); or

Accident Investigation

- (N) *Drinking fluids for relief of heat stress.*
- iii) **Are any other procedures included in first aid?** No, this is a complete list of all treatments considered first aid for Part 1904 purposes.
- iv) **Does the professional status of the person providing the treatment have any effect on what is considered first aid or medical treatment?** No, OSHA considers the treatments listed in § 1904.7(b)(5)(ii) of this Part to be first aid regardless of the professional status of the person providing the treatment. Even when these treatments are provided by a physician or other licensed health care professional, they are considered first aid for the purposes of Part 1904. Similarly, OSHA considers treatment beyond first aid to be medical treatment even when it is provided by someone other than a physician or other licensed health care professional.
- v) **What if a physician or other licensed health care professional recommends medical treatment but the employee does not follow the recommendation?** If a physician or other licensed health care professional recommends medical treatment, you should encourage the injured or ill employee to follow that recommendation. However, you must record the case even if the injured or ill employee does not follow the physician or other licensed health care professional's recommendation.
- 6) **Is every work-related injury or illness case involving a loss of consciousness recordable?** Yes, you must record a work-related injury or illness if the worker becomes unconscious, regardless of the length of time the employee remains unconscious.
- 7) **What is a "significant" diagnosed injury or illness that is recordable under the general criteria even if it does not result in death, days away from work, restricted work or job transfer, medical treatment beyond first aid, or loss of consciousness?** Work-related cases involving cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum must always be recorded under the general criteria at the time of diagnosis by a physician or other licensed health care professional.

Note to § 1904.7: OSHA believes that most significant injuries and illnesses will result in one of the criteria listed in § 1904.7(a): death, days away from work, restricted work or job transfer, medical treatment beyond first aid, or loss of consciousness. However, there are some significant injuries, such as a punctured eardrum or a fractured toe or rib, for which neither medical treatment nor work restrictions may be recommended. In addition, there are some significant progressive diseases, such as byssinosis, silicosis, and some types of cancer, for which medical treatment or work restrictions may not be recommended at the time of diagnosis but are likely to be recommended as the disease progresses. OSHA believes that cancer, chronic irreversible diseases, fractured or cracked bones, and punctured eardrums are generally considered significant injuries and illnesses, and must be recorded at the initial diagnosis even if medical treatment or work restrictions are not recommended, or are postponed, in a particular case.

OSHA incident reporting forms and work-related injury and illness logs are available at
<http://www.osha.gov/recordkeeping/new-osha300form1-1-04.pdf>

Accident/Incident Report

Date of Accident	Time	Day of Week <input type="checkbox"/> S <input type="checkbox"/> M <input type="checkbox"/> T <input type="checkbox"/> W <input type="checkbox"/> T <input type="checkbox"/> F <input type="checkbox"/> S			Shift <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	Department
INJURED PERSON						
Name:			Address:			
Age:	Phone:					
Job Title:			Supervisor Name:			
Length of Employment at Company:			Length of Employment at Job:			
Employee Classification: <input type="checkbox"/> Full Time <input type="checkbox"/> Part Time <input type="checkbox"/> Contract <input type="checkbox"/> Temporary						
NATURE OF INJURY	<input type="checkbox"/> Bruising	<input type="checkbox"/> Dislocation	<input type="checkbox"/> Other (specify)	Injured Body Part :		
<input type="checkbox"/> Strain/Sprain	<input type="checkbox"/> Scratch/ Abrasion	<input type="checkbox"/> Internal				
<input type="checkbox"/> Fracture	<input type="checkbox"/> Amputation	<input type="checkbox"/> Foreign Body	Remarks:			
<input type="checkbox"/> Laceration/Cut	<input type="checkbox"/> Burn/Scald	<input type="checkbox"/> Chemical Reaction				
TREATMENT	Name and Address of Treating Physician or Facility:					
<input type="checkbox"/> First Aid						
<input type="checkbox"/> Emergency Room						
<input type="checkbox"/> Dr.'s Office						
<input type="checkbox"/> Hospitalization						
DAMAGED PROPERTY						
Property, Equipment, or Material Damaged			Describe Damage			
Object or Substance Inflicting Damage:						

Accident/Incident Report pg. 2

INCIDENT DESCRIPTION
Describe what happened (attach photographs or diagrams if necessary)

Accident/Incident Report pg.3

ROOT CAUSE ANALYSIS (Check All that Apply)		
Unsafe Acts	Unsafe Conditions	Management Deficiencies
<input type="checkbox"/> Improper work technique	<input type="checkbox"/> Poor workstation design/layout	<input type="checkbox"/> Lack of written policies & procedures
<input type="checkbox"/> Safety rule violation	<input type="checkbox"/> Congested work area	<input type="checkbox"/> Safety rules not enforced
<input type="checkbox"/> Improper PPE or PPE not used	<input type="checkbox"/> Hazardous substances	<input type="checkbox"/> Hazards not identified
<input type="checkbox"/> Operating without authority	<input type="checkbox"/> Fire or explosion hazard	<input type="checkbox"/> PPE unavailable
<input type="checkbox"/> Failure to warn or secure	<input type="checkbox"/> Inadequate ventilation	<input type="checkbox"/> Insufficient worker training
<input type="checkbox"/> Operating at improper speeds	<input type="checkbox"/> Improper material storage	<input type="checkbox"/> Insufficient supervisor training
<input type="checkbox"/> Bypassing safety devices	<input type="checkbox"/> Improper tool or equipment	<input type="checkbox"/> Improper maintenance
<input type="checkbox"/> Guards not used	<input type="checkbox"/> Insufficient knowledge of job	<input type="checkbox"/> Inadequate supervision
<input type="checkbox"/> Improper loading or placement	<input type="checkbox"/> Slippery conditions	<input type="checkbox"/> Inadequate job planning
<input type="checkbox"/> Improper lifting	<input type="checkbox"/> Poor housekeeping	<input type="checkbox"/> Inadequate hiring practices
<input type="checkbox"/> Servicing machinery in motion	<input type="checkbox"/> Excessive noise	<input type="checkbox"/> Inadequate workplace inspection
<input type="checkbox"/> Horseplay	<input type="checkbox"/> Inadequate hazard guards	<input type="checkbox"/> Inadequate equipment
<input type="checkbox"/> Drug or alcohol use	<input type="checkbox"/> Defective tools/equipment	<input type="checkbox"/> Unsafe design or construction
<input type="checkbox"/> Unnecessary haste	<input type="checkbox"/> Insufficient lighting	<input type="checkbox"/> Unrealistic scheduling
<input type="checkbox"/> Unsafe act of others	<input type="checkbox"/> Inadequate fall protection	<input type="checkbox"/> Poor process design
<input type="checkbox"/> Other:	<input type="checkbox"/> Other:	<input type="checkbox"/> Other:
ACCIDENT / INCIDENT ANALYSIS		
Using the root cause analysis list, explain the cause(s) of the incident in as much detail as possible. Attach a sheet if there is not enough room.		
How bad could the accident have been? <input type="checkbox"/> Very Serious <input type="checkbox"/> Serious <input type="checkbox"/> Minor		What is the chance of the accident happening again? <input type="checkbox"/> Frequent <input type="checkbox"/> Occasional <input type="checkbox"/> Rare

Accident/Incident Report

RECOMMENDATIONS AND FOLLOW-UP			
Describe actions that will be taken to prevent recurrence: <i>(attach another sheet if necessary)</i>	Deadline	By Whom	Complete
SUMMARY			
INVESTIGATION TEAM			
Name	Signature	Position	

6 Fire Protection & Emergency Planning

6.1 Policy Statement

Pyro Combustion & Controls Inc. has implemented this policy for the protection of our employees against the fire and other emergency situations in the workplace. *Gary Pfizenmayer* will supervise the Emergency Action Plan and Fire Protection Program.

Pyro Combustion & Controls Inc. will have a written Emergency Action Plan (EAP) and Fire Protection Program (FPP). The EAP and FPP will be posted in the workplace, and remain available to employees for review along with the names and job titles of every person in the chain of command during emergency situations.

6.2 Responsibilities

Fire prevention and emergency planning is a responsibility shared between *Pyro Combustion & Controls Inc.* and its employees.

6.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Ensure adequate workplace safeguards against hazards, including appropriate exit routes, fire alarms and fire protection systems.
- Ensure development and implementation of FPP and EAP.
- Ensure training of employees in accordance with this policy.

6.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Develop and implement fire prevention plan and emergency action plan.
- Train new employees in fire prevention and emergency action plans and provide continued employee safety training according to *Pyro Combustion & Controls Inc.* policy.
- Inform employees about fire hazards in the workplace specific to their task.

6.2.3 Employee Responsibilities

Every *Pyro Combustion & Controls Inc.* employee is expected to:

- Report a fire or other emergency.
- Follow fire prevention plan and emergency action plan.
- Report any suspected problem with fire control systems to *Gary Pfizenmayer*, a supervisor or a member of the safety committee.
- Assist in fire hazard assessment.

6.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on fire protection and emergency planning. This training will be provided at no cost to the employee during working hours.

Training will be provided:

- At the time of assignment.
- At least annually thereafter; annual training for all employees will be provided within one year of their previous training.

Pyro Combustion & Controls Inc. will provide additional training when tasks or procedures are added or changed that may affect the employee's work. It is acceptable for additional training to be limited to addressing only the changes or additions to the employees' exposure.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to the educational level, literacy, and language of employees.

6.3.1 Training Components

Gary Pfizenmayer will ensure all employees at *Pyro Combustion & Controls Inc.* are informed and trained in the following minimum elements for the Emergency Action Plan and Fire Protection Program:

- Fire hazards at the worksite
- Means of controlling or removing fire hazards at the worksite
- Procedures for reporting a fire or other emergency.
- Procedures for emergency evacuation for all areas of work, including type of evacuation and exit route assignments.
- Safe assembly areas designated for all work areas in the event of evacuation.
- Procedures to be followed by employees who are requested to remain to operate critical plant operations before they evacuate, if applicable.

- Procedures to account for all employees after evacuation.
- Procedures to be followed by employees performing rescue or medical duties.
- The members in the chain of command who may be contacted by employees for information about the plans or for an explanation of their duties under the plans.
- Proper operation of fire extinguishers provided by the company if the EAP allows employees to fight incipient stage fires rather than evacuate.
- The hazards involved in incipient stage firefighting. Employees are instructed to ensure the local emergency response service (Fire Department) is notified before attempting to extinguish any fire, and that if a fire is not immediately extinguished, or the fire recurs to evacuate immediately.

6.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

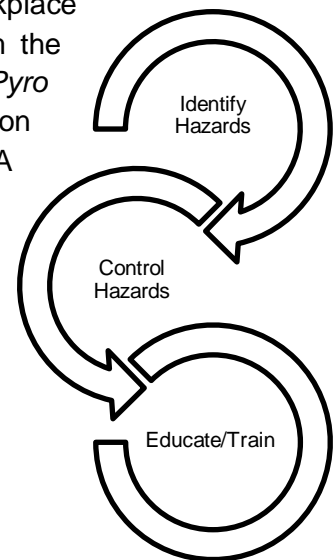
Employee training records will be maintained for 3 years from the training.

6.4 Policy

6.4.1 Fire Prevention Plan

Pyro Combustion & Controls Inc. is committed to providing a safe workplace and will ensure procedures are in place to protect employees from the advent of any emergency, including fire emergencies. Accordingly, *Pyro Combustion & Controls Inc.* will ensure there is a Fire Protection Program written and available to employees as required by OSHA regulations. This plan will include the following:

- A list of all major fire hazards, proper handling and storage procedures for hazardous materials, potential ignition sources and their control, and the type of fire protection equipment necessary to control each major hazard;
- Procedures to control accumulations of flammable and combustible waste materials;
- Procedures for regular maintenance of safeguards installed on heat-producing equipment to prevent the accidental ignition of combustible materials;
- The name or job title of employees responsible for maintaining equipment to prevent or control sources of ignition or fires; and
- The name or job title of employees responsible for the control of fuel source hazards.



6.4.1.1 Determining Fire Hazards

A fire is essentially the rapid oxidation of a chemical. It requires heat, oxygen and fuel in the right proportion. Different types of fuel react in different ways and require different levels of heat and oxygen to ignite; however, once the chemical reaction begins, fire provides a source of heat for continued ignition until one of the essential aspects of combustion — fuel, heat or oxygen — is removed and the reactions end. See figure 1.



Figure 1

The *Pyro Combustion & Controls Inc.* safety committee will perform an area-by-area assessment of fire hazards and record them by location on the “Major Fire Hazards” list. The assessment will ascertain and document whether the hazard is a fuel or ignition source, control systems in place to protect against fire, and the name or job title of the individual who is responsible for removing or minimizing the listed hazard.

The goal is to systematically eliminate fire hazards wherever possible; ensure a means to prevent a fire if the hazard cannot be removed; inform employees about fire hazards in their workspace; and identify the party responsible for controlling any given fire hazard. Fire hazard identification plays a central role in the FPP, and all employees are expected to contribute their efforts to identify and mitigate fire hazards in the workplace.

Employees will familiarize themselves with the safety data sheet of any hazardous chemicals with which they work and know proper handling and storage procedures to reduce hazards. Flammable and combustible material will be stored and staged in amounts as small as possible for operations and away from sources of ignition. It is important for employees to monitor the workplace for changes that might pose additional fire hazards.

6.4.1.2 Fire Protection Equipment and Safeguards

Alarm Systems

An alarm system to alert employees and the local fire department will provide a distinctive signal in case of fire or other emergency. The alarm needs to be heard above ambient noise levels and/or seen over ambient light levels. *Pyro Combustion & Controls Inc.* will establish how the alarm should be sounded and maintain the alarm system. Employee training will include an explanation of the system and the preferred means of reporting an emergency. (A verbal alert is sufficient for employers with fewer than 10 employees, provided all employees can hear it.) After the alarm is sounded during an emergency or a test, the alarm system will be reset as quickly as possible. If the system has components that wear out quickly — or are consumed or destroyed for the alarm — spare components will be readily available to reset the system with as little delay as possible.

The alarm code and reporting instructions must be posted conspicuously at phones and at employee entrances.

If the employee alarm system is used to alert fire brigade members, or for any other purpose, it must use a distinctive signal for each purpose.

Inspection, Maintenance and Testing

Pyro Combustion & Controls Inc. will provide for the testing of all alarm systems and making sure they remain in operating condition. All maintenance and repair of alarm systems will be performed only by qualified, trained personnel. At least every two months, a qualified individual will test systems that do not require employee supervision, replacing power supplies as necessary. Tests for systems that are capable of being supervised will occur annually.

Portable Fire Extinguishers

Any portable fire extinguisher provided will:

- Be fully charged and operable;
- Be kept in a conspicuous place when not in use;
- Not use carbon tetrachloride, chlorobromomethane, or other toxic vaporizing extinguishing agents;
- not be operated by inverting the extinguisher to rupture a cartridge or initiate an uncontrollable pressure-generating chemical reaction to expel the extinguishing agent.
- be protected from freezing (if subject to freezing)

All portable fire extinguishers will be selected based on the fire hazards present and distributed to minimize travel distances for employees to use. See Table 1.

Each 3,000 square feet of protected buildings during construction requires a fire extinguisher rated at least 2A, spaced within 100 feet of any point of the protected area. In multi-story construction, each floor needs its own extinguisher rated at least 2A, adjacent to the stairwell.

Pyro Combustion & Controls Inc. will provide a fire extinguisher rated not less than 10B within 50 feet of anywhere there is more than 5 gallons of flammable or combustible liquids being used on the jobsite (aside from vehicle fuel tanks).

Inspection, Maintenance and Testing

Pyro Combustion & Controls Inc. is responsible for the inspection, maintenance and testing of all portable fire extinguishers in the workplace. Maintenance checks of portable fire extinguishing equipment will occur at least annually. The dates of fire extinguisher checks will be recorded; the record of these checks will be retained for at least a year after the last check or the life of the shell (whichever is less). An individual trained to perform hydrostatic testing will test each portable fire extinguisher with suitable equipment. Such testing is also called for when portable fire extinguishers show new evidence of corrosion or mechanical wear.

Fire Protection & Emergency Planning

	Water Type				Foam	Carbon Dioxide	Dry chemical			
	Stored Pressure	Cartridge operated	Water pump tank	Soda acid			Sodium or potassium bicarbonate		Multi-purpose ABC	
					Foam	CO ₂	Cartridge Operated	Stored pressure	Stored pressure	Cartridge operated
Class A Fires Wood, Paper, Trash, Having Glowing Embers	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes
Class B Fires Flammable Liquids, Gasoline, Oils, Paints, Grease, Etc.	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Class C Fires Electric Equipment	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Class D Fires Combustible Metals	Special extinguishing agents approved by recognized testing laboratories									
Method of Operation	Pull pin squeeze handle	Turn upside down and bump	Pump handle	Turn upside down	Turn upside down	Pull pin squeeze lever	Rupture Cartridge squeeze lever	Pull pin squeeze handle	Pull pin squeeze handle	Rupture Cartridge squeeze lever
Range	30'-40'	30'-40'	30'-40'	30'-40'	30'-40'	3'-8'	5'-20'	5'-20'	5'-20'	5'-20'
Maintenance	Check air pressure gauge monthly	Weigh gas cartridge — add water if required annually	Discharge and fill with water annually	Discharge annually — recharge	Discharge annually — recharge	Weigh semi-annually	Weigh gas cartridge — check condition of dry chemical annually	Check pressure gauge and condition of dry chemical annually	Check pressure gauge and condition of dry chemical annually	Weigh gas cartridge — check condition of dry chemical annually

Table 1

Each extinguisher in the workplace will be accompanied by a record securely fixed to the extinguisher that indicates:

- The name of the person or agency who performed the last test, and the test date;
- The signature of the person who performed the test; and
- The serial number or other identifier of the fire extinguisher that was tested.

Training

Where employees have been provided portable fire extinguishers, *Pyro Combustion & Controls Inc.* will provide training over general principles of fire extinguisher use and the hazards involved with incipient-stage firefighting. This training will occur upon hire and be repeated annually.

Alternatives to Portable Fire Extinguishers

During construction activities, a 55-gallon drum with two fire pails may substitute for a fire extinguisher with a 2A rating.

A ½-inch diameter garden-type hose no longer than 100 feet can substitute for the same, as long as it can discharge at least 5 gallons per minute and the stream ranges at least 30 feet horizontally.

Further, 100 feet or fewer of 1½-inch hose with a nozzle capable of discharging water at 25 gallons or more per minute, may be substituted, provided that the hose line can reach all points in the area. (Make sure the hose connections are compatible with local firefighting equipment.)

Other Fire Protection Systems

Pyro Combustion & Controls Inc. will meet or exceed all legal requirements for any fire protection system in the workplace and keep in good working order all safeguards designed to protect employees during emergencies, including fire retardant paints and solutions. Any other fire protection systems in use will also meet applicable regulatory requirements and may include the following:

- Temperature limit switches
- Flashback arresters
- Fixed extinguishing systems
- Automatic sprinkler systems
- Fire detection systems
- Fire brigades
- Standpipe and hose systems

During demolition activities involving combustible materials, charged hose lines, supplied by hydrants, water tank trucks with pumps, or equivalent, must be available.

Water Supply

A water supply adequate for the operation of firefighting equipment must be available as soon as there is an accumulation of combustible materials.

Underground water mains must be made available as soon as practicable where they are to be provided.

Sprinklers

If there will be an automatic sprinkler fire protection system, install and place it in service as soon as permitted following completion of each story.

During demolition or alterations, keep automatic sprinkler installations in service as long as reasonable. Only authorized personnel may operate sprinkler control valves. Expedite sprinkler system modifications made to permit alterations or additional demolition so that the automatic protection may be returned to service as quickly as possible. Check sprinkler control valves daily at close of work to ensure protection is in service.

No one may occupy a portion of a structure (except as permitted under law) that must be protected by automatic sprinklers until the sprinkler system is operable and has been approved.

Standpipes

If standpipes are required, or exist in structures being altered, they shall be brought up as soon as applicable laws permit and shall be maintained as construction progresses in such a manner that they are always ready for fire protection use. Standpipes shall be provided with Siamese fire department connections on the outside of the structure, at the street level, which shall be conspicuously marked. Local codes may specify lighting or painting requirements. There shall be at least one standard hose outlet at each floor.

During demolition, maintain a standpipe as long as possible in operable condition for firefighting use. Do not demolish the standpipe further than one floor below the floor being demolished.

6.4.1.3 Fire Protection

Controlling fire hazards (e.g. accumulations of flammable and combustible materials) and ensuring safe storage of building materials is a priority of the highest order for *Pyro Combustion & Controls Inc.* and its employees. Controlling fuel sources demands all workers maintain a tidy work area and dispose of refuse in the appropriate receptacle; it also calls for due consideration of piles and stacks of materials at the worksite. Controlling means of ignition requires following appropriate safety guidelines especially around electricity, open flame, or any work that may produce arc, sparks, excessive heat, etc.

Ignition Hazards

Electrical wiring onsite must be installed safely by qualified personnel and in compliance with applicable regulations.

If equipment is powered by an internal combustion engine, make sure it is located so that the exhausts are well away from combustible materials. If the exhausts are piped outside, verify there is a 6 in. clearance between piping and combustible materials.

If portable battery powered lighting equipment is used in connection with flammable gases or liquids, ensure it is approved for hazardous locations.

During the cleaning or ventilation of tanks and vessels that contain hazardous concentrations of flammable gases or vapors nozzles, lines, or hoses for air, inert gas, or steam must be bonded to the tank or vessel shell and neither attached nor detached in hazardous concentrations of flammable gases or vapors.

All debris and refuse must be disposed of promptly (at the end of each shift or more frequently as required), especially if it is combustible. If material is to be disposed of by burning onsite, such disposal must be approved and must comply with all relevant safety controls. Ensure materials susceptible to spontaneous ignition (oily rags) are stored only in a listed disposal container.

Hotwork must be completed according to appropriate guidelines, and appropriate fire watch must be established and maintained to ensure safety of any operation that presents a fire hazard.

No Smoking, No Open Flame

Smoking is prohibited at the jobsite at all times. Signs must be posted according to local requirements alerting employees and the public to this prohibition

Open fires may not be ignited or maintained at the worksite. Approved heaters shall only be used in designated locations in such a way to prevent fires.

Temporary Buildings

No temporary building may adversely affect a means of exit.

Temporary buildings erected within another building must be of noncombustible construction or of combustible construction with a fire resistance rating of at least 1 hour.

Temporary buildings, not inside another building and not used for the storage, handling, or use of flammable or combustible liquids, flammable gases, explosives, or blasting agents, or similar hazardous occupancies, shall be located at least 10 feet from another building or structure. Groups of temporary buildings, not exceeding 2,000 square feet in aggregate, shall, for the purposes of this part, be considered a single temporary building.

Open Yard Storage

Combustible materials may not be piled higher than 20 feet and must be piled in such a way to ensure the stability of the pile.

Where driveways go between or around combustible storage piles, they must be at least 15 feet wide and free from any obstruction. A driveway grid formed by such driveways may not exceed 50 ft. by 150 ft.

Make sure the storage area is clean and any plant life is controlled to prevent additional fire hazards. Piles of combustible material must be organized and orderly and 10 feet or more from buildings. Ensure appropriate fire extinguishers (at least 2A) are easily accessible.

Indoor Storage

Make sure materials stored indoors do not block exits or impede exit in any way and are piled to maintain a 36" clearance between the top of the stored material and sprinkler heads.

Maintain safe clearance between material piles and lights or heating elements. Also, provide a barricade or ensure at least 24" around the path of travel to fire doors. Never store material within 36" of a fire door.

Access for Firefighting

Vehicle access to a construction, remodel or demolition site must be maintained at all times within 100 feet (consult local codes) of available fire department connections. Temporary vehicle access must be maintained until permanent access is established. Such roads may need to be inspected by local authorities to comply with local laws. Horizontal and vertical clearance for such access routes must be sufficient for emergency vehicle approach and meet applicable local codes.

6.4.1.4 Flammable and Combustible Liquids

Flammable and combustible liquids must be stored and handled in approved containers and tanks. Handling and use of flammable liquid materials in quantities of 5 gallons or less requires approved safety cans or DOT-approved containers. Flammable liquids that are hard to pour may be stored, handled and used in quantities of one gallon or less in their original container.

Ensure flammable or combustible liquids are kept clear of areas used for exits or safe passage of people.

This section applies to the handling, storage, and use of flammable and combustible liquids with a flashpoint below 200°F but not to:

- Bulk transportation of flammable and combustible liquids; and
- Storage, handling, and use of fuel oil tanks and containers connected with oil burning equipment.

Indoor Storage

Outside of an approved storage cabinet, limit storage of flammable or combustible liquids to 25 gallons. An approved storage cabinet must adhere to the following specifications:

- The bottom, sides, and top shall be constructed of an exterior grade of plywood at least 1 in. thick, which shall not break down or delaminate under standard fire test conditions.
- All joints shall be rabbeted and fastened in two directions with flathead wood screws.
- When more than one door is used, there shall be a rabbeted overlap of not less than 1 inch.
- Steel hinges shall be mounted in such a manner as to not lose their holding capacity due to loosening or burning out of the screws when subjected to fire.
- Such cabinets shall be painted inside and out with fire retardant paint.
- Approved metal storage cabinets are acceptable.
- Cabinets shall be labeled in conspicuous lettering, "Flammable-Keep Fire Away."

Fire Protection Provided*	Fire Resistance	Maximum size	Total allowable quantities gals. / sq. ft. / floor area
Yes	2 hrs.	500 sq. ft.	10
No	2 hrs.	500 sq. ft.	4
Yes	1 hr.	150 sq. ft.	5
No	1 hr.	150 sq. ft.	2

Table 2

** Fire protection system will be sprinkler, water, spray, carbon dioxide or other system approved by a nationally recognized testing laboratory for this purpose*

Any one storage cabinet is limited to 60 gallons of flammable liquids, and 120 gallons of combustible liquids. Any one storage area is limited to three storage cabinets. Higher quantities must be stored inside a storage room.

Indoor Storage Rooms

Storage rooms inside must be sufficiently fire-resistive for their use and comply with test specifications outlined in "Standard Methods of Fire Test of Building Construction and Material, NFPA 251-1969" and table 2.

If there is an automatic extinguishing system it must be designed and installed in an approved manner:

- Openings to other rooms or buildings require noncombustible liquid-tight raised sills or ramps at least 4 inches in height, or the floor in the storage area shall be at least 4 inches below the surrounding floor;
- Openings shall be provided with approved self-closing fire doors;
- The room shall be liquid-tight where the walls join the floor;
- A permissible alternate to the sill or ramp is an open-grated trench, inside of the room, which drains to a safe location;
- Where other portions of the building or other buildings are exposed, windows shall be protected as set forth in the Standard for Fire Doors and Windows, NFPA No. 80-1970, for Class E or F openings;
- Wood of at least 1-inch nominal thickness may be used for shelving, racks, dunnage, scuffboards, floor overlay, and similar installations;
- Materials which will react with water and create a fire hazard shall not be stored in the same room with flammable or combustible liquids;
- Wiring and equipment in such rooms must be approved for Class I, Division 1, Hazardous Locations as outlined in CFR 1926.449;
- In every inside storage room there shall be maintained one clear aisle at least 3 feet wide; and
- Containers over 30 gallons capacity shall not be stacked one upon the other.

Each indoor storage room must be equipped with either a gravity or a mechanical exhausting system. Such a system must adhere to the following specifications:

- It must commence not more than 12 inches above the floor;
- It must be designed to provide for a complete change of air within the room at least 6 times per hour;
- If a mechanical exhausting system is used, it shall be controlled by a switch located outside of the door;
- The ventilating equipment and any lighting fixtures shall be operated by the same switch;
- An electric pilot light shall be installed adjacent to the switch if flammable liquids are dispensed within the room;
- Where gravity ventilation is provided, the fresh air intake, as well as the exhausting outlet from the room, shall be on the exterior of the building in which the room is located;

Limit the quantity of flammable or combustible liquids in the vicinity of spraying operations to the minimum required for operations, ordinarily not to exceed a supply for 1 day or one shift. Bulk storage of portable containers of flammable or combustible liquids shall be in a separate, constructed building detached from other important buildings or cut off in a standard manner.

Storage Outside Buildings

Flammable and combustible liquids in excess of that permitted in inside storage rooms shall be stored outside of buildings.

Limit groupings of containers (not more than 60 gallons each) to 1,100 gallons in any one pile or area. Piles or groups must be separated by a 5-foot clearance and placed 20 feet or further away from a building.

Within 200 feet of such piles, ensure a 12-foot-wide access for fire control approach.

The area reserved for storing flammable and combustible liquids must be graded to divert spills away from building. Alternatively, the area may be surrounded by a curb or dike at least 12 inches high if provisions are made for draining off accumulations of ground or rain water, or spills of the stored liquids. Drains must terminate at a safe location and be accessible to operation under fire conditions.

Outdoor Portable Tank Storage

- Portable tanks shall not be nearer than 20 feet from any building.
- Two or more portable tanks, grouped together, having a combined capacity in excess of 2,200 gallons, shall be separated by a 5-foot-clear area.
- Individual portable tanks exceeding 1,100 gallons shall be separated by a 5-foot-clear area.
- Within 200 feet of each portable tank, there shall be a 12-foot-wide access way to permit approach of fire control apparatus.
- Storage areas shall be kept free of weeds, debris, and other combustible material not necessary to the storage.
- Portable tanks, not exceeding 660 gallons, shall be provided with emergency venting and other devices, as required by chapters III and IV of NFPA 30-1969, The Flammable and Combustible Liquids Code.
- Portable tanks, in excess of 660 gallons, shall have emergency venting and other devices, as required by chapters II and III of "The Flammable and Combustible Liquids Code, NFPA 30-1969".

Fire Control for Flammable or Combustible Liquid Storage

- At least one portable fire extinguisher, having a rating of not less than 20-B units, shall be located outside of, but not more than 10 feet from, the door opening into any room used for storage of more than 60 gallons of flammable or combustible liquids.
- At least one portable fire extinguisher having a rating of not less than 20-B units shall be located not less than 25 feet, nor more than 75 feet, from any flammable liquid storage area located outside.
- When sprinklers are provided, they shall be installed in accordance with the "Standard for the Installation of Sprinkler Systems, NFPA 13-1969".

- At least one portable fire extinguisher having a rating of not less than 20-B:C units shall be provided on all tank trucks or other vehicles used for transporting and/or dispensing flammable or combustible liquids.

Dispensing Liquids

- Areas where combustible liquids are transferred more than 5 gallons at a time must be separated from other activity by 25 ft. or construction with a fire resistance rating of 1 hour. Drainage in such areas to control spills is required as is ventilation sufficient to maintain flammable vapor concentrations below 10 percent of the lower flammable limit.
- Flammable liquid transfer between two containers requires the containers to be electrically bonded.
- Draw or transfer flammable or combustible liquids from vessels, containers, or tanks within a building or outside only through a closed piping system, from safety cans, by means of a device drawing through the top, or from a container, or portable tanks, by gravity or pump, through an approved self-closing valve. Transferring by means of air pressure on the container or portable tanks is prohibited.
- Protect dispensing units against collision damage.
- Dispensing devices and nozzles for flammable liquids shall be of an approved type.

Handling Liquids at Point of Final Use

- Keep Flammable liquids in closed containers when not in use.
- Dispose of leakage or spillage of flammable or combustible liquids promptly and safely.
- Flammable liquids may be used only where there are no open flames or other sources of ignition within 50 feet of the operation, unless conditions warrant greater clearance.

Service and Refueling Areas

Flammable or combustible liquids shall be stored in approved closed containers, in tanks located underground, or in above-ground portable tanks;

- Tank trucks must comply with the requirements covered in the “Standard for Tank Vehicles for Flammable and Combustible Liquids, NFPA No. 385-1966”;
- The dispensing hose shall be an approved type;
- The dispensing nozzle shall be an approved automatic-closing type without a latch-open device;
- Do not abandon underground tanks;
- Provide clearly identified and easily accessible switch(es) at a location remote from dispensing devices to shut off the power to all dispensing devices in the event of an emergency;
- Heating equipment of an approved type may be installed in the lubrication or service area where there is no dispensing or transferring of flammable liquids, provided the bottom of the heating unit is at least 18 inches above the floor and is protected from physical damage;

- Heating equipment installed in lubrication or service areas, where flammable liquids are dispensed, shall be of an approved type for garages, and shall be installed at least 8 feet above the floor;
- There shall be no smoking or open flames in the areas used for fueling, servicing fuel systems for internal combustion engines, receiving or dispensing of flammable or combustible liquids;
- Post conspicuous and legible signs prohibiting smoking;
- Shut off motors of equipment being fueled during the fueling operation; and
- Provide each service or fueling area with at least one fire extinguisher having a rating of not less than 20-B:C located so that an extinguisher will be within 75 feet of each pump, dispenser, underground fill pipe opening, and lubrication or service area.

6.4.1.5 Employee Education

Pyro Combustion & Controls Inc. is committed to informing employees about all fire hazards with which they may come into contact. *Gary Pfizenmayer* or a designate from the safety committee will review the FPP with all employees and inform them of any fire hazards a new assignment might present.

6.4.2 Emergency Action Plan

Pyro Combustion & Controls Inc. is committed to providing a safe workplace and ensuring procedures are in place to protect employees in the event of any emergency. Accordingly, *Pyro Combustion & Controls Inc.* will ensure there is an Emergency Action Plan, written and available to employees, that includes:

- Procedures for reporting a fire or other emergency;
- Procedures for emergency evacuation, including type of evacuation and exit route assignments;
- Procedures to account for all employees after evacuation;
- Procedures to be followed by employees performing rescue / medical duties and operating critical plant operations; and
- The name or job title of every employee from whom other employees can find out more about the plan.

6.4.2.1 Employee Involvement

The continued development and thorough implementation of the EAP is a company-wide effort that demands concerted effort of *Pyro Combustion & Controls Inc.* management, the *Pyro Combustion & Controls Inc.* safety committee and all employees. Accordingly, employees will be involved in every step of the EAP from planning to training to implementation in an emergency situation.

Gary Pfizenmayer, or an approved designate, will review the EAP with all employees to ensure they understand procedures that should be followed in an emergency.

Employees should report or remedy workplace hazards and unsafe work practices as soon as they may do so safely.

6.4.2.2 Possible Workplace Emergencies

In the planning and implementation of the *Pyro Combustion & Controls Inc.* EAP, employees will consider the range of emergencies that may require response and develop contingencies that respond to the unique workplace impact of these emergencies.

Weather

Weather-related events include hurricanes, tornadoes, blizzards, floods and severe storms. Supervisors must communicate unexpected schedule changes because of severe weather to employees as quickly as possible. Such events may result in a loss of power or communication and may limit the ability of first-responders to respond quickly.

Medical

Medical emergencies are the most likely workplace emergency. Response time is critical to a positive outcome during a severe medical emergency. Onsite medical first responders will know first aid and CPR, but no employee will perform first aid beyond their training or capability. If first aid trained personnel are not available, stop any bleeding with firm pressure (avoiding contact with body fluid) and in case of choking, clear the air passages. In the event of a medical emergency, it is imperative to call 911 promptly.

Threat of Violence

Threats of violence can come through a range of modes of communication, directed at a single employee, a group of employees or the entire workplace. Every threat is serious. If you receive or are aware of a threat of violence, contact a member of the safety committee or a supervisor immediately, but only if you are able to do so safely. Please see the chapter on “Workplace Violence Prevention” for more information about how to prevent and respond to threats of violence and violence in the workplace.

Fire

The fire prevention plan requires involvement of all employees to prevent fire emergencies. Response to a fire emergency depends on whether your workplace has decided to allow all employees or some employees to fight incipient-stage fires. Members of the safety committee and supervisors may have to serve as evacuation wardens, and if the emergency action plan demands it, an employee may need to shut down critical operations before evacuation. A quick, orderly evacuation accompanied by a call to 911 is the acceptable response to an out-of-control fire.

Explosion

If there are flammable substances at your worksite, take extra care during planning to address the hazards they present. Explosions do not offer any warnings, and often, panic presents the biggest obstacle to safety in the wake of such a disaster. Further, explosions often accompany fires, adding complexity to fire response planning.

Earthquake

When an earthquake strikes, the greatest risks come from above. Collapsing ceilings and falling objects can severely injure workers. If the workplace is in an earthquake-prone location, consider earthquake drills and make sure you and your coworkers know to protect their head and neck under sturdy furniture or against an inside wall. A severe earthquake will occupy emergency workers, and onsite rescue and triage may be a task that falls into the hands of the safety committee. No employee should perform first aid or attempt rescue beyond training or capacity to do so safely.

6.4.2.3 Chain of Command

During an emergency, it is critical that employees understand the chain of command in the emergency action plan. In consideration of chain of command, it is also important to recognize that the authority of local emergency response officials, like members of the fire department, supersedes the authority of any *Pyro Combustion & Controls Inc.* employee.

Emergency Scene Commander

Gary Pfizenmayer is the safety coordinator at *Pyro Combustion & Controls Inc.*. Unless the involvement is precluded by unforeseen contingencies, the safety coordinator acts as the scene commander in the event of a workplace emergency. *Pyro Combustion & Controls Inc.* will determine whether an emergency exists, oversee procedures during an emergency, and notify and coordinate with outside emergency services.

Emergency Scene Coordinators

The emergency action plan requires the worksite to have enough people trained to assist in the safe and orderly evacuation of employees and assist the safety coordinator/emergency scene commander in emergency procedures. The number of scene responders depends on the number of employees, the size and complexity of the worksite and the hazards posed by likely emergencies. Table 3 provides a good guideline when considering how many coordinators will be necessary to implement the EAP. Scene coordinators should know CPR and first aid and would benefit from additional safety training, including workplace violence response. Their duties in an emergency include, but are not limited to the following:

- Checking for employees who may be unable to evacuate;

Number of Emergency Scene Responders for Typical Workplaces		
Employees in Workplace	Emergency Scene Commander	Emergency Scene Coordinator
11-19	1	1
20-49		1-2
50-99		2-5
100-249		5-12
250+		12+

Table 3

- Knowing who may need assistance during evacuation and how to assist them;
- Coordinating emergency activities;
- Using their knowledge of workplace layout, escape routes, and hazards to ensure a swift, safe evacuation; and
- Verifying all employees are in designated safe areas following an evacuation.

6.4.2.4 Procedures

Reporting Emergencies

Employees should report emergencies as quickly as they may do so safely. Emergencies may be reported through manual pull stations or other alarm systems. If the EAP calls for employees to call *Gary Pfizenmayer* or other assigned staff, those numbers will be posted at every phone. Major emergencies demand an immediate call to 911 to prevent damage, injury or death. After the report of an emergency, the alarm system will notify employees about the emergency.

Workplace Evacuation

Routes and Exits

The EAP will include a floor diagram with arrows to designate exit route assignments based on location within the building. There should be secondary routes and exits whenever possible. It is important every employee knows the building's exit routes and keeps them free of obstacles and debris at all times. For more information about exit routes, please see the floor diagram and consult "Exit Routes" in this chapter.

Evacuation Assistance

Scene coordinators or other assigned personnel will act as evacuation wardens to ensure employees move from danger to safety during an emergency. An employee designated to assist in evacuations will need to know which employees need extra assistance and be trained and prepared to offer this assistance. Further, any visitors on premises may need assistance during evacuations. It is useful to implement a system to account for visitors, like a sign-in sheet, to promote facility security and account for everyone in case of an emergency.

Services During Evacuation

Workplaces with equipment and processes that take time to shut down or with systems that may pose a hazard if not shut down may include, as part of the EAP, a partial evacuation procedure. The roles of those performing critical operations during evacuation should be clear, and anyone left behind must be able to recognize when to abandon the task and evacuate. The same goes for workplaces that plan for employees to fight incipient-stage fires.

Accounting for Employees

The emergency action plan requires *Pyro Combustion & Controls Inc.* account for employees after an evacuation. Employees will gather in an established assembly area (or areas) after an evacuation. After the evacuation is complete, *Pyro Combustion & Controls Inc.* or an approved designate will perform a head count and note the names and last known whereabouts of anyone missing. Accuracy in accounting for employees during an evacuation is vital to prevent a dangerous search-and-rescue operation if one is not needed. Procedures should include a way to account for visitors, customers and suppliers who are onsite as well.

Sheltering in place

Not every emergency requires evacuation. Certain contaminants and disasters present greater hazards outside than inside. If an emergency does not require evacuation, it may demand employers instead “shelter-in-place.” *Gary Pfizenmayer* will determine the extent of evacuation and whether employees need to shelter in place. Sheltering in place means taking refuge in an interior room with no or few windows until the emergency has passed. In many cases, local authorities will issue advice to shelter-in-place via TV or radio. In case of chemical release, special precautions to protect against toxic atmospheres may be necessary. Including shelter-in-place preparations in the EAP demands a means of alerting employees in distinguishable ways and additional training on shelter-in-place procedures.

First Aid and Rescue

Pyro Combustion & Controls Inc. will ensure the availability of medical personnel for advice and consultation. In the absence of an onsite clinic, at least one person on staff will be trained to render first aid. An amount and dispersal of first aid supplies appropriate to the size of the facility, number of employees and hazards present will remain readily available. First aid supplies will be added or replaced as frequently as necessary to ensure availability. Facilities for rinsing or drenching eyes or body will be provided as hazards demand. First Aid kits will include or will be accompanied by appropriate personal protective equipment for anticipated hazards, including exposure to bloodborne pathogens while performing first aid. More information is available in the chapter entitled “Medical Services and First Aid.”

Critical Information

As part of the personnel file, there will be a record of emergency contact information for employees in case an employee is unable to contact next of kin. The confidential record should include physician information and any other medical information the employee shares for use in case of an emergency.

Multi-employer Workplaces

If *Pyro Combustion & Controls Inc.* shares a building or worksite with other employers, consider working with them to develop a building-wide emergency plan. If a building-wide plan is not feasible, take all necessary steps to ensure the EAP does not conflict with the plans of other employers in the building.

Personal Protective Equipment

During some emergencies, it is necessary for an employee to encounter hazards that require personal protective equipment. A medical emergency involving blood, for instance, will call for gloves as indicated in the bloodborne pathogen exposure control plan. Training, preparation and procedures will include consideration for any necessary PPE.

6.4.2.5 Training and Review

Pyro Combustion & Controls Inc. and the safety committee will review the plan with employees covered by the plan as it is being developed. The plan will also be communicated to employees when they are first assigned to their job, when the plan changes, or when there is a change to an employee's responsibilities under the plan. The plan is subject to annual review and update to reflect changes in the workplace and respond to new or changed hazards.

6.4.3 Exit Routes

During an emergency, swift evacuation can ensure the safety and well-being of employees. To facilitate evacuation and to protect employees should an emergency require employees to evacuate, *Pyro Combustion & Controls Inc.* will adhere to all applicable regulations to ensure safe exit routes remain available to employees in case fire or other emergency demands evacuation of the workplace.

6.4.3.1 Basic Requirements

An exit route must be established and separated by fire resistant materials as quickly as possible during construction, and a safe means of egress must be maintained during renovation and demolition.

If the route connects three or fewer stories, construction materials separating the exit from other parts of the workplace must have a one-hour fire resistance rating. (More stories call for a two-hour resistance rating.) An opening to an exit will only have self-closing, laboratory-tested fire doors as necessary to allow individuals into the route.

Enclosure of and protection of openings for means of egress must occur as soon as possible after exterior walls/windows are in place.

6.4.3.2 Adequate Exit Routes

Pyro Combustion & Controls Inc. will ensure sufficient exit routes for the workplace. While a single exit route is permissible in small workplaces (as long as safe evacuation is possible), two exit routes, located as far as practical from each other helps employees evacuate safely should one exit route be blocked by smoke or fire. More exit routes must be available should the number of employees, or size and configuration of the workplace demand them to ensure every employee can evacuate safely in an emergency.

Consult local codes to ensure safe means of egress in any construction. Exit stairways and means of egress in multi-story buildings must be provided immediately after floor decking is installed. In new multi-story buildings, one of the exit stairs may be obstructed for construction, but do not obstruct exit stairs for more than two contiguous floor levels.

6.4.3.3 Exit Discharge

Exits must discharge outside or to a space with access to the outside that is large enough to accommodate the number of people taking that route. If there are stairs that continue past the evacuation level, some means must interrupt travel to indicate proper direction to discharge area.

6.4.3.4 Unlocked, Side-Hinged

Under no circumstances will an exit door be locked from the inside. Nothing can restrict the use of an exit door or any means of egress established in the fire protection plan in an emergency.

All exit doors will be side-hinged. It is preferable for doors to swing out in the direction of exit travel, and required for rooms designed to hold more than 50 people or in a high-hazard area.

6.4.3.5 Capacity and Size Requirements

Exit routes must be able to handle the maximum occupant load for that floor. The capacity may not decrease as the route approaches the exit discharge.

The ceiling of an exit route must be at least seven feet six inches high. Any projection from the ceiling must not reach a point less than six feet eight inches from the floor.

An exit access must be at least 28 inches wide at all points. Where there is only one exit access leading to an exit or exit discharge, the width of the exit and exit discharge must be at least equal to the width of the exit access. The width of an exit route must be sufficient to accommodate the maximum permitted occupant load of each floor served by the exit route.

Objects that project into the exit route must not reduce the width of the exit route to less than the minimum width requirements for exit routes.

6.4.3.6 Outdoor Exit Routes

An outdoor exit route must be:

- protected by guardrails if a fall hazard is present;
- covered or otherwise protected from slipping hazards like ice or snow;
- reasonably straight, smooth, solid, and substantially level; and
- free of dead ends longer than 20 ft.

6.4.3.7 Minimize Dangers

Exit routes will be unobstructed and clear of hazardous materials or flammable furnishings. An exit route that goes toward a high hazard area requires barriers or partitions to provide a suitable shield from the hazard for workers.

6.4.3.8 Lighting and Marking

Exit routes should be adequately lit, clearly visible and marked by a sign reading "EXIT." Decorations and signs must not obstruct or obscure the visibility of the exit door. If a doorway could be mistaken for an exit, it must be marked "Not an Exit" or a sign that identifies its use. If the direction to the exit is not apparent, signs must be posted to indicate the direction for evacuation.

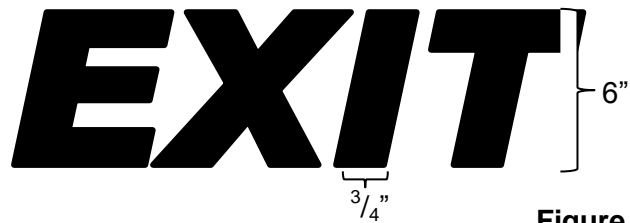


Figure 2

Exit signs must be illuminated to a surface value of five foot-candles or greater. A self-luminous or electroluminescent sign is required to have a luminance surface value of at least .06 footlamberts. The letters on an exit sign should be at least 6" high with a stroke width of 3/4". See figure 2

6.4.3.9 Construction, Repairs, Alterations

Employees may not occupy any workplace during construction, repairs or alterations unless all exit routes and required safety standards are maintained. *Pyro Combustion & Controls Inc.* will ensure removal of or appropriately minimize hazards beyond normal conditions during construction activities.

6.5 Forms & Attachments

On the following pages, please find the following documents:

- Major Fire Hazards list
- Emergency Action Plan
- Fire Prevention Training Documentation
- Emergency Action Plan Training Documentation

These forms may be reproduced freely by *Pyro Combustion & Controls Inc.* for the purposes of implementing and maintaining a safety and health program.

Emergency Action Plan

to be posted at all facilities and workplaces

Company Name: Pyro Combustion & Controls Inc. Job Location:		
Street Address: 2969 South Highland Drive		
City: Las Vegas	State: Nevada	ZIP Code: 89109
Prepared By:		
Title:	Phone Number:	
Signature:	Date:	
PURPOSE		
This plan is for the safety and well-being of the employees of <i>Pyro Combustion & Controls Inc.</i> It identifies necessary management and employee actions during fires and other emergencies. Education and training are provided so that all employees know and understand the Emergency Action Plan.		
LOCATON OF PLAN		
The Emergency Action Plan can be found at the station or office of:		
Upon request, an OSHA representative may obtain a copy of the plan from:		
EXIT ROUTES		
Draw a diagram of jobsite or facility exit routes in space below. Locate meeting place or "Roll-Call" area on diagram		

Emergency Action Plan (Pg. 2)

ACCOUNTING FOR EMPLOYEES	
After exiting jobsite or facility, all employees are to assemble for "Roll-Call" at this location:	
Note location on above diagram	
The following are responsible for ensuring that employees comply with this requirement:	
Name and Title:	
Name and Title:	
CRITICAL OPERATIONS	
To minimize damage from the emergency, the following personnel are responsible for shutting down the listed critical operations:	
Personnel Names	Critical Operations
As soon as shutdowns are completed, the employees who performed critical operations must take the nearest exit route in accordance with general emergency procedures.	
RESCUE AND MEDICAL DUTIES	
The following personnel are certified and trained in both CPR and general first aid.	
Name and Title	Phone Number
REPORTING EMERGENCIES	
The following personnel have the duty of contacting public responders to come to the emergency scene. The personnel are listed in descending order of availability:	
Name and Title	Phone Number

Emergency Action Plan (Pg. 3)

ALARM SYSTEMS AND NOTIFICATION OF EMERGENCIES
In the event of a workplace or facility emergency, employees will be notified as follows:
TYPES OF EVACUATION
OSHA requires this Company to have an established system of types of evacuation to follow for different emergency circumstances. The following listing represents Company policy for various emergency situations:
PARTIAL EVACUATION: Code Yellow – 3 rings or horn blasts RESPONDERS (trained extinguisher personnel and trained rescue and medical personnel)
FULL EVACUATION: Code Red – 4 rings or horn blasts: RESPONDERS (n/a)
NOTE: If there is more than one evacuation type, the alarm signal for each must be distinctive.
OTHER: (describe)
PUBLIC EMERGENCY RESPONSE INFORMATION
<i>911 emergency services DO / DO NOT cover the area this Emergency Action Plan covers. (circle one)</i>
Local Police Department:
Local Fire Department:
Local Ambulance/EMS:
Local Hospital:
FURTHER INFORMATION
For further information or explanation about any duties under this Plan, contact:
Name and Title:
Name and Title:
This Emergency Action Plan is authorized and approved by (Name and Title):
Signature

7

Medical Services & First Aid

7.1 Policy Statement

Pyro Combustion & Controls Inc. is committed to the safety and health of our employees and to ensuring prompt medical attention for any injury that occurs at work.

Part of that commitment includes having readily available medical personnel. Where there is no medical facility in proximity to the worksite, *Gary Pfizenmayer* and other personnel as needed will be trained to provide first aid. First-aid kits are located at: *Each vehicle*

Pyro Combustion & Controls Inc. will provide, at no cost, medical services for employee evaluations, employment requirements and special conditions of work.

7.2 Responsibilities

The availability of medical attention in the event of a medical emergency is a responsibility shared between *Pyro Combustion & Controls Inc.* and its employees.

7.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Ensure every employee receives training that explains the first-aid response plan.
- Determine who must be trained to render first aid and ensure every employee expected to render first aid will be trained in appropriate practices and techniques, including response to site-specific hazards.
- Ensure the first-aid response plan, amount of first-aid-trained personnel, first-aid equipment and all other hazard controls reflect workplace hazards as determined in job hazard analyses and worksite inspections.
- Ensure first-aid kits remain fully stocked and any emergency response equipment is in good repair.
- Respond to recommendations and concerns from *Pyro Combustion & Controls Inc.* employees and the safety committee.

7.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Participate in the creation of a first-aid response plan.
- Participate in all job hazard analyses and recommend changes to the first-aid policy and first-aid response plan to increase workplace safety.
- Recommend changes to first-aid policy and procedures.

7.2.3 Employee Responsibilities

Every *Pyro Combustion & Controls Inc.* employee is expected to:

- Follow the first-aid policy and the first-aid response plan
- Understand the hazards presented by “Good Samaritan” first aid response.

7.3 Training

Pyro Combustion & Controls Inc. will ensure every employee receives training that covers the *Pyro Combustion & Controls Inc.* first-aid response plan. All personnel expected to render first aid will be certified by an approved first-aid training organization. All training for workplace safety will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will provide training:

- At the time of assignment to tasks where occupational exposure may take place.
- At least annually thereafter; annual training will be provided within one year of previous training.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to educational level, literacy, and language of employees.

7.3.1 Training Components

The training program for medical services and first aid will contain at a minimum the following elements:

- Location and contents of workplace first-aid kits;
- “Good Samaritan” hazards and bloodborne pathogens; and
- Self-care and incident reporting.

The person conducting the training will be knowledgeable in the subject matter of the training program as it relates to the workplace.

Any *Pyro Combustion & Controls Inc.* employee who is expected to render first aid as part of his or her job duties will receive additional training from an external organization (e.g. American Heart Association, American Red Cross, the National Safety Council) including, but not limited to:

- Recommended first-aid practices, especially those that may be necessary for hazards specific to the *Pyro Combustion & Controls Inc.* workplace;
- Bloodborne pathogen exposure control; and
- Cardiopulmonary resuscitation incorporating use of automated external defibrillators (if present at worksite).

If a third-party first aid training provider is unable to provide first aid training specific to hazards at *Pyro Combustion & Controls Inc.*, first aid responders require supplementary training over the appropriate response to injuries that may result from worksite-specific hazards.

7.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Pyro Combustion & Controls Inc. will maintain employee-training records for 3 years from the date on which the training occurred.

7.4 Policy

7.4.1 Planning

As with any element of the *Pyro Combustion & Controls Inc.* Safety and Health Program, the first-aid response plan demands leadership from management and the active involvement of employees. The goal is a first-aid response plan based on hazards in the workplace and training for employees according to the risks they face while performing their job duties.

7.4.1.1 Hazard Assessment

A job hazard analysis (see chapter on “Job Hazard Analysis”) will not only inform the extent and nature of first-aid training for a given job, but also determine the first-aid supplies that need to be available.

7.4.1.2 First-Aid Response Planning

Gary Pfizenmayer, working with members of the safety committee, will determine a first-aid response plan appropriate to the worksite.

The first-aid response plan can be incorporated into the emergency action plan and will:

- Fit the work location, type of work, and environmental conditions;
- Identify available emergency medical services, their numbers and where they are posted;
- Describe the type of first-aid training employees receive, if applicable;
- Identify the location(s) of first-aid supplies and/or first-aid station;
- Identify the contents of first-aid kits;
- Describe how first-aid supplies, kits and equipment will be inspected and maintained and by whom; and
- List all first-aid trained employees.

Emergency Medical Services

Knowledge of available emergency medical services and their estimated response times to the worksite throughout the day can be useful when planning the first-aid response plan.

7.4.1.3 Sharing First-aid Response Plan Information

First-aid policies and procedures are most effective when they are in writing. Whether in writing or not, the first-aid response plan needs to be communicated in such a way that every worker, can understand and follow the plan.

7.4.2 Implementation

7.4.2.1 First-Aid Kits

First-aid supplies will remain available in adequate quantities and be readily accessible at *Each vehicle*. The contents of the kit listed in The American National Standard (ANSI) Z308.1-1998 "Minimum Requirements for Workplace First-aid Kits" (table 1) should be adequate for most small worksites. *Gary Pfizenmayer* or the appropriate safety committee member(s) will determine the need for additional first-aid kits at the worksite, additional types of first-aid equipment and supplies, and additional quantities and types of supplies in first-aid kits to accommodate larger operations or multiple operations conducted at the same location.

ANSI Z308.1-1998 Minimum Requirements for Workplace First-aid Kits	
Quantity	Description
1 ea.	absorbent compress (at least 4" X 8")
16 ea.	adhesive bandages (1" X 3")
5 yd.	adhesive tape
10 ea.	antiseptic applications (.5g)
6 ea.	burn treatment applications (.5g)
4 ea.	sterile pads (at least 3" X 3")
2 pr.	medical exam gloves
1 ea.	Triangular bandage (at least 40" X 40" X 56")

Table 1

7.4.2.2 Sudden Cardiac Arrest

Cardiopulmonary Resuscitation

OSHA standards require training in cardiopulmonary resuscitation (CPR) in some employment situations where sudden cardiac arrest from asphyxiation, electrocution, or exertion may occur: permit-required confined spaces; logging operations; electric power generation, transmission, and distribution; dive teams; and power transmission and distribution construction. However, sudden cardiac arrest is a potential risk at all worksites, and those trained in first aid benefit greatly from learning CPR regardless of work hazards.

Automated External Defibrillators

Pyro Combustion & Controls Inc. will determine the need for an automated external defibrillator (AED) program as part of the first-aid response plan. Training will reflect whether an AED is included.

If an AED is available at the worksite, CPR training will incorporate AED training.

7.4.2.3 Corrosives, Irritants or Corrosive Materials

If workplace hazard analysis determines hazards from corrosive materials, strong irritants or toxic chemicals, the *Pyro Combustion & Controls Inc.* first-aid plan will include appropriate hazard controls. These controls include eye irrigation equipment, eye wash stations and emergency showers.

Even worksites without high risk levels from corrosives, irritants and toxic chemicals may find eye irrigation equipment and eyewash equipment appropriate to address workplace hazards. However, some state requirements and specific chemical safety procedures **require** such equipment on worksites. Where such requirements exist, *Pyro Combustion & Controls Inc.* will adhere to applicable workplace safety and health regulations and industry best practices.

7.4.3 Training

First-aid training courses provided to *Pyro Combustion & Controls Inc.* employees will include instruction in general and workplace hazard-specific knowledge and skills.

First-aid trained employees should repeat training periodically to maintain and update knowledge and skills.

See Potential First-Aid Training Elements at the end of this chapter for more.

7.4.3.1 Bloodborne Pathogens

If an employee renders first-aid as part of his or her job duties, the employee must meet the requirements of the Occupational Exposure to Bloodborne Pathogens standard and be trained accordingly. Please see the chapter on “Bloodborne Pathogens” for more information.

Additionally, employees who have not received first-aid training need to understand the hazards presented by delivering first aid to a coworker. While *Pyro Combustion & Controls Inc.* discourages the administration of first aid by any employee who has not been trained in first aid, “Good Samaritan” first aid delivery is always a possibility.

7.4.4 Record Keeping

All safety and health incidents and near-misses will be documented and investigated according to the policy on “Accident Investigation.” This includes prompt notification to OSHA of catastrophic or deadly incidents and may include other reporting requirements.

7.4.5 Program Review

Gary Pfizenmayer will review the first-aid response plan and all elements at least annually to ensure all elements sufficiently address the safety needs of *Pyro Combustion & Controls Inc.* and its employees. Recommended first-aid techniques and knowledge change over time, and *Pyro Combustion & Controls Inc.* policy will reflect those changes.

7.5 Forms & Attachments

On the following pages, please find the following documents:

- First-Aid Response Plan
- Medical Services and First-Aid Training Documentation

First-Aid Response Plan

Company:	Date:
This plan was written for: (site or location this plan covers)	
The following person/position is responsible for managing our first-aid response plan:	
The emergency medical service to be called:	
Summon the emergency medical service by doing the following: (In most cases, it will be to call 911 or some other phone number, but a direct alarm or some other method may be the preferred way.)	
Emergency phone numbers are posted at the following location(s):	
Other means to summon aid are at the following location:	
When employees need first aid they must do the following:	
Employees on site who are first-aid trained:	
First-aid kits (or a first aid station) are located at:	
The following person/position is responsible for inspecting the first-aid kits:	
The Company's Designated Medical Provider is:	
Person Preparing Plan:	
Signature:	Date:
Supervisor's Name:	
Signature:	Date:

Potential First-Aid Training Elements

OSHA suggests a number of elements to include when planning first-aid training programs.

1. Teaching Methods

Training programs should incorporate the following principles:

- Basing the curriculum on a consensus of scientific evidence where available;
- Having trainees develop “hands-on” skills through the use of mannequins and partner practice;
- Having appropriate first-aid supplies and equipment available;
- Exposing trainees to acute injury and illness settings as well as to the appropriate response through the use of visual aids;
- Including a course information resource for reference both during and after training;
- Allowing enough time for emphasis on commonly occurring situations;
- Emphasizing skills training and confidence-building over classroom lectures; and
- Emphasizing quick response to first-aid situations.

2. Preparing to Respond to a Health Emergency

The training program should include instruction or discussion in the following:

- Prevention as a strategy in reducing fatalities, illnesses and injuries;
- Interacting with the local EMS system;
- Maintaining a current list of emergency telephone numbers (police, fire, ambulance, poison control) accessible to all employees;
- Understanding the legal aspects of providing first-aid care, including Good Samaritan legislation, consent, abandonment, negligence, assault and battery, State laws and regulations;
- Understanding the effects of stress, fear of infection, panic; how they interfere with performance; and what to do to overcome these barriers to action;
- The importance of universal precautions and body substance isolation to provide protection from bloodborne pathogens and other potentially infectious materials;
- Learning about personal protective equipment — gloves, eye protection, masks, and respiratory barrier devices; and
- Appropriate management and disposal of blood-contaminated sharps and surfaces; and awareness of OSHA’s Bloodborne Pathogens standard.

3. Assessing the Scene and the Victim(s)

The training program should include instruction in the following:

- Assessing the scene for safety, number of injured, and nature of the event;
- Assessing the toxic potential of the environment and the need for respiratory protection;
- Establishing the presence of a confined space and the need for respiratory protection and specialized training to perform a rescue;
- Prioritizing care when there are several injured;
- Assessing each victim for responsiveness, airway patency (blockage), breathing, circulation, and medical alert tags;
- Taking a victim's history at the scene, including determining the mechanism of injury;
- Performing a logical head-to-toe check for injuries;
- Stressing the need to continuously monitor the victim;
- Emphasizing early activation of EMS;
- Indications for and methods of safely moving and rescuing victims; and
- Repositioning ill/injured victims to prevent further injury.

4. Responding to Life-Threatening Emergencies

The training program should be designed or adapted for the specific worksite and may include first-aid instruction in the following:

- Establishing responsiveness;
- Establishing and maintaining an open and clear airway;
- Performing rescue breathing;
- Treating airway obstruction in a conscious victim;
- Performing CPR;
- Using an AED;
- Recognizing the signs and symptoms of shock and providing first aid for shock due to illness or injury;
- Assessing and treating a victim who has an unexplained change in level of consciousness or sudden illness;
- Controlling bleeding with direct pressure;

- Poisoning
 - Ingested poisons: alkali, acid, and systemic poisons. Role of the Poison Control Center (1-800-222-1222);
 - Inhaled poisons: carbon monoxide; hydrogen sulfide; smoke; and other chemical fumes, vapors, and gases. Assessing the toxic potential of the environment and the need for respirators;
 - Knowledge of the chemicals at the worksite and of first aid and treatment for inhalation or ingestion;
 - Effects of alcohol and illicit drugs so that the first-aid provider can recognize the physiologic and behavioral effects of these substances.
- Recognizing asphyxiation and the danger of entering a confined space without appropriate respiratory protection. Additional training is required if first-aid personnel will assist in the rescue from the confined space.
- Responding to Medical Emergencies
 - Chest pain
 - Stroke
 - Breathing problems
 - Anaphylactic reaction
 - Hypoglycemia in diabetics taking insulin
 - Seizures
 - Pregnancy complications
 - Abdominal injury
 - Reduced level of consciousness
 - Impaled object

5. Responding to Non-Life-Threatening Emergencies

The training program should be designed for the specific worksite and include first-aid instruction for the management of the following:

- Wounds;
 - Assessment and first aid for wounds including abrasions, cuts, lacerations, punctures, avulsions, amputations and crush injuries;
 - Principles of wound care, including infection precautions;
 - Principles of body substance isolation, universal precautions and use of personal protective equipment.
- Burns;
 - Assessing the severity of a burn;
 - Recognizing whether a burn is thermal, electrical, or chemical and the appropriate first aid; and
 - Reviewing corrosive chemicals at a specific worksite, along with appropriate first aid.

- Temperature extremes;
 - Exposure to cold, including frostbite and hypothermia;
 - Exposure to heat, including heat cramps, heat exhaustion and heat stroke.
- Musculoskeletal injuries;
 - Fractures;
 - Sprains, strains, contusions and cramps;
 - Head, neck, back and spinal injuries;
 - Appropriate handling of amputated body parts.
- Eye injuries
 - First aid for eye injuries;
 - First aid for chemical burns.
- Mouth and teeth injuries
 - Oral injuries; lip and tongue injuries; broken and missing teeth;
 - The importance of preventing aspiration of blood and/or teeth.
- Bites and stings;
 - Human and animal bites;
 - Bites and stings from insects; instruction in first-aid treatment of anaphylactic shock.

8

Bloodborne Pathogens

8.1 Policy Statement

Pyro Combustion & Controls Inc. is committed to the safety and health of our employees and to preventing the spread of bloodborne pathogens. Therefore, *Pyro Combustion & Controls Inc.* adheres to the following bloodborne pathogen policy and Exposure Control Plan (ECP). If an employee is exposed to bloodborne pathogens — such as those designated as responsible for first aid and medical assistance or those doing work in certain medical or sanitation facilities — all measures within this program will be taken to prevent spread of disease.

8.2 Responsibilities

Preventing the spread of bloodborne illnesses is a responsibility shared between *Pyro Combustion & Controls Inc.* and its employees.

8.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- enact and enforce an exposure control plan to prevent occupational exposure to potentially infectious materials;
- identify employees who, as part of their job duties, may reasonably be anticipated to come into contact with blood and other potentially infectious materials;
- provide for post-exposure evaluation and follow-up should an employee be exposed to potentially infectious materials;
- ensure employees have received appropriate bloodborne pathogens training; and
- ensure adequate supply of Personal Protective Equipment.

8.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- develop and implement a site-specific exposure control plan;
- identify employees who, as part of their job duties, may reasonably be anticipated to come into contact with blood and other potentially infectious materials;
- develop, conduct, and document training for bloodborne pathogens safety;
- investigate exposure incidents and recommend work practice changes, if necessary; and
- recommend personal protective equipment (PPE) if necessary.

8.2.3 Employee Responsibilities

Every *Pyro Combustion & Controls Inc.* employee is expected to:

- Offer input on ECP as appropriate, including identification, evaluation and selection of new control methods;
- Follow all elements of the bloodborne pathogens policy and training; and
- Notify supervisor if they encounter any problems.

8.3 Training

Pyro Combustion & Controls Inc. will ensure every employee who might reasonably anticipate coming into occupational exposure to potentially infectious materials participate in a bloodborne pathogen training program. *Pyro Combustion & Controls Inc.* will provide this training at no cost to the employee during working hours.

Training will be provided:

- At the time of assignment to tasks where occupational exposure may take place.
- At least annually thereafter; annual training for all employees will be provided within one year of their previous training.

Pyro Combustion & Controls Inc. will provide additional training when tasks or procedures are added or changed that affect the employee's occupational exposure. It is acceptable for additional training to be limited to addressing only the changes or additions to the employees' exposure.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to educational level, literacy, and language of employees.

8.3.1 Training Components

The training program will contain at a minimum the following elements:

- An accessible copy of the regulatory text of CFR 1910.1030, this bloodborne pathogen policy and exposure control plan, and an explanation of its contents;
- A general explanation of the epidemiology and symptoms of bloodborne diseases;
- An explanation of the modes of transmission of bloodborne pathogens;
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials;
- An explanation of the use and limitations of methods to prevent or reduce exposure, including engineering controls, work practices, and personal protective equipment;

- Information on the types, proper use, location, removal, handling, decontamination, and disposal of personal protective equipment;
- An explanation of the basis for selection of personal protective equipment;
- Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine and vaccination will be offered free of charge to employees who face occupational exposure;
- Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials;
- An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available;
- Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident;
- An explanation of the signs and labels and/or color coding; and
- An opportunity for interactive questions and answers with the person conducting the training session.

The person conducting the training will be knowledgeable in the subject matter of the training program as it relates to the workplace.

8.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

8.4 Policy

Bloodborne pathogens are diseases caused by microorganisms that live in the bloodstream and are spread through blood and other body fluids. Bloodborne pathogens include the human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV). HIV compromises the body's immune functions and can lead to acquired immunodeficiency syndrome. While the virus does not live out of the body for long, it can enter the bloodstream through cuts, abrasions and small tears in mucous membranes. Hepatitis affects the health of the liver. There is a vaccination available to prevent the spread of HBV, but not HCV. Bloodborne pathogens can be transmitted through any body fluid, and employees must take care whenever handling possible contaminants to prevent the spread of bloodborne infections.

8.4.1 Exposure Determination

As part of the comprehensive bloodborne pathogen exposure control plan, it is crucial to determine which jobs expose an employee to blood and other potentially infectious material, as well as the means by which that exposure might occur. Accordingly, the *Pyro Combustion & Controls Inc.* safety committee will determine which job classifications can reasonably expect occupational exposure to potentially infectious material. The following will be determined and documented:

- Job classifications in which all employees have occupational exposure
- Job classifications in which some employees have occupational exposure
- Tasks and procedures in which occupational exposure occurs

Further, input from non-managerial employees exposed to contaminated sharps and infectious material is vital to the success of this exposure control plan, and every employee is encouraged to offer suggestions that will help the effectiveness of the exposure control plan.

8.4.2 Methods of Compliance

Employees will take precautions to prevent contact with potentially infectious material. If an employee cannot easily determine the nature of a body fluid, he or she should treat it as infectious.

8.4.2.1 Engineering and Work Practice Controls

As part of this exposure control plan, *Pyro Combustion & Controls Inc.* will seek methods by which to eliminate occupational exposure to the greatest extent possible. This plan encourages work task changes to reduce exposure as well as isolating or removing materials that might pose a hazard. The exposure control plan requires *Pyro Combustion & Controls Inc.* to examine regularly and maintain or replace engineering controls to ensure their effectiveness.

Handwashing

Pyro Combustion & Controls Inc. will provide readily accessible handwashing facilities to every employee. If providing handwashing facilities is not feasible, *Pyro Combustion & Controls Inc.* will provide either an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes.

In addition to basic workplace hygiene requirements, employees will wash hands as soon as possible after removing gloves or other PPE.

Should an employee's skin or mucous membrane be exposed to potentially infectious materials, the employee will wash skin with soap and water or flush mucous membranes with water.

Sharps

Employees will handle and dispose of contaminated sharps in a way that prevents unnecessary exposure to hazards. Employees will not bend, recap, or remove contaminated sharps unless no alternative is feasible and the employee can accomplish any bending, recapping or needle removal using a mechanical device or one-handed technique.

As soon as possible after use, contaminated reusable sharps will be placed in a container that is puncture resistant, labeled or color-coded appropriately, leakproof on sides and bottom and doesn't require employees to reach into it to use it.

Other Engineering and Work Practice Controls

- Employees may not eat, drink, smoke, apply cosmetics or handle contact lenses where occupational exposure may occur.
- No food or drink is to be stored where potentially infectious materials are present.
- Employees may not use their mouths to pipette or suction potentially infectious materials.
- Containers used to store or transport potentially infectious materials should be closable, prevent leaks and be appropriately labeled or color-coded. They should also be puncture resistant, if necessary.
- Employees will examine any equipment that may be contaminated before servicing or shipping and will decontaminate it as necessary and feasible. If decontamination is impossible, the employee will attach a label to the equipment, and inform all appropriate personnel of the contamination to ensure they take proper precautions.

8.4.2.2 Personal Protective Equipment

Where the possibility of occupational exposure exists, *Pyro Combustion & Controls Inc.* will provide personal protective equipment appropriate to the hazards and the work being performed. Appropriate personal protective equipment (PPE) is impermeable to blood or other potentially infectious material under normal conditions and durations of use.

PPE will be provided and maintained free to employees in appropriate sizes, and provisions will be made should an employee be allergic to gloves normally provided.

An employee may decline using appropriate PPE under "rare and extraordinary circumstances" when PPE use might prevent the delivery of health care or public safety services. These exceptions will be investigated and documented to prevent future occurrences.

PPE will be removed as soon as feasible and be removed before leaving the work area. After removal, the employee will place contaminated PPE in an appropriate area or container to be stored, washed, decontaminated or disposed of.

Gloves

Employees must wear gloves if they anticipate hand contact with potentially infectious materials. Do not reuse single use gloves, and replace as quickly as possible if torn, punctured or otherwise compromised.

Masks, Eye Protection and Face Shields

Employees will wear masks, together with eye protection devices whenever splashes, spray, spatter, or droplets of blood or other potentially infectious materials may be generated and eye, nose, or mouth contamination can be reasonably anticipated.

Gowns, Aprons, etc.

Employees will wear appropriate protective clothing like gowns or clinic jackets when appropriate; the type of protective clothing is determined by the nature of exposure, and will be sufficient to protect against occupational exposure.

8.4.2.3 Housekeeping

Employees will keep the workplace clean and sanitary. *Pyro Combustion & Controls Inc.* will implement a written schedule for cleaning and decontamination based on the demands of the site.

Employees will use an appropriate disinfectant to clean and decontaminate contaminated or potentially contaminated work surfaces after any spill of infectious materials and at the end of the work shift. *Pyro Combustion & Controls Inc.* will replace protective surface coverings as soon as possible if they are contaminated. Bins, cans, pails or other receptacles that may become contaminated should be inspected and decontaminated regularly, in addition to being decontaminated as soon as feasible after visible contamination. Employees must not pick up any broken glassware that may be contaminated by hand. Use a brush/dustpan or tongs.

Laundry

Employees will handle any contaminated laundry as little as possible. They must put such laundry into a color-coded or labeled container where it was used. Wet laundry should be placed into a leakproof container. Employees handling contaminated laundry must use appropriate PPE.

8.4.3 Hepatitis B Vaccination

Pyro Combustion & Controls Inc. will make available the hepatitis B vaccination series at no cost to any *Pyro Combustion & Controls Inc.* employee who faces occupational exposure.

An employee occupationally exposed to potentially infectious material may decline the hepatitis B vaccine, but must sign a declination statement to be kept on file. Anyone who declines vaccination may request and receive the vaccination at no cost later.

8.4.4 Post-exposure Evaluation and Follow-up

Should an exposure incident occur the employee should contact *Gary Pfizenmayer* (or designate) immediately.

8.4.4.1 In Case of Exposure

A licensed health care professional will conduct a confidential medical evaluation and follow-up as soon as possible following an exposure incident. Following initial first aid (clean the wound, flush eyes or other mucous membrane, etc.), follow the following procedure:

1. Document the routes of exposure and how the exposure occurred.
2. Identify and document the source individual (unless the employer can establish that identification is infeasible or prohibited by state or local law).
3. Obtain consent and arrange to have the source individual tested as soon as possible to determine HIV, HCV, and HBV infectivity; convey and document conveyance of the source individual's test results to the employee's health care provider. If the source individual is known to be HIV, HCV and/or HBV positive, new testing need not be performed.
4. Provide the exposed employee with the source individual's test results and with information about applicable disclosure laws and regulations concerning the identity and infectious status of the source individual (e.g., laws protecting confidentiality).
5. After obtaining consent, collect exposed employee's blood as soon as feasible after exposure incident, and test blood for HBV and HIV serological status.
6. If the employee does not give consent for HIV serological testing during collection of blood for baseline testing, preserve the baseline blood sample for at least 90 days; if the exposed employee elects to have the baseline sample tested during this waiting period, perform testing as soon as feasible.

8.4.4.2 Administrative Responsibilities Following Exposure

Pyro Combustion & Controls Inc. will ensure that the health care professional responsible for post-exposure evaluation and follow-up receives the following:

- a copy of OSHA's bloodborne pathogens standard;
- a description of the employee's job duties relevant to the exposure incident;
- route(s) of exposure;
- circumstances of exposure;
- results of the source individual's blood test if possible; and
- relevant employee medical records, including vaccination status

Pyro Combustion & Controls Inc. will provide the employee with a copy of the evaluating healthcare professional's written opinion within 15 days of the completion of the evaluation.

8.4.5 Recordkeeping

8.4.5.1 Medical Records

Pyro Combustion & Controls Inc. will maintain a confidential medical record for every employee with occupational exposure that will include at least the following:

- the name and social security number of the employee;
- a copy of the employee's HBV status (with dates of all Hep B vaccinations);
- a copy of all post-exposure documentation and healthcare professional's written opinion; and
- a copy of the information provided to the healthcare professional.

Do not share or report this record unless the employee provides written consent.

8.4.5.2 Sharps Injury Log

Pyro Combustion & Controls Inc. will maintain a sharps injury log to record injuries from contaminated sharps that break the skin. The log will protect the identity of the injured employee and will contain the following:

- an explanation of how the injury occurred;
- the type and brand of device involved; and
- the department or work area where injury occurred.

8.4.6 Hazard Communication

Label containers of regulated biological waste, or any container used to store or transport potentially infectious material, and contaminated equipment to prevent exposure. Labels for such containers will include the legend depicted in figure 1.

All such labels will be fluorescent orange or orange-red and be attached as close as feasible to the container.



Figure 1

8.4.7 Review and Update of ECP

The *Pyro Combustion & Controls Inc.* safety committee will review this ECP and update it at least annually and whenever necessary to reflect new or changed tasks and procedures that affect occupational exposure. Reviews and updates will:

- Reflect changes in technology that eliminate or reduce exposure to bloodborne pathogens; and
- Document annually consideration and implementation of appropriate commercially available and effective safer medical devices designed to eliminate or minimize occupational exposure.

Pyro Combustion & Controls Inc. will seek the input of non-managerial employees to identify, evaluate and select controls to reduce occupational exposure. This input will be documented as part of this ECP.

8.5 Forms and Attachments

On the following pages, please find the following documents:

- Exposure Control Plan Documentation
- Declination Statement
- Exposure Incident Report
- Evaluating Physician's Written Opinion
- Sharps Injury Log
- Bloodborne Pathogens Training Documentation

These forms may be reproduced freely by *Pyro Combustion & Controls Inc.* for the purposes of implementing and maintaining a safety and health program.

Exposure Control Plan Documentation

<u>Exposure Determination</u>	
<i><u>Jobs in which all employees have occupational exposure to potentially infectious materials</u></i>	<i><u>Task or procedure where exposure occurs</u></i>
<i><u>Jobs in which some employees have occupational exposure to potentially infectious materials</u></i>	<i><u>Task or procedure where exposure occurs</u></i>

Engineering controls and work practice controls:

<i>The following types of PPE are available in the following locations:</i>	
Personal Protective Equipment	Location

Declination Statements

DECLINATION STATEMENT

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Employee Signature _____ Date _____

DECLINATION STATEMENT

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Employee Signature _____ Date _____

DECLINATION STATEMENT

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring Hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself. However, I decline Hepatitis vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Employee Signature _____ Date _____

Exposure Incident Report

(Routes and Circumstances of Exposure Incident)

Please Print

Employee's Name _____ Date _____

Date of Birth _____ SS# _____

Telephone (Business) _____ (Home) _____

Job Title _____

Date of Exposure _____ Time of Exposure _____ AM ___ PM _____

Hepatitis B Vaccination Status _____

Location of Incident _____

Describe job duties you were performing when the exposure incident occurred

Describe the circumstances under which the exposure incident occurred

(What happened that resulted in the incident?)

What body fluid(s) were you exposed to? _____

What was the route of exposure? *(e.g., mucosal contact, contact with nonintact skin, percutaneous)*

Describe any personal protective equipment in use at time of exposure incident

Did PPE fail? _____ If yes, how? _____

Identification of source individual(s) (names) _____

Other pertinent information _____

Evaluating Physician's Written Opinion

To the Evaluating Physician:

This employee may have suffered an exposure incident to a Bloodborne Pathogen. In accordance with OSHA standards covering post-exposure evaluation and follow up, the following documents are provided for you:

- A copy of OSHA regulations covering Occupational Exposure to Bloodborne Pathogens;
- A description of the exposed employee's duties as they relate to the exposure incident;
- Documentation of the routes of exposure and circumstances under which exposure occurred;
- Results of the source individual's blood testing, if available; and
- All medical records relevant to this employee's appropriate treatment, including vaccination status.

After you have determined whether there are contra-indications to vaccination of this employee with Hepatitis B vaccine, please state in the space below if:

- Vaccine was indicated
- Vaccine was received

(All other findings are to remain confidential and are not to be included on this page)

Please return this sheet to this employee:

Thank you for your evaluation of this employee.

Physician's name (printed) _____ date _____

Physician's signature _____

Sharps Injury Log

Facility/Location: _____ Year: _____

Address: _____

City: _____ State: _____ ZIP: _____

Date	Time	Type, Brand, Model of Device	Department / Work Area	Description of How Incident Occurred

(Retain at least 5 years)

9

Workplace Violence Prevention

9.1 Policy Statement

Pyro Combustion & Controls Inc. encourages a safe and healthy work environment. Verbal or physical intimidation, harassment, threats of violence or any violent act are expressly forbidden. A person who makes threats of violence, exhibits threatening behavior or engages in violent acts on *Pyro Combustion & Controls Inc.* property will be removed from the premises as quickly as safety permits and will be kept off premises pending the outcome of an investigation.

Pyro Combustion & Controls Inc. is committed to preventing acts of violence and intimidation. *Pyro Combustion & Controls Inc.* has adopted a system of controls to prevent workplace violence, mitigate the harm caused by it and otherwise address violence and harassment in the workplace.

Gary Pfizenmayer is responsible for implementing and enforcing this policy and will do so with the assistance of management, the safety committee members and all employees.

9.2 Responsibilities

Preventing workplace violence is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

9.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Ensure managers remain committed to preventing aggression and violence;
- Document plan to control aggressive or violent behavior in the workplace;
- Evaluate reports of workplace violence at least yearly to determine necessary changes to violence prevention policy;
- Ensure job hazard analyses include workplace violence hazards;
- Exhibit commitment to the safety and health of workers and customers;
- Ensure employees understand and fulfill obligations under the violence prevention program;
- Establish a program to address medical and psychological repercussions of workplace violence; and
- Support and implement appropriate recommendations of the Safety Committee.
- Enforce prohibition on sexual harassment.

9.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Help create policy, evaluate risks, and develop procedures to respond to hostile acts;
- Assist in or lead training for workplace violence prevention; and
- Participate in job hazard analyses that identify potential for workplace violence.

9.2.3 Employee Responsibilities

Pyro Combustion & Controls Inc. employees are expected to:

- Contribute to developing procedures to address concerns over safety and security;
- Understand and comply with the workplace violence prevention program, and safety and security measures;
- Report violent incidents promptly and accurately;
- Refrain from hostile and violent acts;
- Participate in safety and health committees or teams that receive reports of violent incidents or security problems, make facility inspections and respond with recommendations for corrective strategies; and
- Participate actively in training programs and share on-the-job experiences that cover techniques to recognize escalating agitation, aggressive behavior or criminal intent.

9.3 Training

Pyro Combustion & Controls Inc. will provide training to employees regarding their roles in workplace violence prevention. This training will come at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to the educational level, literacy and language of employees.

9.3.1 Training Components

Gary Pfizenmayer will ensure that every employee will be trained in the following elements:

- The workplace violence prevention policy;
- Risk factors that cause or contribute to assaults;
- Early recognition of escalating behavior or recognition of warning signs or situations that may lead to assaults;
- Ways to prevent or diffuse volatile situations, manage anger and appropriately;
- A standard response action plan for violent situations, including the availability of assistance, response to alarm systems and communication procedures;
- Ways to deal with hostile people in the workplace;

- Relaxation, stress management and anger control;
- Basic self-protection measures;
- The location and operation of safety devices such as alarm systems, along with the required maintenance schedules and procedures;
- Ways to protect oneself and coworkers, including use of the “buddy system;”
- Policies and procedures for reporting and recordkeeping;
- Information on multicultural diversity to increase staff sensitivity to racial and ethnic issues and differences;
- Policies and procedures for obtaining medical care, counseling, workers’ compensation or legal assistance after a violent episode or injury; and
- The sexual harassment policy.

Managers and Supervisors at *Pyro Combustion & Controls Inc.* will be trained in:

- The Company’s Workplace Violence Prevention Program;
- Communication skills;
- Recognition of aggressive behavior;
- Dealing with employee layoffs, job terminations, and discipline; how to assess violence potential of individuals; and take appropriate measures;
- Violence prevention, *Pyro Combustion & Controls Inc.* security and response procedures; and
- Addressing problems and conflict promptly.

Any employee engaged in a task that faces a high risk of workplace violence (e.g. working alone, especially late at night) will be trained for workplace safety practices specific to the worksite that reduce the risk of workplace violence.

Where *Pyro Combustion & Controls Inc.* operations require security personnel, such personnel will receive training specific to the worksite, including the psychological components of handling aggressive and abusive customers, types of disorders and ways to handle aggression and defuse hostile situations.

9.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

9.4 Policy

9.4.1 Background

9.4.1.1 Workplace Violence

Workplace violence includes violence or the threat of violence against workers. It can occur at or outside the workplace and can range from threats and verbal abuse to physical assaults and homicide. For this policy, workplace violence also includes aggressive behavior, workplace harassment, bullying and intimidation.

Pyro Combustion & Controls Inc. permits no workplace violence. No negative action will ever be taken against an employee for reporting any hazardous situation, and appropriate confidentiality considerations will be taken in every instance of such a report.

9.4.1.2 High-Risk Occupations

Workplace violence is a hazard at any worksite for every worker. Some workers, however, are at significantly increased risk, including workers who:

- Exchange money with the public;
- Deliver passengers, goods, or services; or
- Work alone or in small groups, during late night or early morning hours, in high-crime areas, or in community settings and homes with extensive contact with the public.

Any *Pyro Combustion & Controls Inc.* employee who faces an increased risk of workplace violence will be informed of the increased risk and trained in appropriate practices based on a job hazard analysis of the job. Please see “Workplace Risk Factors” later in this chapter.

9.4.1.3 Types of Workplace Violence

Type	Description
Type I: Criminal Intent	The perpetrator has no legitimate relationship to the business or its employees and is usually committing a crime in conjunction with the violence. These crimes can include robbery, shoplifting, trespassing, and terrorism.
Type II: Customer / Client	The perpetrator has a legitimate relationship with the business and becomes violent while being served by the business. This category includes customers, clients, patients, students, inmates, and any other group for which the business provides services
Type III: Worker-on-Worker	The perpetrator is an employee or past employee of the business who attacks or threatens another employee(s) or past employee(s) in the workplace.
Type IV: Personal Relationship	The perpetrator usually does not have a relationship with the business but has a personal relationship with the intended victim. This category includes victims of domestic violence assaulted or threatened while at work.

9.4.1.4 Horseplay

Horseplay includes playing tricks on coworkers; distracting coworkers; wrestling; showing off; playing punching, kicking or slapping games; and otherwise drawing focus away from the task to engage in a playful way that disregards safety precautions. Horseplay creates unnecessary hazards in the workplace and presents needless distractions. While horseplay is not necessarily violent, it can have a harmful impact on the safety of *Pyro Combustion & Controls Inc.* employees, and is therefore forbidden and will be treated as a workplace violence issue for the sake of this company's safety and health program.

9.4.2 Program Planning

9.4.2.1 Planning Principles

As with any element of the *Pyro Combustion & Controls Inc.* safety and health program, workplace violence prevention requires site-specific and job-specific planning.

Gary Pfizenmayer will work with management, the safety committee and appropriate employees to evaluate the ability of *Pyro Combustion & Controls Inc.* to prevent workplace violence and handle incidents involving violence to enforce effective protections from workplace violence.

Plans to prevent workplace violence should be evaluated regularly, and will also be evaluated when changes are made that impact the risk of workplace violence and when a workplace incident involving violence occurs.

9.4.2.2 Job Hazard Analyses

Workplace violence hazards will be considered in every job hazard analysis performed at *Pyro Combustion & Controls Inc.*. If a job or task presents hazards, steps will be taken to control those hazards as soon as safely possible to prevent injury.

Please see chapter on "Job Hazard Analysis."

9.4.2.3 Other Planning Considerations

As part of the organization-wide violence prevention program, *Pyro Combustion & Controls Inc.* may conduct a screening survey to get employee ideas on the potential for violent incidents and to identify opportunities for improved security measures. These surveys may be repeated as part of the periodic review of this policy.

Independent reviewers such as safety and health professionals, security consultants or law enforcement professionals can provide expert opinions on workplace safety and provide a fresh perspective on preventing workplace violence.

9.4.3 Hazards

Violent behavior, like any safety and health risk factor, occurs within a context. Controlling workplace violence hazards first requires identifying them.

9.4.3.1 Warning Signs of Violence

There is no way to predict all acts of violence; however, the FBI suggests the following indicators of escalating violence risk in an individual:

- Increasing belligerence;
- Ominous, specific threats;
- Hypersensitivity to criticism;
- Recent acquisition/fascination with weapons;
- Apparent obsession with another person;
- Preoccupation with violent themes;
- Interest in recently publicized violent events;
- Outbursts of anger;
- Extreme disorganization;
- Noticeable changes in behavior; and
- Homicidal/suicidal comments or threats

9.4.3.2 Workplace Risk Factors

A variety of workplace factors can contribute to violence risk as well, including the following:

- Understaffing;
- Frustrations arising from poorly defined job tasks and responsibilities;
- Downsizing or reorganization;
- Labor disputes and poor labor-management relations;
- Inadequate security or a poorly trained, poorly motivated security force;
- A lack of employee counseling;
- Poor management styles (for example, arbitrary or unexplained orders; over-monitoring; corrections or reprimands in front of other employees, inconsistent discipline); and
- A high injury rate or frequent grievances may be clues to problem situations in a workplace.

Research indicates that in addition to management oversights, certain job elements increase risk and may indicate the need for greater care when performing job hazard analysis and violence prevention planning. These factors include the following:

- Contact with the public;
- Exchange of money;
- Delivery of passengers, goods, or services;
- Having a mobile workplace;
- Working with unstable or volatile people;
- Working alone or in small numbers;
- Working late at night or during early morning hours;
- Working in high-crime areas;
- Guarding valuable property; and
- Working in community-based settings.

9.4.4 Controls

Pyro Combustion & Controls Inc. will identify and implement effective controls to protect workers against violence hazards. These controls will be determined based on the work, the environment and the organizational context of the work. Controls may include a variety of engineering and administrative approaches to control the hazards associated with violence in the workplace.

Please see the section on “Control” in the chapter covering “Job Hazard Analysis”

9.4.4.1 Engineering

- Develop emergency signaling, alarms and monitoring systems.
- Increase visibility, especially in high-risk areas. Use cameras and curved mirrors in hallways, and ensure good lighting in the workplace and in parking lots.
- Restrict movement of the public and employees with appropriate barriers and card- or key-controlled access.
- Design public areas to minimize assault risk:
- Provide staff restrooms and emergency exits.
- Install enclosed stations, deep service counters or bullet resistant and shatterproof glass enclosures in reception areas if appropriate.
- Arrange furniture and other objects with safety in mind. Be mindful of objects or furniture that can easily be turned into weapons

9.4.4.2 Administrative and Work Practice Controls

- Demonstrate concern for workers’ emotional and physical health and safety, communicating that violence is not permitted.
- Design staffing patterns to prevent personnel from working alone and to minimize waiting time for customers.
- Provide security escorts to the parking lots at night if appropriate.
- Develop a system for alerting security personnel or management to threats of violence and recording incidents to determine need for additional controls.
- Encourage employees to use the “buddy system” when personal safety threatened.
- Limit the amount of accessible cash and valuables in the workplace.
- Consider an employee assistance program to help employees handle their personal problems that may affect job performance and workplace safety.
- Consider potential for violence in human resources operations. Areas where appropriate procedures and policies to prevent violence should be in place include the following:
 - Pre-employment screening;
 - Employee assistance;
 - Employment transition or outplacement services during layoffs;
 - Substance abuse prevention programs; and
 - Detailed post-termination security protocol.

9.4.5 Response

Pyro Combustion & Controls Inc. understands violence can best be prevented through appropriate workplace security measures and caring for the people who work for our company through communication, adequate training, and a system for reporting and following up on incidents. However, regardless of the level of hazard control, *Pyro Combustion & Controls Inc.* may experience a safety incident involving violence. Response to violence in the workplace will depend on the nature of the incident, but will focus on reducing the negative impacts of the incident and discovering ways to prevent similar incidents in the future.

Workplace violence will be considered during the development of the Emergency Action Plan. Please see the chapter entitled “Fire Prevention and Emergency Action Plans” for more information.

9.4.5.1 Notification

Employees will notify a supervisor as soon as safely possible if an incident involving violence occurs. However, if there is an immediate danger of harm and the situation demands the presence of emergency responders, an employee should contact the appropriate authorities or see that a supervisor contacts them. Employees should report any criminal act immediately to police if safely possible and keep a line of communication with the authorities until police arrive.

Management will handle all reports of violence and threats of violence in a manner that respects the sensitive nature of such reports and maintains an appropriate level of confidentiality.

It is a good idea for every worksite to have a means to alert others to an emerging incident. Such means include alarms, codes and signals. These alerts need to be in place and shared before an incident to ensure effectiveness.

De-escalation Strategies	
<p>DO:</p> <ul style="list-style-type: none"> • Be calm. Move and speak slowly, quietly, and confidently. • Encourage the person to talk; listen closely and patiently. • Maintain a relaxed, attentive posture. • Position yourself at an angle to the person rather than directly in front of him or her. • Arrange yourself so your access to emergency exits is not blocked. • Acknowledge the person's feelings. • Ask for small, specific favors such as asking the person to move outside. • Use delaying tactics to give the person time to calm down, such as offering a drink of water. • Point out choices, break big problems into smaller ones. • Avoid sudden movements and maintain a 3-6 foot distance. • If necessary, call the police, but only when it is safe to do so. • A fitness-for-duty evaluation may be appropriate for employees exhibiting dysfunctional behaviors. • Potential victims will be informed of any threat made to them and permitted access to legal assistance and psychological counseling as warranted. 	<p>DON'T:</p> <ul style="list-style-type: none"> • Make sudden movements that may seem threatening. • Speak rapidly, raise your volume, or use an accusatory tone. • Reject all demands. • Make physical contact, jab your finger at the other person, or use long periods of eye contact. • Pose in challenging stances — directly opposite someone, hands on hips or with arms crossed. • Challenge, threaten, or dare the individual. • Belittle the other person. • Criticize or act impatient. • Attempt to bargain with a threatening individual. • Try to make the situation seem less serious than it is. • Make false statements or promises you cannot keep. • Try to impart a lot of technical or complicated information when emotions are high. • Take sides or agree with distortions. • Invade the individual's personal space.

9.4.5.2 Incident Response Team

Gary Pfizenmayer and the safety committee, as part of hazard control planning may determine the need for an incident response team responsible for violence response. Training for this team should include identifying hazard escalation, techniques for de-escalating conflict and other appropriate incident response.

9.4.5.3 Evacuation and Shelter In Place

All employees will be made aware of appropriate evacuation and "Shelter-In-Place" procedures and follow them as necessary in response to a violent workplace incident. Training and preparation may include drills and simulations for a violent incident.

9.4.5.4 Post-Incident Response

In the event of workplace violence, *Pyro Combustion & Controls Inc.* will ensure victims and witnesses are provided appropriate treatment, regardless of the severity of the incident. In addition to physical injuries, victims of workplace violence may suffer other consequences such as the following:

- Psychological trauma;
- Fear of returning to work;
- Changes to relationships;
- Feelings of guilt, powerlessness and incompetence; and
- Fear of criticism by supervisors.

Further, to address opportunities to remedy oversights in the violence prevention program, any incident that demands managerial response under this violence prevention program will be followed by an incident investigation.

Please see the chapter on “Accident Investigation” for more information.

9.4.6 Recordkeeping and Program Evaluation

Pyro Combustion & Controls Inc. will record and communicate injuries and illnesses to workers according to applicable regulations.

This policy will be reviewed, and these reviews documented, at least once a year or under the following circumstances:

- Following a workplace violence incident or report;
- Change in management;
- Change of contact person;
- To make needed changes or improvements to the policy; and
- To identify new training or refresher training needs.

9.5 Sexual Harassment

It is this company’s policy that sexual discrimination, unwelcome sexual advances, requests for sexual favors, and any other conduct of a sexual nature is strictly prohibited.

Requiring coworkers, subordinate employees, or prospective employees to submit to conduct of this nature, explicitly or implicitly, as a term or condition of employment, or used as a basis for any employment decisions is forbidden.

Any behavior that has the purpose or effect of unreasonably interfering with an individual’s work performance, or creating an intimidating, hostile, or offensive work environment is banned.

Sexual harassment can occur in a variety of circumstances:

- The victim as well as the harasser may be a woman or a man. The victim does not have to be of the opposite sex.
- The harasser can be the victim's supervisor, an agent of the employer, a supervisor in another area, a co-worker, or a non-employee.
- The victim does not have to be the person harassed but could be anyone affected by the offensive conduct.
- Sexual harassment may occur without economic injury to or discharge of the victim.
- The harasser's conduct must be unwelcome.

Prevention is the best tool to eliminate sexual harassment in the workplace. *Pyro Combustion & Controls Inc.* has designated appropriate managers (rather than a direct supervisor) and other alternative routes by which an employee can issue formal complaints of sexual harassment. If possible, any victimized employee should attempt to resolve a sexual harassment issue informally by directly informing the harasser that the conduct is unwelcome and must stop. If informal resolution is unsuccessful, the victim should use the formal complaint form and submit it to an appropriate supervisor.

Pyro Combustion & Controls Inc. will take immediate appropriate action when an employee files a complaint.

Pyro Combustion & Controls Inc. recognizes that the question of whether a particular course of conduct constitutes sexual harassment requires a factual determination. *Pyro Combustion & Controls Inc.* also recognizes that false accusations of sexual harassment can have serious effects on innocent persons. If an investigation results in a finding that a person who has accused another of sexual harassment has maliciously or recklessly made false accusations, the accuser will be subject to appropriate sanctions, including discharge.

When investigating allegations of sexual harassment, this company will look at the whole record, the circumstances, and the context in which the alleged incidents occurred. *Pyro Combustion & Controls Inc.* will make a determination on the allegations from available facts on a case-by-case basis. Outside avenues of resolution are available to employees who feel their rights have not been protected. *Pyro Combustion & Controls Inc.* tolerates no sexual harassment.

9.6 Forms & Attachments

On the following pages, please find the following documents:

- Assault/Threat Report
- Sexual Harassment Complaint Form
- Workplace Violence Training Documentation

Assault/Threat Report	
<i>(Attach additional sheets as necessary)</i>	
EMPLOYEE INFORMATION	
Name:	Telephone:
Address:	Employee Classification:
Manager's Name:	Telephone:
INCIDENT INFORMATION	
Name of Assailant:	Is he/she and employee? <input type="checkbox"/> yes <input type="checkbox"/> no
Date of Incident:	Location of Incident
This incident occurred: <input type="checkbox"/> over the phone <input type="checkbox"/> in person <input type="checkbox"/> over the Internet <input type="checkbox"/> other Please explain:	
Were there any witnesses? <input type="checkbox"/> yes <input type="checkbox"/> no (Please provide relevant information below and attach statements)	
WITNESSES	
Witness 1	Name:
	Telephone:
Witness 2	Address:
	Witness Roll (e.g. employee, customer):
THREAT INFORMATION	
As closely as possible, what were the exact words used?	
Was the assailant in a position to carry out the threat immediately?	
How serious do you believe the threat was and why?	

Assault/Threat Report (pg. 2)		
ASSAULT INFORMATION		
What (if anything) happened to set off the assault?		
Did the assailant say anything during the assault? What?		
How did the assailant attack? (e.g. punching, kicking, knife, words)		
What injuries, if any, did you sustain? Did injuries require medical treatment?		
What brought the assault to an end?		
How did you leave the site of the assault?		
EMPLOYEE ACTIONS		
What actions did you take later? (e.g. worker's comp claim, medical treatment, sick leave)		
Do you request <i>Pyro Combustion & Controls Inc.</i> action at this time related to the assault? What? (If none, please specify "None.")		
LAW ENFORCEMENT INFORMATION (attach police report when possible)		
Law Enforcement Agency Contacted/Name of Official	Date Contacted:	Telephone Number:
Was a written report completed? <input type="checkbox"/> yes <input type="checkbox"/> no Indicate any action promised.		
MANAGER ACTIONS		
Directions given to employee:		
Manager Recommendation: <input type="checkbox"/> Prosecution <input type="checkbox"/> Restraining Order <input type="checkbox"/> Letter to Threatener <input type="checkbox"/> Other (please specify)		
LEGAL COUNSEL ACTIONS		

Sexual Harassment Complaint Form	
Please write legibly and fill out form completely. Attach additional sheets if necessary. Submit completed form to appropriate manager.	
Complainant:	Alleged Harasser:
Department:	Department:
Job Title:	Job Title:
Mailing Address:	Other relevant information about Alleged Harasser:
Home Phone:	
Work Phone:	
Details of Incident	
What exactly occurred or was said?	
When did it occur and is it ongoing?	
Where did it occur?	
How often did it occur?	
How did it affect you?	
What response did you make when the incident(s) occurred or afterwards and how did you react?	
Has your job been affected in any way?	
Was anyone present when the alleged harassment occurred? List any third party witnesses:	

Sexual Harassment Complaint Form (pg. 2)

Please write legibly and fill out form completely. Attach additional sheets if necessary. Submit completed form to appropriate manager.

Are there any persons who have relevant information?

Did you tell anyone about it?

Did anyone see you immediately after episodes of alleged harassment?

Did the person who harassed you harass anyone else?

Do you know whether anyone complained about harassment by that person?

Are there any notes, physical evidence, or other documentation regarding the incident(s)?

Do you know of any other relevant information?

How would you like to see the situation resolved?

I am aware that false accusations of sexual harassment can have serious effects on innocent persons.

I further understand that if it is determined, after investigation, that I have maliciously or recklessly made false accusations, I will be subject to appropriate sanctions, including discharge.

Complainant's Signature:

Date:

Received by:

Date:

Signature:

10

Hazard Communication

10.1 Policy Statement

Pyro Combustion & Controls Inc. is committed to the safety and health of its employees. To identify and control hazards presented by chemicals in the workplace, *Pyro Combustion & Controls Inc.* will have in place a hazard communication program (HCP) to provide information to employees about any hazardous materials they are exposed to.

If *Pyro Combustion & Controls Inc.* employees are exposed to any hazardous chemical, *Pyro Combustion & Controls Inc.* designates *Rob Abraham* to ensure a written HCP is created, communicated to all employees, and maintained according to all applicable regulations, standards and industry best practices

10.2 Responsibilities

Hazard communication is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

10.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* (through *Rob Abraham*) to:

- Establish a hazard communication program if employees work with or around any potentially hazardous material;
- Ensure that proper safeguards are in place to ensure the safety of personnel working with or around hazardous chemicals;
- Ensure all hazardous chemicals in the workplace are labeled and have a complete safety data sheet on file and available to employees;
- Ensure every employee is provided training covering the hazard communication program;
- Provide support for the implementation of HCP; and
- Review the HCP at least annually to evaluate the effectiveness of the program.

10.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Assist in the creation and implementation of the *Pyro Combustion & Controls Inc.* hazard communication program;
- Assist in the development and delivery of HCP training;

- Identify issues of non-compliance and hazards related to the use of hazardous chemicals.
- Recommend steps to promote safety compliance and adherence to all safety and health policy; and
- Provide an avenue for employees to share concerns and recommend changes regarding chemicals in the workplace to help ensure a safer work environment.

10.2.3 Employee Responsibilities

Every *Pyro Combustion & Controls Inc.* employee is expected to:

- Follow safety policy and adhere to all precautions and safety requirements when working with or around hazardous chemicals;
- Understand the hazards of the chemicals in the workplace, reviewing Safety Data Sheets before using any hazardous chemical;
- Understand how to lessen or prevent exposure to hazardous chemicals through safe work practices and use of personal protective equipment;
- Understand emergency procedures to follow in the event of exposure to these chemicals;
- Verify the proper labeling of chemicals at the worksite, and the presence of SDSs for each;
- Report any deficiencies in hazard communication as soon as safely possible to his or her supervisor; and
- Attend and participate actively in safety trainings.

10.3 Training

Pyro Combustion & Controls Inc. will provide training covering all pertinent aspects of the hazard communication program at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to educational level, literacy, and language of employees.

Pyro Combustion & Controls Inc. will provide training on hazardous chemicals in their work area at the time of assignment and whenever a new hazard is introduced to the work area.

10.3.1 Training Components

Rob Abraham will ensure that all employees at *Pyro Combustion & Controls Inc.* are informed and trained in the following minimum elements for hazard communication:

- The requirements of regulatory bodies, industry standards and best safety practices regarding hazardous chemicals;
- Operations in the employee's work area that involve hazardous chemicals;
- The availability and location of the written HCP, list of hazardous chemicals, and safety data sheets (SDSs);
- How to detect the presence or release of a hazardous chemical in the work area;
- The classified and unclassified hazards of chemicals in the work area;
- Measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented for employee protection; and
- The details of the HCP, including an explanation of all labels and SDSs, and how employees can obtain and use the appropriate hazard information. Training must include the order of information on the SDS and how to obtain and use the hazard information.

10.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Pyro Combustion & Controls Inc. will maintain employee training records for 3 years from the date on which training occurred.

10.4 Policy

10.4.1 Background

The hazard communication program (HCP) describes how *Pyro Combustion & Controls Inc.* will meet all applicable requirements regarding hazardous chemical labeling, material safety data sheets and employee information and training.

Hazard Communication

The HCP also will include the following:

- A list of chemicals known to present a hazard to *Pyro Combustion & Controls Inc.* employees;
- Methods *Pyro Combustion & Controls Inc.* will use to inform employees of hazards presented by non-routine tasks; and
- Methods *Pyro Combustion & Controls Inc.* will use to inform employees of hazards associated with chemicals contained in unlabeled pipes in their work areas.

10.4.2 Hazard Determination & Communication

Pyro Combustion & Controls Inc. will rely on the evaluation of the chemical manufacturer or importer of any hazardous chemicals at the worksite to provide the identifying and safety information required for the HCP.

10.4.2.1 Labels

All hazardous material containers at *Pyro Combustion & Controls Inc.* will be labeled, tagged or marked with the following:

- The product signifier;
- Signal word;
- Hazard statement(s);
- Pictogram(s);
- Precautionary statement(s); and
- Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party.

For unclassified hazards, the label requires supplementary information, a description of the unclassified hazards and appropriate precautionary measures to ensure safe handling and use.

Alternatively, hazardous material containers at *Pyro Combustion & Controls Inc.* can be marked with the product identifier and words, pictures, symbols, or combination thereof, to provide at least general information regarding the hazards of the chemicals. Labeling is done in conjunction with other information immediately available to employees under the HCP to provide employees with the specific information regarding the physical and health hazards of the hazardous chemical.

In lieu of affixing labels to individual containers, the *Pyro Combustion & Controls Inc.* HCP may rely on signs, placards, process sheets, batch tickets, operating procedures or similar written materials, as long as the alternative method provides workers with the same information.

A container for a hazardous substance into which the substance has been transferred for **immediate use** does not have to be labeled. No employee will remove or deface labels or other forms of warnings. *Pyro Combustion & Controls Inc.* will ensure every label is legible in English, but may present the chemical's hazard information in another language, as long as it is also present in English.

10.4.2.2 Safety Data Sheets

Pyro Combustion & Controls Inc. will maintain at least English-language copies of SDSs for each hazardous chemical it uses, which will include the following section numbers and headings, and the information about the chemical associated with each:

- Section 1, Identification;
- Section 2, Hazard(s) identification;
- Section 3, Composition/information on ingredients;
- Section 4, First-aid measures;
- Section 5, Fire-fighting measures;
- Section 6, Accidental release measures;
- Section 7, Handling and storage;
- Section 8, Exposure controls/personal protection;
- Section 9, Physical and chemical properties;
- Section 10, Stability and reactivity;
- Section 11, Toxicological information.
- Section 12, Ecological information;
- Section 13, Disposal considerations;
- Section 14, Transport information;
- Section 15, Regulatory information
- Section 16, Other information, including date of preparation or last revision.

Pyro Combustion & Controls Inc. will maintain copies of safety data sheets for each hazardous chemical in the workplace and shall ensure they are readily accessible during each work shift to employees when they are in their work area(s). Safety data sheets can be found at *The office*

Where employees must travel between workplaces during a work shift, *Pyro Combustion & Controls Inc.* may keep SDSs at the primary workplace facility.

Pyro Combustion & Controls Inc. will make SDSs readily available, upon request, to any employee (or their designated representatives) and any regulatory official with the authority to demand them.

10.4.3 Hazard Control

10.4.3.1 Employee Information and Training

The HCP will be made available upon request to any employee (or their designated representatives) and any regulatory official with the authority to demand it.

Pyro Combustion & Controls Inc. will provide every employee with effective information and training on hazardous chemicals in their work area at the time of initial assignment and whenever a new chemical hazard the employees has not been trained about is introduced into their work area. *Pyro Combustion & Controls Inc.* may design training or use training designed to cover categories of hazards or specific chemicals.

10.4.3.2 Multi-Employer Workplaces

If hazardous chemicals present risk to employees of another employer, *Pyro Combustion & Controls Inc.* will ensure the HCP includes the methods to do the following for the other employers on the site:

- Provide onsite access to SDSs for each hazardous chemical to which their employees may be exposed;
- Inform them of any precautionary measures that need to be taken for worker protection during normal operating conditions and foreseeable emergencies; and
- Inform them of the labeling system used in the workplace.

10.4.3.3 Multiple Workplaces

If employees must travel between workplaces during a shift, *Pyro Combustion & Controls Inc.* may keep the HCP at only the primary workplace facility.

10.4.3.4 Non-Routine Tasks

Before employees begin work on hazardous non-routine tasks, the appropriate supervisor will give affected employees information about hazardous chemicals to which the employee may be exposed during such activity. This information will include the following:

- Specific chemical hazards;
- Protective/safety measures employees can take; and
- Measures *Pyro Combustion & Controls Inc.* has taken to reduce the hazards.

10.4.3.5 Hazardous Chemicals in Unlabeled Pipes

If there are hazards associated with chemicals in pipes in the work area, a supervisor must inform employees working around the pipes and provide information about the chemical and its hazards. Labels to relay this information are good practice for workplaces that transport potentially hazardous chemicals through pipes, and may be required by other regulations.

Standards for labeling pipes in the workplace can be found in ANSI A13.1-2007.

10.4.4 Policy Review

All aspects of this policy and the *Pyro Combustion & Controls Inc.* hazard communication program are subject to annual review by *Rob Abraham* and the safety committee to ensure the effectiveness of the policy, to guarantee a safe working environment for *Pyro Combustion & Controls Inc.* employees, and to reflect any regulatory changes to which the policy must respond.

10.5 Forms & Attachments

On the following pages, please find the following documents:

- Hazardous Chemical Labels
- Chemicals Known to Present a Hazard
- Hazard Communication Training Documentation

These forms may be reproduced freely by *Pyro Combustion & Controls Inc.* for the purposes of implementing and maintaining a safety and health program.

***HAZARDOUS
CHEMICAL***

NAME OF CHEMICAL:

Physical Hazards:

Health Hazards, Target Organs, or Systems:

Optional Information, such as Personal Protective
Equipment or Safe Handling:

***HAZARDOUS
CHEMICAL***

NAME OF CHEMICAL:

Physical Hazards:

Health Hazards, Target Organs, or Systems:

Optional Information, such as Personal Protective
Equipment or Safe Handling:

***HAZARDOUS
CHEMICAL***

NAME OF CHEMICAL:

Physical Hazards:

Health Hazards, Target Organs, or Systems:

Optional Information, such as Personal Protective
Equipment or Safe Handling:

***HAZARDOUS
CHEMICAL***

NAME OF CHEMICAL:

Physical Hazards:

Health Hazards, Target Organs, or Systems:

Optional Information, such as Personal Protective
Equipment or Safe Handling:

11 **Personal Protective Equipment**

11.1 Policy Statement

Pyro Combustion & Controls Inc. requires employees use personal protective equipment (PPE) appropriate to the hazards of their job. This equipment may include protection for the following:

- Eye
- Face
- Foot
- Hand
- Head
- Body

Employees required to use such equipment will be trained in all aspects of its use, maintenance and applicability.

The following list of PPE is available to employees and will be used as required:

hard hats, safety glasses, steel toe shoes, dust masks, fall protection, and welding equipment

11.2 Responsibilities

Ensuring the effective use of personal protective equipment is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

11.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- perform a hazard assessment of the workplace to identify and control physical and health hazards with PPE, as appropriate;
- identify and provide PPE for employees;
- train employees in the use and care of PPE;
- ensure employees maintain PPE;
- replace worn or damaged PPE; and
- periodically review, update and evaluate the effectiveness of the PPE program.

11.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- develop, conduct, and document training for PPE;
- assist in hazard assessments; and
- make recommendations to management concerning elements of the PPE program.

11.2.3 Employee Responsibilities

Pyro Combustion & Controls Inc. employees are expected to:

- Properly wear PPE;
- Attend training sessions on PPE;
- Care for, clean and maintain PPE, and
- Inform a supervisor of the need to repair or replace PPE.

11.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on personal protective equipment. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to educational level, literacy, and language of employees.

11.3.1 Training Components

Pyro Combustion & Controls Inc. will ensure training for every employee in the following minimum elements:

- When PPE is necessary;
- What PPE is necessary;
- How to properly put on, take off, adjust and wear PPE;
- The limitations of PPE; and
- The proper care, maintenance, useful life and disposal of the PPE.

Affected employees must demonstrate an understanding of all training and the ability to use PPE properly before they will be permitted to perform work requiring PPE.

Pyro Combustion & Controls Inc. will retrain any affected employee who has been trained but lacks the understanding and skills to use PPE properly. Circumstances that require retraining include, but are not limited to the following:

- When there have been changes in the workplace that have rendered previous training obsolete;
- When there have been changes to PPE used that render previous training obsolete; or
- When an employee demonstrates or expresses inadequacies in understanding or skill needed to use assigned PPE properly.

11.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions.
- The contents or a summary of the training sessions.
- The names and qualifications of persons conducting the training.
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

11.4 Policy

Pyro Combustion & Controls Inc. will manage or eliminate hazards in the workplace to the greatest extent possible with engineering controls and work practice controls. However, if such controls fail to provide employees sufficient protection, *Gary Pfizenmayer* or designate will provide employees with personal protective equipment (PPE) and ensure proper use thereof. PPE minimizes exposure to a range of hazards. All protective devices must meet the following minimum requirements:

- Provide adequate protection against the hazards for which they are designed;
- Be of safe design and construction for the work to be performed;
- Be reasonably comfortable when worn under the designated conditions;
- Fit snugly and not unduly interfere with the movements of the wearer;
- Be durable;
- Be capable of being disinfected;
- Easily cleaned; and
- Be distinctly marked to facilitate identification of the manufacturer.

11.4.1 Hazard Assessment

As explained in the chapter on Job Hazard Analysis, hazard assessment is the backbone of the *Pyro Combustion & Controls Inc.* safety and health program. Recognizing and documenting hazards is the first step to protecting employees from them. An initial walk-through to develop a list of potential hazards should be followed by a review of records and an analysis of the facility layout to determine what controls would best protect workers. If engineering and administrative controls are unable to protect employees from hazards they face, *Gary Pfizenmayer* and the safety committee will determine what personal protective equipment is necessary.

Pyro Combustion & Controls Inc. job hazard analysis is an ongoing process. *daily* inspections and periodic reassessments will look for changes that may affect occupational hazards for workers and will determine if PPE remains viable (in terms of condition, age and appropriateness) to protect a worker from hazards on the job.

Personal Protective Equipment

Pyro Combustion & Controls Inc. must certify and document the required workplace hazard assessment in a way that identifies the following:

- The workplace evaluated;
- The person certifying the evaluation has been performed;
- The date of the hazard assessment; and
- The document as a certification of hazard assessment.

11.4.2 Selection

Pyro Combustion & Controls Inc. will select only PPE of safe design and construction and will work with employees to ensure PPE remains clean and reliable. In selecting PPE used to control hazards in the workplace, *Pyro Combustion & Controls Inc.* will give consideration to comfortable fit, providing sizes appropriate to the effected employees, and ensure any PPE used will be compatible to provide sufficient protection. Comfort and ease of use is an important consideration because workers are more likely to wear comfortable PPE.

All PPE at *Pyro Combustion & Controls Inc.*, including any employee-owned PPE, will meet at least the minimum standards and requirements to provide sufficient protection for workers. Following are the standards referenced by OSHA for select groups of PPE:

- Eye and Face: ANSI Z87.1-1989 (or 1989(R-1998), or 2003)
- Head: ANSI Z89.1-1986 (or 1997, or 2003)
- Foot: ANSI Z41.1-1991

However, alternative protective equipment is acceptable if *Pyro Combustion & Controls Inc.* demonstrates it is at least as effective as equipment constructed according to the above standards.

11.4.3 Payment

Pyro Combustion & Controls Inc. will provide all PPE and replacement PPE at no cost to employees except for the following:

- Non-specialty safety-toe protective footwear, non-specialty prescription eyewear, provided they may be worn away from work;
- Shoes or boots with metatarsal protection if *Pyro Combustion & Controls Inc.* provides separate metatarsal guards;
- Logging boots;
- Everyday clothing;
- Clothing worn only for protection from weather;
- Replacement PPE the employee has intentionally damaged or lost;
- Where the employee provides his or her own adequate PPE.

11.4.4 Eye and Face Protection

Pyro Combustion & Controls Inc. will ensure adequate protection against the following:

- Flying particles;
- Molten metal;
- Liquid chemicals
- Acids or caustic liquids;
- Chemical gases or vapors;
- Potentially infected material; or
- Potentially harmful light radiation.

When there is a hazard from flying particles, eye protection will provide side protection, or *Pyro Combustion & Controls Inc.* will provide effected employees with detachable side protectors.

11.4.4.1 Prescription Lenses

Everyday glasses will not provide sufficient protection against the types of hazards that require eye protection. Employees who wear prescription lenses to correct their vision must wear either eye protection that incorporates their prescription or that can be worn over glasses without compromising the glasses' ability to correct the wearer's vision.

11.4.4.2 Eye Protection for Exposed Workers

Pyro Combustion & Controls Inc. will consider eye protection for employees in the following job categories:

- carpenters,
- electricians,
- machinists,
- mechanics,
- millwrights,
- plumbers and pipe fitters,
- sheet metal workers and tinsmiths,
- assemblers,
- sanders,
- grinding machine operators,
- sawyers,
- welders,
- laborers,
- chemical process operators and handlers, and
- timber cutting and logging workers.

If *Pyro Combustion & Controls Inc.* requires more than one worker to wear the same piece of eyewear, employees must disinfect the protective eyewear after each use.

11.4.4.3 Types of Eye Protection

Safety Spectacles: These protective eyeglasses have safety frames constructed of metal or plastic and impact-resistant lenses. Side shields are available on some models.

Goggles: These are tight-fitting eye protection that completely cover the eyes, eye sockets and the facial area immediately surrounding the eyes and provide protection from impact, dust and splashes. Some goggles will fit over corrective lenses.

Welding Shields: Constructed of vulcanized fiber or fiberglass and fitted with a filtered lens, welding shields protect eyes from burns caused by infrared or intense radiant light; they also protect both the eyes and face from flying sparks, metal spatter and slag chips produced during welding, brazing, soldering and cutting operations. OSHA requires filter lenses to have a shade number appropriate to protect against the specific hazards of the work being performed in order to protect against harmful light radiation.

Personal Protective Equipment

Laser Safety Goggles: These specialty goggles protect against intense concentrations of light produced by lasers. The type of laser safety goggles an employer chooses will depend upon the equipment and operating conditions in the workplace.

Face Shields: These transparent sheets of plastic extend from the eyebrows to below the chin and across the entire width of the employee's head. Some are polarized for glare protection. Face shields protect against nuisance dusts and potential splashes or sprays of hazardous liquids but will not provide adequate protection against impact hazards. Face shields used in combination with goggles or safety spectacles will provide additional protection against impact hazards.

Laser Safety Glass		
Intensity, CW maximum power density (watts/cm ²)	Attenuation	
	Optical density (O.D.)	Attenuation factor
10 ²	5	10 ⁵
10 ⁻¹	6	10 ⁶
1.0	7	10 ⁷
10.0	8	10 ⁸

Table 2

Filter Lenses for Protection Against Radiant Energy				
Operations	Electrode Size 1/32 in.	Arc Current	Minimum (*) Protective Shade	
Shielded metal arc welding	Less than 3	Less than 60	7	
	3-5	60-160	8	
	5-8	160-250	10	
	More than 8	250-550	11	
Gas metal arc welding and flux cored arc welding		Less than 60	7	
		60-160	10	
		160-250	10	
		250-500	10	
Gas tungsten arc welding		Less than 50	8	
		50-150	8	
		150-500	10	
Air carbon arc cutting	(Light)	Less than 500	10	
	(Heavy)	500-1000	11	
Plasma arc welding		Less than 20	6	
		20-100	8	
		100-400	10	
		400-800	11	
Plasma arc cutting	(light)(**)	Less than 300	8	
	(medium)(**)	300-400	9	
	(heavy)(**)	400-800	10	
Torch brazing			3	
Torch soldering			2	
Carbon arc welding			14	
Filter Lenses for Protection Against Radiant Energy				
Operations	Plate Thickness – inches	Plate Thickness – mm	Minimum (*) Protective Shade	
Gas Welding	Light	Under 1/8	Under 3.2	4
	Medium	1/8 to 1/2	3.2 to 12.7	5
	Heavy	Over 1/2	Over 12.7	6
Oxygen Cutting	Light	Under 1	Under 25	3
	Medium	1 to 6	25-150	4
	Heavy	Over 6	Over 150	5

Table 1

Footnote(*) As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation. **Footnote(**)** These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.

11.4.4.4 Welding Operations

The intense light associated with welding operations can cause serious and sometimes permanent eye damage if operators do not wear proper eye protection. The intensity of light or radiant energy produced by welding, cutting or brazing operations varies according to a number of factors including the task producing the light, the electrode size and the arc current. Table 1 shows the minimum protective shades for a variety of welding, cutting and brazing operations in general industry and in the shipbuilding industry.

11.4.4.5 Laser Operations

Laser light radiation can be extremely dangerous to the unprotected eye, and direct or reflected beams can cause permanent eye damage.

Laser retinal burns can be painless, so it is essential that all personnel in or around laser operations wear appropriate eye protection.

Laser safety goggles should protect for the specific wavelength of the laser and must be of sufficient optical density for the energy involved. Safety goggles intended for use with laser beams must be labeled with the laser wavelengths for which they are intended to be used, the optical density of those wavelengths and the visible light transmission.

11.4.5 Head Protection

Pyro Combustion & Controls Inc. will protect employees from potential head injuries. Wearing a safety helmet or hard hat is one of the easiest ways to protect an employee's head from injury. Hard hats can protect employees from impact and penetration hazards as well as from electrical shock and burn hazards.

Pyro Combustion & Controls Inc. will ensure employees wear head protection if any of the following apply:

- Objects might fall from above and strike them on the head;
- They might bump their heads against fixed objects, such as exposed pipes or beams; or
- There is a possibility of accidental head contact with electrical hazards.

Some examples of occupations in which employees should be required to wear head protection include construction workers, carpenters, electricians, linemen, plumbers and pipefitters, timber and log cutters, welders, among many others. Whenever there is a danger of objects falling from above, such as working below others who are using tools or working under a conveyor belt, head protection must be worn. Hard hats must be worn with the bill forward to protect employees properly.

Personal Protective Equipment

In general, protective helmets or hard hats should do the following:

- Resist penetration by objects.
- Absorb the shock of a blow.
- Be water-resistant and slow burning.
- Have clear instructions explaining proper adjustment and replacement of the suspension and headband.

Hard hats must have a hard outer shell and a shock-absorbing lining that incorporates a headband and straps that suspend the shell from 1 to 1¼ inches (2.54 cm to 3.18 cm) away from the head. This type of design provides shock absorption during an impact and ventilation during normal wear.

11.4.5.1 Types of Hard Hats

Pyro Combustion & Controls Inc. will select protective headgear that meets ANSI standard requirements and ensure employees wear hard hats to provide appropriate protection against potential workplace hazards. Hard hat selection must consider all hazards on the worksite, including electrical hazards. This can be done through a comprehensive hazard analysis and an awareness of the different types of protective headgear available.

Hard hats are divided into three industrial classes:

- Class G (formerly Class A) hard hats (General) provide impact and penetration resistance along with limited voltage protection (up to 2,200 volts).
- Class E (formerly class B) hard hats (Electrical) provide the highest level of protection against electrical hazards, with high-voltage shock and burn protection (up to 20,000 volts). They also provide protection from impact and penetration hazards by flying/falling objects.
- Class C hard hats (Conductive) provide lightweight comfort and impact protection but offer no protection from electrical hazards.

Another class of protective headgear on the market is called a “bump hat,” designed for use in areas with low head clearance. They are recommended for areas where protection is needed from head bumps and lacerations. These are not designed to protect against falling or flying objects and are not ANSI approved. It is essential to check the type of hard hat employees are using to ensure that the equipment provides appropriate protection. Each hat should bear a label inside the shell that lists the manufacturer, the ANSI designation and the class of the hat.

11.4.5.2 Size and Care Considerations

Head protection that is too large or too small is inappropriate for use, even if it meets all other requirements. Protective headgear must fit appropriately on the body and for the head size of each individual. Most protective headgear comes in a variety of sizes with adjustable headbands to ensure a proper fit (many adjust in 1/8-inch increments). A proper fit should allow sufficient clearance between the shell and the suspension system for ventilation and distribution of an impact. The hat should not bind, slip, fall off or irritate the skin.

Some protective headgear allows for the use of various accessories to help employees deal with changing environmental conditions, such as slots for earmuffs, safety glasses, face shields and mounted lights. Optional rims may provide additional protection from the sun and some hats have channels that guide rainwater away from the face. Protective headgear accessories must not compromise the safety elements of the equipment.

Periodic cleaning and inspection will extend the useful life of protective headgear. A daily inspection of the hard hat shell, suspension system and other accessories for holes, cracks, tears or other damage that might compromise the protective value of the hat is essential. Paints, paint thinners and some cleaning agents can weaken shells of hard hats and may eliminate electrical resistance. Consult the helmet manufacturer for information on the effects of paint and cleaning materials on their hard hats. Never drill holes, paint or apply labels to protective headgear as this may reduce the integrity of the protection. Do not store protective headgear in direct sunlight, such as on the rear window shelf of a car, since sunlight and heat can damage them.

Hard hats with any of the following defects should be removed from service and replaced:

- Perforation, cracking, or deformity of the brim or shell;
- Indication of exposure of the brim or shell to heat, chemicals or ultraviolet light and other radiation (in addition to a loss of surface gloss, such signs include chalking or flaking).

Always replace a hard hat if it sustains an impact, even if damage is not noticeable. Suspension systems are offered as replacement parts and should be replaced when damaged or when excessive wear is noticed. It is not necessary to replace the entire hard hat when deterioration or tears of the suspension systems are noticed.

11.4.5.3 Accessories

Faceshield Protection: Faceshield devices can be attached to the helmet without changing the helmet strength and electrical protection. A metal faceshield bracket system can be used on a Class G helmet; however, if a Class E helmet is to be used in an area where Class E protection is required, a type of bracket and shield system that will not conduct electricity (has a dielectric rating) should be used.

Ear Muffs: The required degree of hearing protection should be considered prior to selecting ear muff attachments. If ear muffs are to be attached to helmets, metal attachments are acceptable for Class G helmets. Attachments with a dielectric rating must be used for Class E helmets.

Sweat Bands: If sweat bands are necessary, they must not interfere with the effectiveness of the helmet headband system. Some sweatband devices are made to fit on the headband. For electrical work, metal components must not be used to attach sweat bands to helmets.

Winter Liners: There are many varieties of winter liners. One type fits over the hard hat assembly. It is flame retardant and elasticized to give the user a snug, warm fit. Other styles fit under the helmet. If the liner is to be used with a Class E helmet, it must have a dielectric rating. Regardless of the warmth characteristics, the liner and helmet combination should be compatible. The liner and helmet must fit properly to give the employee proper impact and penetration protection.

Chin Straps: When wind or other conditions present the possibility of the hard hat being accidentally removed from the head, chin straps can be used. If chin straps are used, they should be the type that fastens to the shell of the hard hat. If the chin straps fasten to the headband and suspension system, the shell may blow off and strike another employee.

11.4.6 Foot & Leg Protection

Employees who face possible foot or leg injuries from falling or rolling objects or from crushing or penetrating materials must wear protective footwear. Also, employees whose work involves exposure to hot substances or corrosive or poisonous materials must have protective gear to cover exposed body parts, including legs and feet. If an employee's feet may be exposed to electrical hazards, nonconductive footwear must be worn. On the other hand, workplace exposure to static electricity may necessitate the use of conductive footwear.

Examples of situations in which an employee may be required to wear foot and/or leg protection include:

- When heavy objects such as barrels or tools might roll onto or fall on the employee's feet.
- Working with sharp objects such as nails or spikes that could pierce the soles or uppers of ordinary shoes.
- Exposure to molten metal that might splash on feet or legs.
- Working on or around hot, wet or slippery surfaces.
- Working when electrical hazards are present.

Foot and leg protection choices include the following:

- Leggings protect the lower legs and feet from heat hazards such as molten metal or welding sparks. Safety snaps allow leggings to be removed quickly.
- Metatarsal guards protect the instep area from impact and compression. Made of aluminum, steel, fiber or plastic, these guards may be strapped to the outside of shoes. Footwear designed to newer versions of ANSI Z41 and the ASTM standards require metatarsal protection to be built into the footwear.
- Toe guards fit over the toes of regular shoes to protect the toes from impact and compression hazards. They may be made of steel, aluminum or plastic.

Note: An employer who chooses to provide employees with toe guards must demonstrate that they are as protective as an incorporated toebox.

- Combination foot and shin guards protect the lower legs and feet, and may be used in combination with toe guards when greater protection is needed.
- Safety shoes have impact-resistant toes and heat-resistant soles that protect the feet against hot work surfaces common in roofing, paving and hot metal industries. The metal insoles of some safety shoes protect against puncture wounds. Safety shoes may also be designed to be electrically conductive to prevent the buildup of static electricity in areas with the potential for explosive atmospheres or nonconductive to protect workers from workplace electrical hazards.

11.4.6.1 Special Purpose Shoes

Electrically conductive shoes provide protection against the buildup of static electricity. Employees working in explosive and hazardous locations such as explosives manufacturing facilities or grain elevators must wear conductive shoes to reduce the risk of static electricity buildup on the body that could produce a spark and cause an explosion or fire. Foot powder should not be used in conjunction with protective conductive footwear because it provides insulation, reducing the conductive ability of the shoes. Silk, wool and nylon socks can produce static electricity and should not be worn with conductive footwear. Conductive shoes must be removed when the task requiring their use is completed. *Note: Employees exposed to electrical hazards must never wear conductive shoes.*

Electrical hazard, safety-toe shoes are nonconductive and will prevent the wearers' feet from completing an electrical circuit to the ground. These shoes can protect against open circuits of up to 600 volts in dry conditions and should be used in conjunction with other insulating equipment and additional precautions to reduce the risk of a worker becoming a path for hazardous electrical energy. The insulating protection of electrical hazard, safety-toe shoes may be compromised if the shoes become wet, the soles are worn through, metal particles become embedded in the sole or heel, or workers touch conductive grounded items. *Note: Nonconductive footwear must not be used in explosive or hazardous locations.*

Foundry shoes insulate the feet from the extreme heat of molten metal. They keep hot metal from lodging in shoe eyelets, tongues or other shoe parts. These snug-fitting leather or leather-substitute shoes have leather or rubber soles and rubber heels. All foundry shoes must have built-in safety toes.

11.4.6.2 Care of Protective Footwear

As with all protective equipment, safety footwear should be inspected prior to each use. Shoes and leggings should be checked for wear and tear at reasonable intervals. This includes looking for cracks or holes, separation of materials, broken buckles or laces. The soles of shoes should be checked for pieces of metal or other embedded items that could present electrical or tripping hazards. Employees should follow the manufacturers' recommendations for cleaning and maintenance of protective footwear.

11.4.7 Hand & Arm Protection

If a workplace hazard assessment reveals employees face potential injury to hands and arms that cannot be eliminated through engineering and work practice controls, *Pyro Combustion & Controls Inc.* will ensure employees wear appropriate protection. Potential hazards include skin absorption of harmful substances, chemical or thermal burns, electrical dangers, bruises, abrasions, cuts, punctures, fractures and amputations. Protective equipment includes gloves, finger guards, and arm coverings or elbow-length gloves.

Pyro Combustion & Controls Inc. will explore possible engineering and work practice controls to eliminate hazards and use PPE to provide additional protection against hazards that cannot be completely eliminated through other means. For example, machine guards may eliminate a hazard. Installing a barrier to prevent workers from placing their hands at the point of contact between a table saw blade and the item being cut is another example of an engineering control.

11.4.7.1 Types of Protective Gloves

There are many types of gloves available today to protect against a wide variety of hazards. The nature of the hazard and the operation involved will affect the selection of gloves. The variety of potential occupational hand injuries makes selecting the right pair of gloves challenging. No gloves can provide protection against all potential hand hazards. It is essential employees use gloves specifically designed for the hazards and tasks found in their workplace because gloves designed for one function may not protect against a different function even though they may appear to be an appropriate protective device.

The following are examples of some factors that may influence the selection of protective gloves for a workplace:

- Type of chemicals handled (toxic properties of the chemical(s)).
- Chemical concentration and temperature (the higher the concentration and temperature, the shorter the breakthrough time).
- Nature of contact (total immersion, continual contact, splash, etc.)
- Duration of contact.
- Area requiring protection (hand only, forearm, arm).
- Degree of dexterity (fine motor work).
- Grip requirements (dry, wet, oily).
- Thermal protection.
- Size and comfort.
- Abrasion/cut resistance requirements.
- Other job hazards (such as biological, electrical, and radiation hazards).
- Gloves made from a wide variety of materials are designed for many types of workplace hazards. In general, gloves fall into four groups:
 - Gloves made of leather, synthetic fibers or metal mesh.
 - Fabric and coated fabric gloves.
 - Chemical protective gloves.
 - Insulating rubber gloves (See 29 CFR 1910.137, Electrical Protective Equipment, for detailed requirements on the selection, use and care of insulating rubber gloves).

11.4.7.2 Leather, Canvas or Metal Mesh Gloves

Sturdy gloves made from metal mesh, leather or canvas provide protection against cuts and burns. Leather or canvas gloves also protect against sustained heat.

- Leather gloves protect against sparks, moderate heat, blows, chips and rough objects. These gloves can be used for tasks such as welding.
- Aluminized gloves provide radiant heat protection by reflection and insulate/reduce heat conduction with a liner or insert. Employees working with molten materials would benefit from this type of glove.
- Aramid fiber gloves such as Kevlar, protect against heat, are cut- and abrasion-resistant and wear well. Employees working in jobs such as firefighting, automotive work, metal fabrication, glass and ceramic handling would benefit from this type of glove.
- Synthetic gloves of various materials offer protection against heat and cold, are cut- and abrasion-resistant and may withstand some diluted acids. These materials do not stand up against alkalis and solvents.
- Metal mesh hand, wrist, arm and finger protective wear protects against knife cuts; however, it offers very little, if any, protection against punctures. Plastic dots can be adhered to the metal mesh to facilitate gripping.

11.4.7.3 Fabric and Coated Fabric Gloves

Fabric and coated fabric gloves are made of cotton or other fabric to provide varying degrees of protection.

- Fabric gloves protect against dirt, slivers, chafing and abrasions. They do not provide sufficient protection for use with rough, sharp or heavy materials. Adding a plastic coating will strengthen some fabric gloves.
- Coated fabric gloves normally are made from cotton flannel with napping on one side. By coating the un-napped side with plastic, fabric gloves are transformed into general-purpose hand protection offering slip-resistant qualities. These gloves are used for tasks ranging from handling bricks and wire to chemical laboratory containers. When selecting gloves to protect against chemical exposure hazards, always check with the manufacturer or review the manufacturer's product literature to determine the gloves' effectiveness against specific workplace chemicals and conditions.

11.4.7.4 Chemical- and Liquid-Resistant Gloves

Chemical-resistant gloves are made with different kinds of rubber: natural, butyl, neoprene, nitrile and fluorocarbon (viton); or various kinds of plastic: polyvinyl chloride (PVC), polyvinyl alcohol and polyethylene. These materials can be blended or laminated for better performance. As a general rule, the thicker the glove material, the greater the chemical resistance but thick gloves may impair grip and dexterity, having a negative impact on safety.

Some examples of chemical-resistant gloves include:

- **Butyl gloves** are made of a synthetic rubber and protect against a wide variety of chemicals, such as peroxide, rocket fuels, highly corrosive acids (nitric acid, sulfuric acid, hydrofluoric acid and red-fuming nitric acid), strong bases, alcohols, aldehydes, ketones, esters and nitrocompounds. Butyl gloves also resist oxidation, ozone corrosion and abrasion, and remain flexible at low temperatures. Butyl rubber does not perform well with aliphatic and aromatic hydrocarbons and halogenated solvents.
- **Natural (latex) rubber gloves** are comfortable to wear, which makes them a popular general-purpose glove. They feature outstanding tensile strength, elasticity and temperature resistance. In addition to resisting abrasions caused by grinding and polishing, these gloves protect workers' hands from most water solutions of acids, alkalis, salts and ketones. Latex gloves have caused allergic reactions in some individuals and may not be appropriate for all employees. Hypoallergenic gloves, glove liners and powderless gloves are possible alternatives for workers who are allergic to latex gloves.
- **Neoprene gloves** are made of synthetic rubber and offer good pliability, finger dexterity, high density and tear resistance. They protect against hydraulic fluids, gasoline, alcohols, organic acids and alkalis. They generally have chemical and wear resistance properties superior to those made of natural rubber.
- **Nitrile gloves** are made of a copolymer and provide protection from chlorinated solvents such as trichloroethylene and perchloroethylene. Although intended for jobs requiring dexterity and sensitivity, nitrile gloves stand up to heavy use even after prolonged exposure to substances that cause other gloves to deteriorate. They offer protection when working with oils, greases, acids, caustics and alcohols but are generally not recommended for use with strong oxidizing agents, aromatic solvents, ketones and acetates.

11.4.7.5 Care of Protective Gloves

Protective gloves should be inspected before each use to ensure they are not torn, punctured or made ineffective in any way. A visual inspection will help detect cuts or tears but a more thorough inspection by filling the gloves with water and tightly rolling the cuff towards the fingers will help reveal any pinhole leaks. Gloves that are discolored or stiff may also indicate deficiencies caused by excessive use or degradation from chemical exposure.

Any gloves with impaired protective ability should be discarded and replaced. Reuse of chemical-resistant gloves should be evaluated carefully, taking into consideration the absorptive qualities of the gloves. A decision to reuse chemically-exposed gloves should take into consideration the toxicity of the chemicals involved and factors such as duration of exposure, storage and temperature.

11.4.8 Body Protection

Employees who face possible bodily injury of any kind that cannot be eliminated through engineering, work practice or administrative controls, must wear appropriate body protection while performing their jobs. In addition to cuts and radiation, the following are examples of workplace hazards that could cause bodily injury:

- Temperature extremes;
- Hot splashes from molten metals and other hot liquids;
- Potential impacts from tools, machinery and materials;
- Hazardous chemicals.

There are many varieties of protective clothing available for specific hazards. Employers are required to ensure that their employees wear personal protective equipment only for the parts of the body exposed to possible injury. Examples of body protection include laboratory coats, coveralls, vests, jackets, aprons, surgical gowns and full body suits.

If a hazard assessment indicates a need for full body protection against toxic substances or harmful physical agents, the clothing should be carefully inspected before each use, it must fit each worker properly and it must function properly and for the purpose for which it is intended.

Protective clothing comes in a variety of materials, each effective against particular hazards, such as:

- Paper-like fiber used for disposable suits provide protection against dust and splashes.
- Treated wool and cotton adapts well to changing temperatures, is comfortable and fire-resistant, and protects against dust, abrasions and rough, irritating surfaces.
- Duck is a closely woven cotton fabric that protects against cuts and bruises when handling heavy, sharp or rough materials.
- Leather is often used to protect against dry heat and flames.
- Rubber, rubberized fabrics, neoprene and plastics protect against certain chemicals and physical hazards. When chemical or physical hazards are present, check with the clothing manufacturer to ensure that the material selected will provide protection against the specific hazard.

11.4.9 Hearing Protection

Determining the need to provide hearing protection for employees can be challenging. Employee exposure to excessive noise depends upon a number of factors, including:

- The loudness of the noise as measured in decibels (dB).
- The duration of each employee's exposure to the noise.
- Whether employees move between work areas with different noise levels.
- Whether noise is generated from one or multiple sources.

Personal Protective Equipment

Generally, the louder the noise, the shorter the exposure time before hearing protection is required. For instance, employees may be exposed to a noise level of 90 dB for 8 hours per day (unless they experience a Standard Threshold Shift) before hearing protection is required. On the other hand, if the noise level reaches 115 dB hearing protection is required if the anticipated exposure exceeds 15 minutes. For a more detailed discussion of the requirements for a comprehensive hearing conservation program, see the chapter on hearing protection.

If engineering and work practice controls do not lower employee exposure to workplace noise to acceptable levels, employees must wear appropriate hearing protection. It is important to understand that hearing protectors reduce only the amount of noise that gets through to the ears. The amount of this reduction is referred to as attenuation, which differs according to the type of hearing protection used and how well it fits. Hearing protectors worn by employees must reduce an employee's noise exposure to within the acceptable limits.

Types of hearing protection include the following:

- Single-use earplugs are made of waxed cotton, foam, silicone rubber or fiberglass wool. They are self-forming and, when properly inserted, they work as well as most molded earplugs.
- Pre-formed or molded earplugs must be individually fitted by a professional and can be disposable or reusable. Reusable plugs should be cleaned after each use.
- Earmuffs require a perfect seal around the ear. Glasses, facial hair, long hair or facial movements such as chewing may reduce the protective value of earmuffs.

11.4.10 Safety Belts, Lifelines, and Lanyards

Please see "Fall Protection"

The only acceptable use of lifelines, safety belts and lanyards is to safeguard employees. If a lifeline, safety belt or lanyard is subjected to in-service loading, it must be removed from service and not used again.

Lifelines shall be secured above the point of operation to an anchorage or structural member capable of supporting a minimum dead weight of 5,400 pounds.

If a lifeline is subject to cutting or abrasion, as may be the case on rock scaling operations, it must be at least $\frac{7}{8}$ -inch wire core manila rope. Otherwise, it may be a $\frac{3}{4}$ -inch manila or equivalent, with a nominal breaking strength of at least 5,400 pounds.

Safety belt lanyards will be at least $\frac{1}{2}$ -inch nylon and provide for a fall that does not exceed 6 feet. They must also have a nominal breaking strength of 5,400 pounds.

Hardware on safety belts and lanyards in use must be drop forged or pressed steel or cadmium plated according to federal specifications. The surface must be smooth and free of sharp edges.

Safety belt and lanyard hardware, except rivets, must withstand a tensile loading of 4,000 pounds without cracking, breaking, or taking a permanent deformation.

11.4.11 Other PPE

11.4.11.1 Cooling Vests and Suits

Personal cooling vests and suits are available for wear in operations involving extreme heat conditions. One design requires the use of a supplied air system. The air enters the vest or coverall through a tube in which it is cooled by as much as 40 degrees. The cooled air is channeled out over the upper torso and around the neck area when only the vest is being used. When the coverall or full body cooling type of PPE is used, the cooling air is also channeled to the leg and arm areas.

There is also a type of body cooling system that does not require an electrical, air or water supply. This vest is made of durable flame-resistant cotton shell fabric. Sewn underneath the outer shell are layers of light metallic insulation that reflect radiant heat outward and cooling inward toward the body. Pouch-like areas are accessible for quick and easy installation of segmented, semi-frozen gel cooling packets. These gel packs, often referred to as plastic ice, provide approximately twice the cooling effect of the same volume of water ice. The gel packs will not leak, even if punctured. They can be refrozen overnight in an ordinary freezer.

Other systems use supplied cooling air and a manifold system of tubes to channel the cool air to the body extremities. Outer surfaces are frequently made of aluminum or other heat-reflective material, depending on the type and source of the heat conditions.

11.4.11.2 High Visibility Apparel

High visibility apparel must be used by workers involved in traffic control, such as flaggers or law enforcement officers, or for employees who work on the roadways, such as sanitation, utility or construction workers, and emergency responders. The apparel should be high visibility orange, yellow, yellow-green or a fluorescent version. Apparel can be procured with reflective and/or luminescent trim, or vertical or horizontal stripes, which offers greater day and night visibility.

11.4.11.3 Flotation Vests

Employees working over or near water, where the danger of drowning exists, will be provided with approved life jackets or buoyant work vests. These vests are available as flotation pads inside high visibility international orange nylon shells or as vinyl coated flotation pads of international orange. The flotation vests must be U.S. Coast Guard approved.

Additionally, in any other workplace where employees work over or near water, or use boats, approved life jackets, buoyant work vests or other flotation devices must be provided.

11.4.11.4 Welding and High Heat

Coveralls, jackets, pants and aprons are available for operations involving high heat or molten metal splashes. Leather is the traditional protective material for many welding operations. Where there is exposure to radiant heat as well as molten metal splashes, aluminized garments may be used. They reflect up to 95 percent of the radiant heat. Flame-resistant cotton coveralls designed for comfort and protection are sometimes preferred. Whatever the type of clothing used for welding operations, it should not have external pockets or cuffs. Fabrics of silica, ceramic and fiberglass eliminate the need for asbestos and are now available for welding operations. These fabrics are available in many combinations of color and weight. The fabrics are functional over a temperature range of 700 to 2,000 degrees Fahrenheit.

11.5 Forms & Attachments

On the following pages, please find the following documents:

- PPE Hazard Assessment Certification Form
- Personal Protective Equipment Training Documentation

These forms may be reproduced freely by *Pyro Combustion & Controls Inc.* for the purposes of implementing and maintaining a safety and health program.

PPE Hazard Assessment Certification Form

Workplace:	Conducted By:
Address:	Date:
Area(s):	Job or Task:

EYES

<p>Work activities, such as:</p> <input type="checkbox"/> abrasive blasting <input type="checkbox"/> chopping <input type="checkbox"/> cutting <input type="checkbox"/> drilling <input type="checkbox"/> welding <input type="checkbox"/> soldering <input type="checkbox"/> torch brazing <input type="checkbox"/> working outdoors <input type="checkbox"/> computer work	<p>Work-related exposure to:</p> <input type="checkbox"/> airborne dust <input type="checkbox"/> dirt <input type="checkbox"/> UV <input type="checkbox"/> flying particles/objects <input type="checkbox"/> blood splashes <input type="checkbox"/> hazardous liquid chemicals & mists	<p>Work activities, such as:</p> <input type="checkbox"/> punch press operations <input type="checkbox"/> sanding <input type="checkbox"/> sawing <input type="checkbox"/> grinding <input type="checkbox"/> hammering <input type="checkbox"/> chipping <input type="checkbox"/> other:	<p>Work-related exposure to:</p> <input type="checkbox"/> chemical splashes <input type="checkbox"/> molten metal <input type="checkbox"/> splashes <input type="checkbox"/> glare/high intensity lights <input type="checkbox"/> laser operations <input type="checkbox"/> intense light <input type="checkbox"/> hot sparks <input type="checkbox"/> other:	<p>Can hazard be eliminated without the use of PPE?</p> <input type="checkbox"/> Yes <input type="checkbox"/> No	<p>Can hazard be eliminated without the use of PPE?</p> <input type="checkbox"/> Yes <input type="checkbox"/> No
<p>If no, use:</p> <input type="checkbox"/> Safety glasses <input type="checkbox"/> Safety goggles <input type="checkbox"/> Dust-tight goggles <input type="checkbox"/> Impact goggles <input type="checkbox"/> Welding helmet/shield <input type="checkbox"/> Chemical goggles <input type="checkbox"/> Chemical splash goggles <input type="checkbox"/> Laser goggles		<p>With:</p> <input type="checkbox"/> Side shields <input type="checkbox"/> Face shield <input type="checkbox"/> Shaded <input type="checkbox"/> Prescription		<p>If no, use:</p> <input type="checkbox"/> Shading/Filter (# ____) <input type="checkbox"/> Welding shield <input type="checkbox"/> Other:	

FACE

<p>Work activities, such as:</p> <input type="checkbox"/> cleaning <input type="checkbox"/> cooking <input type="checkbox"/> siphoning <input type="checkbox"/> painting <input type="checkbox"/> dip tank operations <input type="checkbox"/> pouring <input type="checkbox"/> other:	<p>Work-related exposure to:</p> <input type="checkbox"/> foundry work <input type="checkbox"/> welding <input type="checkbox"/> mixing <input type="checkbox"/> pouring molten metal <input type="checkbox"/> working outdoors	<p>Work-related exposure to:</p> <input type="checkbox"/> hazardous liquid chemicals <input type="checkbox"/> extreme heat <input type="checkbox"/> extreme cold <input type="checkbox"/> potential irritants <input type="checkbox"/> other:	<p>Can hazard be eliminated without the use of PPE?</p> <input type="checkbox"/> Yes <input type="checkbox"/> No	<p>Can hazard be eliminated without the use of PPE?</p> <input type="checkbox"/> Yes <input type="checkbox"/> No
<p>If no, use:</p> <input type="checkbox"/> Face Shield <input type="checkbox"/> Shading/Filter (# ____) <input type="checkbox"/> Welding shield <input type="checkbox"/> other:		<p>If no, use:</p> <input type="checkbox"/> Face Shield <input type="checkbox"/> Shading/Filter (# ____) <input type="checkbox"/> Welding shield <input type="checkbox"/> other:		

PPE Hazard Assessment Certification Form (pg. 3)

FEET/LEGS

<p>Work activities, such as:</p> <ul style="list-style-type: none"> <input type="checkbox"/> building <input type="checkbox"/> maintenance <input type="checkbox"/> construction <input type="checkbox"/> demolition <input type="checkbox"/> food processing <input type="checkbox"/> foundry work <input type="checkbox"/> working outdoors 	<p>Work-related exposure to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> explosive atmospheres <input type="checkbox"/> explosives <input type="checkbox"/> exposed electrical wiring or components <input type="checkbox"/> heavy equipment <input type="checkbox"/> slippery surfaces <input type="checkbox"/> impact from objects <input type="checkbox"/> pinch points <input type="checkbox"/> slippery/wet surface 	<p>Can hazard be eliminated without the use of PPE?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If no, use:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Safety shoes or boots <input type="checkbox"/> Toe protection <input type="checkbox"/> Electrical protection <input type="checkbox"/> Puncture resistance <input type="checkbox"/> Anti-slip Soles
<p>Work activities, such as:</p> <ul style="list-style-type: none"> <input type="checkbox"/> logging <input type="checkbox"/> plumbing <input type="checkbox"/> trenching <input type="checkbox"/> use of highly flammable materials <input type="checkbox"/> welding <input type="checkbox"/> other: 	<p>Work-related exposure to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> crushing <input type="checkbox"/> sharps injury <input type="checkbox"/> blood <input type="checkbox"/> chemical splash <input type="checkbox"/> penetration <input type="checkbox"/> extreme heat/cold <input type="checkbox"/> fall <input type="checkbox"/> other: 	<p><input type="checkbox"/> Leggings or chaps</p> <p><input type="checkbox"/> Foot-Leg guards</p> <p><input type="checkbox"/> Metatarsal protection</p> <p><input type="checkbox"/> Heat/Cold protection</p> <p><input type="checkbox"/> Chemical resistance</p> <p>Other: _____</p>

BODY/SKIN

<p>Work activities, such as:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Baking or frying <input type="checkbox"/> battery charging <input type="checkbox"/> dip tank operations <input type="checkbox"/> fiberglass installation <input type="checkbox"/> sawing <input type="checkbox"/> other: 	<p>Work-related exposure to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> chemical splashes <input type="checkbox"/> extreme heat <input type="checkbox"/> extreme cold 	<p>Can hazard be eliminated without the use of PPE?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If no, use:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Vest <input type="checkbox"/> Coveralls, Body suit <input type="checkbox"/> Raingear <input type="checkbox"/> Abron
<p>Work-related exposure to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> sharp or rough edges <input type="checkbox"/> irritating chemicals <input type="checkbox"/> other: 	<p><input type="checkbox"/> sharp or rough edges <p><input type="checkbox"/> irritating chemicals <p><input type="checkbox"/> other:</p> </p></p>	<p><input type="checkbox"/> Welding leathers</p> <p><input type="checkbox"/> Abrasion/cut resistance</p> <p>other: _____</p>

BODY/WHOLE

<p>Work activities, such as:</p> <ul style="list-style-type: none"> <input type="checkbox"/> building maintenance <input type="checkbox"/> construction <input type="checkbox"/> logging <input type="checkbox"/> computer work <input type="checkbox"/> working outdoors <input type="checkbox"/> utility work <input type="checkbox"/> other: 	<p>Work-related exposure to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> working from heights of 10 feet or more <input type="checkbox"/> impact from flying objects <input type="checkbox"/> impact from moving vehicles <input type="checkbox"/> sharps injury <input type="checkbox"/> blood <input type="checkbox"/> electrical/static discharge <input type="checkbox"/> hot metal <input type="checkbox"/> sparks 	<p>Can hazard be eliminated without the use of PPE?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If no, use:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Fall Arrest/Restraint <input type="checkbox"/> Traffic vest <input type="checkbox"/> Static coats/overalls <input type="checkbox"/> Flame resistant jacket/pants <input type="checkbox"/> Insulated jacket <input type="checkbox"/> Cut-resistant sleeves/wristslets
<p>Work-related exposure to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> musculoskeletal disorders <input type="checkbox"/> chemicals <input type="checkbox"/> extreme heat/cold <input type="checkbox"/> elevated walking/working surface <input type="checkbox"/> working near water <input type="checkbox"/> injury from slip/trip/fall <input type="checkbox"/> other: 	<p><input type="checkbox"/> musculoskeletal disorders</p> <p><input type="checkbox"/> chemicals</p> <p><input type="checkbox"/> extreme heat/cold</p> <p><input type="checkbox"/> elevated walking/working surface</p> <p><input type="checkbox"/> working near water</p> <p><input type="checkbox"/> injury from slip/trip/fall</p> <p><input type="checkbox"/> other:</p>	<p><input type="checkbox"/> Hoists/Lifts</p> <p><input type="checkbox"/> ergonomic equipment</p> <p>Other: _____</p> <p>With</p> <ul style="list-style-type: none"> <input type="checkbox"/> Hood <input type="checkbox"/> Full sleeves

12

Hearing Conservation

12.1 Policy Statement

Pyro Combustion & Controls Inc. is committed to ensuring a safe, healthy work environment. This commitment includes monitoring the workplace for noise levels that may damage hearing and includes protecting the hearing of those who work in high-noise environments with a complete hearing protection program implemented and maintained by this company and its employees.

12.2 Responsibilities

Hearing protection is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

12.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Protect employees from work-related hearing loss;
- Utilize administrative or engineering noise controls to reduce noise levels and protect worker hearing;
- Ensure employee participation in hearing protection training program;
- Ensure proper initial fitting of hearing protection devices;
- Make hearing protectors available, and replace them as necessary;
- Ensure hearing protectors are worn;
- Notify employees exposed to high-noise activities and equipment;
- Employ an audiologist, otolaryngologist or physician if audiometric evaluations and follow-up are provided;
- Maintain and retain all records necessary for proper implementation of the HPP; and
- Review the hearing protection program according to changes in workplace noise levels, personnel changes and technological changes to ensure that the hearing protection program is providing the most possible protection to employees.

12.2.2 Employee Responsibilities

Pyro Combustion & Controls Inc. employees are expected to:

- Participate in training;
- Wear hearing protection devices when appropriate;
- Report any problems or concerns about the hearing protection program; and
- Report any injuries or loss of hearing to appropriate supervisor.

12.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on hearing protection. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to the educational level, literacy, and language of employees.

Training will be repeated annually with an updated training program that reflects changes in protective equipment and work processes.

12.3.1 Training Components

Gary Pfizenmayer will ensure that every employee will be trained in the following minimum elements:

- Use and care of all hearing protectors provided;
- Effects of noise on hearing;
- Purpose of hearing protectors, advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use and care;
- The purpose of audiometric testing and an explanation of test procedures (if offered); and
- Steps an employee can take in the workplace and outside of the workplace to protect hearing.

12.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

12.4 Policy

Any workplace sound that is not wanted is noise. Workplace noise may be present in a number of ways, each of which has a different potential impact on workers' hearing, and demands different controls to prevent damage to hearing.

Unacceptable levels of noise that may warrant a hearing conservation program are often present on construction sites. OSHA mandates an effective hearing conservation program when sound levels exceed the values shown in table 1.

If a worker needs to raise his voice for someone within arm's reach to hear, the site is probably noisy enough to require workers to wear hearing protection.

Further, exposure to impulsive or impact noise needs to stay below 140 dB peak sound pressure level.

The following trades are routinely overexposed to noise and should practice hearing protection as a matter of course:

- Carpenters
- Plumber pipefitters
- Sprinkler installers
- Mobile equipment operators
- Welders/fabricators
- Sandblasters
- Drillers
- Electricians
- Steel erectors
- Drywallers shooting tracks or boarding

Engineering and administrative noise controls should be implemented to reduce sound sufficiently. Where such controls fail to sufficiently reduce sound levels, *Pyro Combustion & Controls Inc.* will provide appropriate personal protective equipment for hearing.

Permissible Noise Exposure	
Duration per day, hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
≤ ¼	115

Footnote: When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each.

Table 1

If there are two or more periods of noise exposure over the course of the day, they all need to be considered: Sum up the ratios of actual exposure times to the maximum permissible exposure time for noises at that sound level. A hearing conservation program must be in place if the sum of all ratios (actual noise duration/permissible noise duration) is more than one.

$$F_e = \left(\frac{T_1}{L_1}\right) + \left(\frac{T_2}{L_2}\right) + \dots + \left(\frac{T_n}{L_n}\right)$$

where:

F_e = Equivalent noise exposure factor (must be ≤ 1)

T = period of exposure duration for the noise

L = permissible noise exposure duration for a noise at that sound level

12.4.1 Noise Exposure

Where noise exposure levels are reasonably expected to be above an 8-hour time weighted average of 85 dBA, exposure measurement can determine the extent of hearing protection necessary and identify tools or processes where sound abatement opportunities exist.

Worker exposure to “background noise” alone often averages above 85 dBA over the course of a work shift. Accordingly, identifying high-noise activity, tools and equipment at a construction site is the first step to lowering site-wide noise levels and reducing noise exposure.

Sound level measurement and dosimetry are valuable tools to measure possible exposure over the course of the day and for specific equipment, but they have their limitations on a construction site.

Attaching the sound level information for a piece of equipment onto the equipment itself can help inform workers about the hazards they face when working with or around that equipment.

Sound monitoring should be repeated when there has been a change that may increase noise exposures and:

- More employees may be exposed, or
- Hearing protectors in use may no longer provide adequate protection to hearing.

Ten Loudest Tools		
Tools	Average Noise Level (dBA)	Maximum Noise Level (dBA)
Chipping Gun	103.0	119.2
Powder Actuated Tool	103.0	112.8
Stationary Power Tool	101.8	119.8
Rattle Gun	98.4	131.1
Chopsaw	98.4	117.7
Rotohammer	97.8	113.5
Screw gun, Drill Motor	97.7	123.7
Hand Power Saw	97.2	114.0
Other Hand Power Tool	95.4	118.3
Welding, Cutting Equipment	94.9	122.8

Table 2

Ten Loudest Tasks		
Tasks (trade)	Average Noise Level (dBA)	Maximum Noise Level (dBA)
Chipping Concrete (laborers)	102.9	120.3
Operating Bulldozer (operating engineers)	100.2	112.5
Grinding (masonry trades)	99.7	118.6
Laying Metal Deck (ironworkers)	99.6	119.9
Demolition (laborers)	99.3	112.1
Operating Scraper (op. eng's)	99.1	108.6
Welding, Burning (ironworkers)	98.4	119.7
Operating Manlift (op. eng's)	98.1	117.6
Operating Work Vehicle (bricklayers)	98.0	116.7
Installing Trench Conduit (electricians)	95.8	118.6

Table 3

12.4.1.1 Noise Measurement Instruments

Instruments used to perform exposure monitoring according to manufacturer’s instructions should be calibrated to ensure accuracy, and operators should follow manufacturer’s instructions to conduct sampling.

Sound-Level Meter

A Sound Level Meter (SLM) is the basic instrument for investigating noise levels. Sound level meters can be used to:

- spot-check noise dosimeter performance;
- determine an employee’s noise dose whenever use of a noise dosimeter is unavailable or inappropriate;
- identify and evaluate individual noise sources for abatement purposes;
- aid in determining the feasibility of engineering controls for individual noise sources; and
- evaluate hearing protectors.

Noise measurements should be taken from the hearing zone of the employee being monitored (within a two-foot diameter sphere surrounding the head of the worker) according to manufacturer’s instructions.

Dosimeter

A noise dosimeter is worn by the employee to measure sound levels and determine noise exposure over the course of the workshift (or sampling period).

Noise Levels of Common Construction Equipment		
Equipment	Sound Level at Operator	
	Average	Range
Background	86	
Earth Moving		
Front End Loader	88	85-91
Back Hoe	86.5	79-89
Bulldozer	96	89-103
Roller	90	79-93
Scraper	96	84-102
Grader	<85	
Truck	96	89-103
Paver	101	100-102
Material Handling		
Concrete Mixer	<85	
Concrete Pump	<85	
Crane	100	97-102
Derrick	<85	
Power Units		
Generators	<85	
Compressors	<85	
Impact		
Pile Driver (diesel & pneumatic)	98	82-105
Pile Driver (gravity & bored)	82.5	62-91
Pneumatic Breaker	106	94-111
Hydraulic Breaker	95.5	90-100
Pneumatic Chipper	109	
Other Equipment		
Poker Vibrator	94.5	87-98
Compressed Air Blower	104	
Power Saw	88.5	78-95
Electric Drill	102	
Air Track Drill	113	

Table 4

Hearing Conservation

During workshift sampling, a dosimeter with a threshold of 80 dBA and 90 dBA measures noise exposure. The 80-dBA threshold dosimeter will measure whether the workers are exposed to the 85 dBA TWA “action level,” and should be included in a hearing protection program. The 90 dBA threshold dosimeter determines whether the noise level to which workers are exposed falls within the permissible exposure limits (PEL) indicated in Table 1.

Noise exposure exceeding the PEL, demands appropriate controls.

Noise Control in 3 Easy Steps

1. **Reduce it:** Use the quietest equipment available.
2. **Move it:** Locate noisy equipment away from workers.
3. **Block it:** Erect temporary barriers to block noise from reaching workers.

12.4.2 Noise Control

When employees are exposed to an 8-hour time weighted average of 90 dBA or more, noise controls must be in place.

Before relying on hearing protection devices to protect worker hearing, other control systems using engineering and administrative controls need to be in place to reduce exposure to hazardous noise levels.

12.4.2.1 Engineering Controls

Engineering controls can abate noise hazards whenever practicable. Examples include, but are not limited to the following:

- Low-noise tools and machinery;
- Appropriate maintenance of all equipment;
- Barriers between noise sources and employees; and
- Enclosure or isolation of noise sources.

Advantages & Disadvantages

When you replace a noisy machine with a quiet one, modify it to make it quieter, or change the sound path so that dangerous noise never reaches the listener, you are using an engineering control.

Noise Controls for Construction <small>(Schneider et al., 1995)</small>	
Equipment	Noise Controls
Pile Driver	Enclosure, muffler
Stone saw cutting	Noise control pad with water
Handheld impact drills	Reduction of reflected sound
Circular saw blades	15° tooth angle, new tooth configuration, slotted saw blades, viscoelastic damping
Pneumatic tools	Muffler
Pavement breaker/ Rock drill	Muffler, enclosure of cylinder case and front head, moil damping
Portable air compressor	Muffler, acoustic enclosures
Bulldozer	Cab-liner material, enclosure, sound absorption in canopy, sealing of all openings
Wheeled loader	Absorption of sound cooling air route
Vibratory roller	Flexible mounting for pump compartment
Joint Cutter	Anti-vibration mounting fixtures

Table 4

Effective, practical, and affordable engineering controls are the best way to control noise. For example, if you have an old, noisy, electric hand drill, you can replace it with a newer, quieter one — a practical, affordable engineering control. If you have a large, noisy chipper/shredder, however, replacing it may not be practical. Instead, you might isolate the noise by enclosing the shredder or block the noise by constructing a barrier between the shredder and the listener.

When you double the distance between the listener and the sound source, you decrease the sound pressure level by six decibels. For example, a hazardous 96-decibel noise source at five feet is a safe 84 decibels at 20 feet.

Strategy Overview

Applying effective, practical, affordable engineering controls to a noise problem is challenging because there are no ready-to-order solutions — you have to tailor them to your workplace. You are more likely to find an engineering-control solution when you have accomplished the following:

- understand what is causing the noise;
- determine how the noise is reaching the listener;
- identify the most appropriate point, or points, at which to control the noise: at the source, along the sound path, or at the listener;
- establish acoustical enclosures and barriers around generators;
- use sound absorbing material and vibration isolation systems on hand tools; and
- quiet work practices — use rubber mallets to erect and dismantle formwork.

12.4.2.2 Administrative Controls

Administrative controls also can reduce worker exposure to noise. Examples of such controls include, but are not limited to:

- scheduling regular maintenance activities;
- operating noisy machines in shifts when fewer workers are present; and
- limiting time employees are exposed to a noise.

Advantages & Disadvantages

To administer an activity means to manage it. Unlike engineering controls — which prevent hazardous noise from reaching a worker — administrative controls manage workers' activities to reduce exposure. Closely related to administrative controls are work-practice controls, which emphasize safe work practices and procedures.

Administrative and work-practice controls are usually less expensive to carry out than engineering controls; that is because there are no significant capital costs involved in changing or modifying equipment. In some cases, administrative controls have reduced employee exposure to noise and increased productivity by rotating employees through a demanding, noisy task. Work-practice controls also improve employee performance by emphasizing safe work practices.

On the other hand, administrative controls and work-practice controls usually are not as effective as engineering controls because they do not control the noise source. Noisy machines are still noisy and the hazard is still present.

Applying Administrative Controls

Examples of administrative and work-practice controls include the following:

- Reducing the time employees spend working in noisy areas — for example, rotating two or more employees so that each is exposed to noise levels less than 85 decibels, averaged over an eight-hour day.
- Shutting down noisy equipment when it is not needed for production.
- Ensuring that employees maintain their equipment to keep it running smoothly and quietly.
- Ensuring that employees know how to perform tasks and operate equipment at safe noise levels.
- Using warning signs to identify work areas where noise exceeds safe levels.
- Teaching employees appropriate methods for eliminating or controlling noise.
- Encouraging employees to report noise hazards to supervisors.

12.4.3 Hearing Protection

Hearing protection devices (HPDs) are the least preferred option to control problematic noise exposure. HPDs will be used in the time it takes to establish engineering or administrative noise controls, or if these controls fail to provide sufficient protection.

This company will provide and replace HPDs at no cost to all employees who work in the following situations:

- Where other controls fail to reduce noise exposure below an 8-hour TWA of 90 dBA; or
- Where employees are exposed to noise at or above an 8-hour TWA of 85 dBA, and have experienced hearing loss.

In-ear protective devices may not be plain cotton and must be fitted or determined by a competent person to ensure adequate fit.






Hearing Protective Devices			
Type	Features	Concerns	
 <p>Roll Down Foam</p>	<p>Fits many differently shaped ear canals.</p> <p>Provides good protection for most noisy environments.</p> <p>Convenient disposable.</p>	<p>Must be inserted properly to get the highest possible protection.</p> <p>If the plug doesn't make a good seal, it won't protect your hearing.</p>	
 <p>Reusable Earplugs</p>	<p>Many have flanges and handles. They come in different sizes.</p> <p>Come with cords, convenient to carry.</p> <p>Reusable, washable</p>	<p>Preformed so may not fit as wide a variety of ear canals as foam plugs.</p> <p>May require a different size for each ear.</p> <p>Must keep clean.</p>	
 <p>Custom Molded</p>	<p>Molded to user's ear.</p> <p>Always comfortable.</p> <p>Long-term wear.</p> <p>Best for difficult-to-fit ears</p>	<p>Must be made by a licensed hearing protection provider.</p>	
 <p>Canal Caps</p>	<p>On a band, can be worn under chin, overhead, or behind neck.</p> <p>Can be put on and taken off quickly.</p>	<p>Not as comfortable as other devices.</p> <p>Not as much protection as other devices.</p>	
 <p>Earmuffs</p>	<p>Easy to use and wear. Fit most people.</p> <p>Easy to keep clean.</p>	<p>Can be hot and heavy.</p> <p>May be more difficult to get a good fit with glasses and/or may interfere with other protective gear.</p>	
Other	Flat	Flat reduction of noise over all frequencies	<p>Can be Expensive.</p> <p>Must be custom fitted.</p>
	Attenuated	Have to baffle to reduce impact noise.	
	Communication	Radio communication while still reducing noise.	

Table 5

When using hearing protectors it is important that workers not overprotect. Devices shouldn't lower noise levels below 70 dBA to ensure workers can hear instructions and ambient sounds to ensure safety.

There are many types of hearing protection. Each type is designed for certain noise conditions. They include the types listed in table 5. But remember – unless worn properly and all the time in high noise areas, the devices will not be effective. *Pyro Combustion & Controls Inc.* will consider the “three c’s” of hearing protection selection — comfort, convenience and compatibility — to ensure the devices will be worn correctly 100% of the time when needed.

Hearing Conservation

Hearing protectors available on the market will be labeled with a noise reduction rating (NRR), which indicates how much noise the protective device can block according to laboratory testing. Workers in trades subject to more noise should wear an HPD with a higher NRR. Table 6 offers the suggestions from the University of Washington for appropriate levels of protection for each of several trades.

Recommended Noise Reduction Rating for Hearing Protective Devices by Trade	
Trade	NRR (dB)
Masonry Restoration Worker	26
Operating Engineer	24
Laborer	24
Bricklayer	22
Ironworker	18
Cement Mason	14
Carpenter	14
Tilesetter	12
Electrician	12
Insulation Worker	12
Sheet Metal Worker	12

Table 6

12.4.4 Audiometric Testing

Audiometric testing monitors an employee's hearing over time. It also provides an opportunity for employers to educate employees about their hearing and the need to protect it.

Though OSHA does not require it for construction activities, all employees exposed to an 8-hour TWA of 85 Db or more should have free audiometric testing as part of the hearing conservation program.

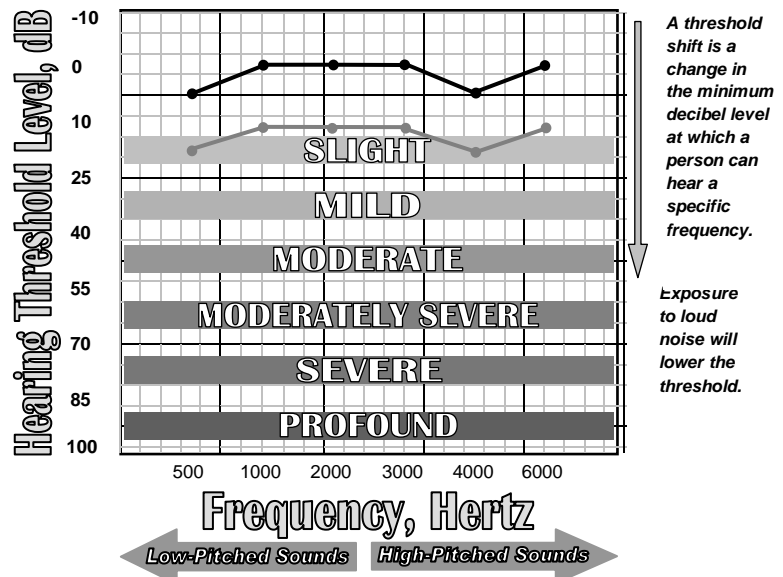
The difficulty in establishing a baseline hearing threshold level and tracking hearing over time for employees in the construction industry, even with the availability of mobile testing facilities, is a well-known challenge in the construction industry. Still, preventing damage to the hearing of employees is of paramount importance, and all appropriate steps should be taken to provide employees the protection they need.

A licensed or certified audiologist, otolaryngologist, or other physician should be responsible for the audiometric testing program and oversee all aspects of such testing. Trained technicians may conduct testing without immediate physician oversight if they are appropriately qualified to conduct such tests and they are accountable to an audiologist, otolaryngologist or physician.

12.4.4.1 Audiogram

A baseline audiogram should be established for each employee within 6 months of his or her first exposure at or above the 85-dBA 8-hour TWA action level.

Baseline audiograms should be preceded by 14 hours free of workplace noise exposure (or hearing protector use) and be conducted according to NIOSH or OSHA guidelines by a competent technician or doctor. Audiometric testing should be performed in an appropriate setting with a calibrated, ANSI-approved audiometer.



12.4.5 Recordkeeping

Pyro Combustion & Controls Inc. should maintain accurate records of employee exposure measurements and audiometric test records pursuant to this policy.

This audiometric test record should include the following:

- name and job classification of the employee;
- date of the audiogram;
- the examiner's name;
- date of the last acoustic or exhaustive calibration of the audiometer; and
- employee's most recent noise exposure assessment.

The following records will be maintained for at least the following periods:

- noise exposure measurement records for two years; and
- audiometric test records for the duration of the affected employee's employment.

All hearing protection program records should be maintained for the duration of the affected worker's employment and be provided upon request to employees, former employees, representatives designated by the individual employee, and any authorized government official.

If *Pyro Combustion & Controls Inc.* ceases to do business, it will transfer hearing protection program records to the successor employer.

Record a hearing loss on the OSHA 300 log if the following are true:

- A standard threshold shift is indicated by an audiometric examination;
- The employee's overall hearing level is at 25 dB or more above audiometric zero averaged at 2000, 3000 and 4000 Hz in the affected ear(s); and
- The hearing loss is work related.

12.4.5.1 Evaluation

A physician or appropriate technician should compare each employee's annual audiogram to that employee's baseline audiogram to determine if the audiogram is valid and if a standard threshold shift has occurred.

A standard threshold shift according to OSHA is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear (excepting an allowance for age as specified by OSHA in 1910.95 Appendix F: Calculation and Application of Age Correction to Audiograms). However, more stringent guidelines may also be followed.

The audiologist, otolaryngologist, or physician will review problem audiograms and shall determine whether there is a need for further evaluation.

12.4.5.2 Audiogram Evaluation Follow-Up

This company will inform the employee in writing within 21 days of an annual audiogram indicating a standard threshold shift to the baseline audiogram.

Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, *Pyro Combustion & Controls Inc.* shall ensure the following steps when a standard threshold shift occurs:

- employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them;
- employees already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation if necessary;
- we will refer the employee for a clinical audiological evaluation or an otological examination as appropriate if additional testing is necessary or if the employer suspects a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors; and
- inform the employee of the need for an otological examination with suspicion of a medical pathology of the ear unrelated to the use of hearing protectors.

If later audiometric testing of an employee whose exposure to noise is less than an 8-hour TWA of 90 decibels indicates that a standard threshold shift is not persistent, *Pyro Combustion & Controls Inc.:*

- shall inform the employee of the new audiometric interpretation; and
- may discontinue the required use of hearing protectors for that employee.

An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist or physician who is evaluating the audiogram:

- the standard threshold shift revealed by the audiogram is persistent; or
- the hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

12.5 Forms & Attachments

On the following pages, please find the following document(s):

- Audiometric & Identification Information
- Hearing Conservation Program Employee Enrollment
- Hearing Protection Training Record Sheet

Audiometric & Identification Information

Name: _____

ID#: _____ Birth Date: ___/___/_____ Gender: _____

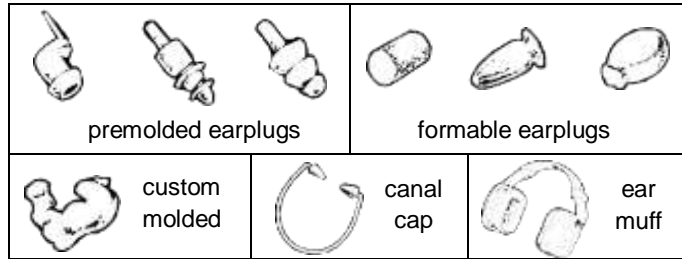
Test Date: ___/___/_____ Time: ____:____ Test type: _____ Time since last exposure: ___ hrs

Exposure Level: _____ dBA

Hearing Protection Devices Used (choose)

Hearing Protector Activity

- Issue
- Reissue
- Training
- Retraining



Self-Reported Employee History

- | | | |
|--|--|---|
| <input type="checkbox"/> Medical history | <input type="checkbox"/> Hobby/Military | <input type="checkbox"/> Additional Information |
| <input type="checkbox"/> Diabetes | <input type="checkbox"/> Hunt/Shoot | <input type="checkbox"/> Noisy 2nd Job |
| <input type="checkbox"/> Ear Surgery | <input type="checkbox"/> Car Racing | <input type="checkbox"/> Noisy past job |
| <input type="checkbox"/> Head Injury | <input type="checkbox"/> Motorcycles | <input type="checkbox"/> Exposure to Solvents |
| <input type="checkbox"/> High Fever | <input type="checkbox"/> Other Loud Vehicles | <input type="checkbox"/> Exposure to Metals |
| <input type="checkbox"/> Measles | <input type="checkbox"/> Loud Music/Band | <input type="checkbox"/> Difficulty Hearing |
| <input type="checkbox"/> Mumps | <input type="checkbox"/> Power Tools | <input type="checkbox"/> Hearing Aid |
| <input type="checkbox"/> Hypertension | <input type="checkbox"/> Other Noisy Hobbies | <input type="checkbox"/> Recent Change in Hearing |
| <input type="checkbox"/> Ringing in Ears | <input type="checkbox"/> Military Service | <input type="checkbox"/> See Physician About Ears |
| <input type="checkbox"/> Ear Infection | <input type="checkbox"/> Other: | <input type="checkbox"/> Other: |
| <input type="checkbox"/> Other: | | |

Audiogram

	Test Frequency						
	500	1000	2000	3000	4000	6000	8000
Right Ear							
Left Ear							

Audiometer _____ Serial Number _____
 Exhaustive Cal. date ___/___/_____ Biological Cal. Date ___/___/_____
 Tester ID _____ Test reliability Good Fair Poor
 Review ID _____ Audiogram Classification _____

Comments: _____

13

Hand & Power Tools

13.1 Policy Statement

The use of tools creates a range of hazards for those who use tools. However, appropriate precautions — including, but not limited to training, tool inspection, tool maintenance, and safe use procedures — can prevent injuries. This policy is intended to ensure safety for employees who use power and hand tools and must be followed by all employees of *Pyro Combustion & Controls Inc.*.

13.2 Responsibilities

Preventing injuries to employees using hand and power tools is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

13.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Maintain all tools and equipment used by employees in safe, working condition;
- Ensure employees are trained in the safe operation of all equipment they are expected to use on the job;
- Provide personal protective equipment to prevent injury and adverse health effects;
- Select only tools with appropriate safety guards;
- Remove unsafe equipment from the worksite; and
- Ensure every job hazard analysis and safe job procedure considers the hazards introduced by power tools and hand tools.

13.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Assist in identifying hazards associated with hand tools and power tools;
- Assist in providing tool training for personnel;
- Assist in training personnel in the safe operation of material handling equipment; and
- Review tool safety procedures and inspect safeguards yearly or as necessary to ensure the safety and health of personnel.

13.2.3 Employee Responsibilities

Pyro Combustion & Controls Inc. employees are expected to:

- Be aware of hazards presented by tools where they work;
- Follow company safety policy and the instructions of the supervisor;
- Comply with safe operating procedures for all equipment;
- Attend and participate in appropriate safety training; and
- Report safety concerns and provide safety recommendations as appropriate.

13.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on hand and power tools. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to the educational level, literacy, and language of employees.

13.3.1 Training Components

Gary Pfizenmayer will ensure that every employee will be trained in the following minimum elements:

- Proper storage, maintenance and use of any tool the employee will use in his job;
- A description and identification of the hazards associated with tools;
- The safeguards, including PPE, to protect the employee from tools, the hazards for which they are intended;
- How to use tool safeguards and why;
- Safety precautions necessary for working with the tool;
- How to inspect tools for damage and what to do (e.g., contact the supervisor) if a tool is damaged, missing safeguards or other pieces, or otherwise unable to provide adequate protection;
- Limitations of tools being used and the how to select the right tool for the job;
- How to replace blades, change accessories, lubricate, charge and other similar activities associated with using power tools; and
- Where to find the manufacturer's instructions for power tools the employee is expected to use.

13.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

13.4 Policy

13.4.1 Overview

All hand and power tools and similar equipment, whether furnished by the employer or the employee, will be maintained in a safe condition.

When power-operated tools are designed to accommodate guards, they shall be equipped with such guards when in use.

13.4.1.1 General Power Tool Safety

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords and hoses away from heat, oil, and sharp edges.
- Disconnect tools when not using them, before servicing and cleaning them, and when changing accessories such as blades, bits, and cutters.
- Keep all people not involved with the work at a safe distance from the work area.
- Secure work with clamps or a vise, freeing both hands to operate the tool.
- Avoid accidental starting. Do not hold fingers on the switch button while carrying a plugged-in tool.
- Maintain tools with care; keep them sharp and clean for best performance.
- Follow instructions in the user's manual for lubricating and changing accessories.
- Be sure to keep good footing and maintain good balance when operating power tools.
- Wear proper apparel for the task. Loose clothing, ties, scarves, or jewelry can become caught in moving parts.

13.4.1.2 Guards

The exposed moving parts of power tools need to be safeguarded.

Belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment must be guarded.

Guards, as appropriate, must be provided to protect the operator and others from the following:

- Point of operation;
- In-running nip points;
- Rotating parts; and
- Flying chips and sparks.

Safety guards must never be removed when a tool is being used. Portable circular saws having a blade greater than 2 inches (5.08 centimeters) in diameter must be equipped at all times with guards. An upper guard must cover the entire blade of the saw. A retractable lower guard must cover the teeth of the saw, except where it makes contact with the work material. The lower guard must automatically return to the covering position when the tool is withdrawn from the work material.

13.4.1.3 Switches and Controls

The following hand-held power tools must be equipped with a constant-pressure switch or control that shuts off the power when pressure is released:

- drills;
- tappers;
- fastener drivers;
- disc sanders with discs greater than 2 inches;
- horizontal, vertical, and angle grinders with wheels more than 2 inches in diameter;
- belt sanders;
- reciprocating saws;
- saber saws, scroll saws, and jigsaws with blade shanks greater than ¼-inch wide; and
- other similar tools.

These tools also may be equipped with a “lock-on” control, if it allows the worker to also shut off the control in a single motion using the same finger or fingers.

The following hand-held power tools must be equipped with either a positive “on-off” control switch, a constant pressure switch, or a “lock-on” control:

- grinders with wheels 2 inches or less in diameter;
- disc sanders with discs 2 inches or less in diameter;
- platen sanders, routers, planers laminate trimmers, nibblers, shears, and scroll saws; and
- and jigsaws, saber and scroll saws with blade shanks a ¼-inch (+/- .05 in.) or less in diameter.

It is recommended that the constant-pressure control switch be regarded as the preferred device.

Other hand tools such as the following hand-held power tools must be equipped with a **constant-pressure switch**:

- circular saws having a blade diameter greater than 2 inches;
- Chain saws; and
- Percussion tools with no means of holding accessories securely

13.4.1.4 Personal Protective Equipment

Employees using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases shall be provided with the particular personal protective equipment necessary to protect them from the hazard. All personal protective equipment shall meet the requirements and be maintained according to OSHA requirements.

13.4.2 Hand Tools

Wrenches, including adjustable, pipe, end, and socket wrenches shall not be used when jaws are sprung to the point that slippage occurs.

Impact tools, such as drift pins, wedges, and chisels, shall be kept free of mushroomed heads.

The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight in the tool.

Knives and scissors must be kept sharp.

All cracked saws shall be removed from service.

When using saw blades, knives or other tools, direct tools away from aisle areas and other employees in close proximity.

Iron or steel hand tools may produce sparks that can be an ignition source around flammable substances. Where this hazard exists, spark-resistant tools made of non-ferrous materials should be used where flammable gases, highly volatile liquids, and other explosive substances are stored or used.

13.4.2.1 General

- Try to avoid prying, pulling, wedging, or lifting at sharp angles or overhead.
- Wherever possible, keep the bar at right angles to the work.
- Wear eye protection and, where necessary, face protection.

13.4.2.2 Axes and Hatchets

In construction, axes are mainly used for making stakes or wedges and splitting or shaping rough timbers.

- Unless it has a striking face, don't use the hatchet as a hammer. The head or the wooden handle can crack and break.
- Hatchets with striking faces are meant only for driving common nails, not for striking chisels, punches, drills, or other hardened metal tools.
- Never use an axe or hatchet as a wedge or chisel and strike it with a hammer.
- Most carpenters prefer a hatchet with a solid or tubular steel handle and a hammer head with a slot for pulling nails.

13.4.2.3 Claw Hammers

These are available in many shapes, weights, and sizes for various purposes. Handles can be wood or steel (solid or tubular). Metal handles are usually covered with shock-absorbing material.

- Start with a good quality hammer of medium weight (16 ounces) with a grip suited to the size of your hand.
- Rest your arm occasionally to avoid tendinitis. Avoid overexertion in pulling out nails. Use a crow bar or nail puller when necessary.

- When nailing, start with one “soft” hit, that is, with fingers holding the nail. Then let go and drive the nail in the rest of the way.
- Strike with the hammer face at right angles to the nailhead. Glancing blows can lead to flying nails. Clean the face on sandpaper to remove glue and gum. Don't use nail hammers on concrete, steel chisels, hardened steel-cut nails, or masonry nails.
- Discard any hammer with a dented, chipped, or mushroomed striking face or with claws broken, deformed, or nicked inside the nail slot.

13.4.2.4 Crow Bars

Any steel bar 10-60 inches long and sharpened at one end is often called a crow bar.

The tools include pry bars, pinch bars, and wrecking bars. Shorter ones usually have a curved claw for pulling nails and a sharp, angled end for prying.

Lifting

Loads levered, lifted, or shifted by bars can land on fingers and toes.

- Make sure to clear the area and maintain control of the load.
- Have enough rollers and blocking ready.
- Never put fingers or toes under the load.

13.4.2.5 Cold Chisels

Cold chisels are used to cut or shape soft metals as well as concrete and brick.

In time the struck end will mushroom. This should be ground off. Don't use chisels with mushroomed heads. Fragments can fly off and cause injury.

13.4.2.6 Hand Planes

Hazards include the risk of crush and scrape injuries when the hand holding the plane strikes the work or objects nearby. Cuts and sliver injuries are also common.

The hand plane requires some strength and elbow grease to use properly. The hazards of overexertion and tendinitis can be aggravated by using a dull iron or too short a plane.

- Only use a plane suited to the job and keep the iron sharp.
- For long surfaces like door edges, use a fore plane 18" long and 2 $\frac{3}{8}$ " wide or a jointer plane 24" long and 2 $\frac{5}{8}$ " wide.
- For shorter surfaces, use a jack plane 15" long and 2 $\frac{3}{8}$ " wide or a smoothing plane 10" long and 2 $\frac{3}{8}$ " wide.
- Remember that sharp tools require less effort and reduce the risk of fatigue, overexertion, and back strain.
- Work can also be easier with a door jack and supports on your work bench.

13.4.2.7 Hand Saws

Select the right saw for the job. A 9 point is not meant for crosscutting hardwood. It can jump up and severely cut the worker's hand or thumb.

For this kind of work the right choice is an 11 point (+). When starting a cut, keep your thumb up high to guide the saw and avoid injury.

For cutting softwood, select a 9 point (-). The teeth will remove sawdust easily and keep the saw from binding and bucking.

Ripping requires a rip saw.

13.4.2.8 Nail Pulling

Pulling out nails can be easier with a crow bar than a claw hammer.

In some cases, a nail-puller does the job best. The hand holding the claw must be kept well away from the striking handle.

13.4.2.9 Plumb Bobs

The weight of a mercury-filled plumb bob will surprise you. Designed for use in windy conditions, the bob has considerable weight in proportion to its surface area.

The weight and point of the bob can make it dangerous. Ensure that all is clear below when you lower the bob.

Don't let it fall out of your pocket, apron, or tool bag. The same goes for the standard solid bob.

13.4.2.10 Screwdrivers

Screwdrivers are not intended for prying, scraping, chiseling, scoring, or punching holes.

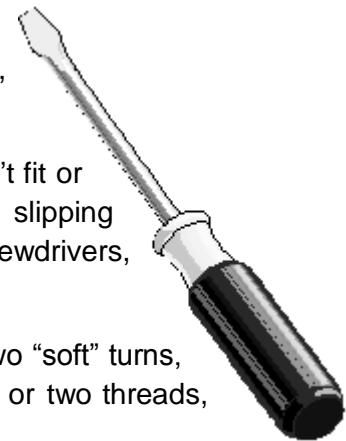
The most common abuse of the screwdriver is using one that doesn't fit or match the fastener. The results are cuts and punctures from slipping screwdrivers, eye injuries from flying fragments of pried or struck screwdrivers, and damaged work.

Always make a pilot hole before driving a screw. Start with one or two "soft" turns, that is, with the fingers of your free hand on the screw. Engage one or two threads, make sure the screw is going in straight, then take your fingers away.

You can put your fingers on the shank to help guide and hold the screwdriver. But the main action is on the handle, which should be large enough to allow enough grip and torque to drive the screw. Power drivers present obvious advantages when screws must be frequently or repeatedly driven.

Phillips screws and drivers are only one type among several cross point systems. They are not interchangeable.

Note: All cross-point screws are not designed to be driven by a Phillips screwdriver.



13.4.2.11 Sledgehammers

Sledgehammers are useful for drifting heavy timbers and installing and dismantling formwork. They can knock heavy panels into place and drive stakes in the ground for bracing.

- Sledgehammers can also be used to drive thick tongue-and-groove planking tightly together. Use a block of scrap wood to prevent damage to the planks.
- The main hazard is the weight of the head. Once the hammer is in motion it's almost impossible to stop the swing. Serious bruises and broken bones have been caused by sledgehammers off-target and out of control.
- Missing the target with the head and hitting the handle instead can weaken the stem. Another swing can send the head flying.
- Always check handle and head. Make sure head is secure and tight. Replace damaged handles.
- As with any striking or struck tool, always wear eye protection.
- Swinging a sledgehammer is hard work. Avoid working to the point of fatigue. Make sure you have the strength to maintain aim and control.

13.4.2.12 Utility Knives

Utility knives cause more cuts than any other sharp-edged cutting tool in construction.

- Use knives with retractable blades only.
- Always cut away from your body, especially away from your free hand. When you're done with the knife, retract the blade at once. A blade left exposed is dangerous, particularly in a toolbox.

13.4.2.13 Wood Chisels

Most injuries with this tool can be prevented by keeping the hand that holds the work behind, not in front of, the chisel.

- A dull or incorrectly sharpened chisel is difficult to control and tedious to work with.
- Chisels not in use or stored in a toolbox should have protective caps.
- Wood chisels are tempered to be very hard. The metal is brittle and will shatter easily against hard surfaces.
- Never use a chisel for prying.
- Repeatedly striking the chisel with the palm of your hand may lead to repetitive strain injury.
- With chisels and other struck tools, always wear eye protection. Gloves are recommended to help prevent cuts and bruises.

13.4.3 Electric Tools

- Operate electric tools within their design limitations according to manufacturer's instructions.

- Use gloves and appropriate safety footwear when using electric tools.
- Store electric tools in a dry place when not in use.
- Do not use electric tools in damp or wet locations unless they are approved for that purpose.
- Keep work areas well lighted when operating electric tools.
- Ensure that cords from electric tools do not present a tripping hazard.
- Unplug the tool before making adjustments or changing attachments.
- The use of electric cords for hoisting or lowering tools shall not be permitted.
- Remove all damaged portable electric tools from use and tag them: "Do Not Use."

13.4.3.1 Electric Safety Features

To protect the user from shock and burns, electric tools must have a three-wire cord with a ground and be plugged into a grounded receptacle, be double insulated, or be powered by a low-voltage isolation transformer. Three-wire cords contain two current-carrying conductors and a grounding conductor. Any time an adapter is used to accommodate a two-hole receptacle, the adapter wire must be attached to a known ground. The third prong must never be removed from the plug.

Double-insulated tools are available that provide protection against electrical shock without third-wire grounding. On double-insulated tools, an internal layer of protective insulation completely isolates the external housing of the tool.

In the construction industry, employees who use electric tools must be protected by ground-fault circuit interrupters or an assured equipment-grounding conductor program.

13.4.3.2 Chop Saws

Chop saws offer quick, efficient, and economical cutting.

Unfortunately, like all power equipment, chop saws pose serious hazards for the unwary or untrained operator.

- Select the proper abrasive cutting wheel for the material being cut. For metals, use aluminum oxide. For masonry, stone, and concrete, use silica carborundum.
- Do not exceed the recommended rpm printed on the blade label.
- The center hole on the blade must fit the mandril and be snugly fastened in place with the proper washer and lock nut.

Warning: A loose or off-center blade can shatter in use.

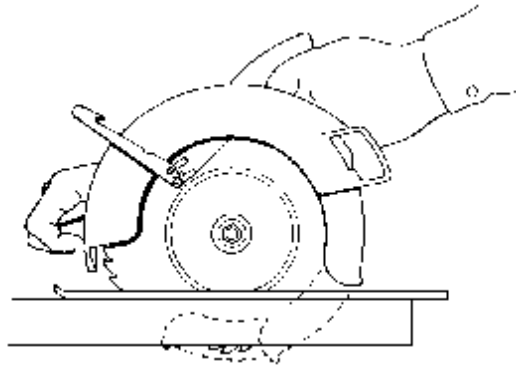
- Position material to be cut at 90° degrees to the blade. Support the other end to prevent the blade from binding.
- Do not rush cutting. Let the wheel cut without burning or jamming.
- When cutting is complete, let the blade stop before moving material.

- Maintain the saw in good repair with the blade guard in place and working smoothly. Tighten any loose parts and replace any broken or damaged ones.
- Don't try to adjust for length on downward cutting motion. Your hand could slide into the blade while it is spinning.
- With some large chop saws, additional precautions are required because of the tremendous torque the saws can develop.
- Beware of sparks landing on combustible material.

13.4.3.3 Circular Saws

Circular saws are either worm-drive or direct-drive. The worm-drive saw has gears arranged so that the blade runs parallel to the motor shaft. The direct-drive saw has the blade at a right angle to the motor shaft.

The worm-drive saw periodically requires special gear oil to keep the inner gears lubricated. This requirement is usually eliminated in the direct-drive saw, which has sealed bearings and gears.



Both saws must be inspected regularly for defects, and operated and maintained in accordance with manufacturers' recommendations.

Check for:

- damaged cord
- loose blade
- faulty guards
- defective trigger
- chipped or missing teeth
- cracked or damaged casing

Safety Features

Sawdust Ejection Chute

This feature prevents sawdust from collecting in front of the saw and obscuring the cutting line. The operator can continue cutting without having to stop the saw and clear away sawdust.

Clutch

Some worm-drive saws are equipped with a clutch to prevent kickback. Kickback occurs when a saw meets resistance and violently backs out of the work. The clutch action allows the blade shaft to continue turning when the blade meets resistance. The blade stud and friction washer can be adjusted to provide kickback protection for cutting different materials. Check friction washers for wear.

Brake

An electric brake on some circular saws stops the blade from coasting once the switch is released. This greatly reduces the danger of accidental contact.

Trigger Safety

On some light-duty saws a latch prevents the operator from accidentally starting the motor. The trigger on the inside of the handle cannot be pressed without first pressing a latch on the outside of the handle. On heavy-duty saws a bar under the trigger switch helps to prevent accidental starting.

Blade Guards

All portable, power-driven circular saws having a blade diameter greater than 2 in. shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to covering position.

Never operate an electric saw with the lower guard tied or wedged open. The saw may kick back and cut you, or another worker who uses the saw.

An exposed blade, still in motion, will force the saw to move, cutting anything in its path. Make sure that the lower guard returns to its proper position after a cut. Never operate a saw with a defective guard-retracting lever.

On most saws the lower guard is spring-loaded and correct tension in the spring will automatically close the guard. However, a spring weakened by use and wear can allow the guard to remain open after cutting. Maintain complete control of the saw until the blade stops turning.

Note: The guard may also be slow to return after 45° cuts.

Blades

For safety, understand the different designs and uses of blades. Blades unsuited for the job can be as hazardous as dull blades. For instance, a saw fitted with the wrong blade for the job can run hot so quickly that blade tension changes and creates a wobbly motion. The saw may kick back dangerously before the operator can switch it off.

Blades should be sharpened or changed frequently to prolong saw life, increase production, and reduce operator fatigue. The teeth on a dull or abused blade will turn blue from overheating. Cutting will create a burning smell. Such blades should be discarded or reconditioned.

- Before changing or adjusting blades, disconnect the saw from the power source.
- Take care to choose the right blade for the job. Blades are available in a variety of styles and tooth sizes.
- Combination blades (rip and crosscut) are the most widely used.
- Ensure that arbor diameter and blade diameter are right for the saw.

- Because all lumber is not new, make sure it is clean and free of nails, concrete, and other foreign objects. This precaution not only prolongs blade life but may also prevent serious injury.
- Take special care to ensure that blades are installed in the proper rotational direction. Remember that electrical circular handsaws cut with an upward motion. The teeth visible between the upper and lower guard should be pointing toward the front of the saw. Most models have a directional arrow on both blade and guard to serve as a guide.

Re-sharpened blades can be substantially reduced in diameter. Make sure that the blade diameter and arbor diameter are right for the saw.

Carbide-Tipped Blades: Take special care not to strike metal when using a carbide-tipped blade. The carbide tips can come loose and fly off, ruining the blade and injuring the operator. Inspect the blade regularly for cracked or missing tips.

Changing, Adjusting, and Setting Blades

When changing blades, take the following precautions:

- Disconnect the saw from the power source.
- Place the saw blade on a piece of scrap lumber and press down until the teeth dig into the wood. This prevents the blade from turning when the locking nut is loosened or tightened. Some machines are provided with a mechanical locking device.
- Make sure that keys and adjusting wrenches are removed before operating the saw.

Proper adjustment of cutting depth keeps blade friction to a minimum, removes sawdust from the cut, and results in cool cutting.

The blade should project the depth of one full tooth below the material to be cut.

Carbide-tipped blades or miter blades should project only half a tooth below the material. If the blade is to run freely in the kerf (saw cut), teeth must be set properly, that is, bent alternate.

The setting of teeth differs from one type of blade to another. Finer toothed blades require less set than rougher-toothed blades. Generally, teeth should be alternately bent $\frac{1}{2}$ times the thickness of the blade.

Sharp blades with properly set teeth will reduce the chance of wood binding. They will also prevent the saw from overheating and kicking back.

Cutting

Place the material to be cut on a rigid support such as a bench or two or more sawhorses. Make sure that the blade will clear the supporting surface and the power cord. The wide part of the saw shoe should rest on the supported side of the cut if possible.

- Plywood is one of the most difficult materials to cut with any type of saw. The overall size of the sheet and the internal stresses released by cutting are the main causes of difficulty. Large sheets should be supported in at least three places, with one support next to the cut.

- Short pieces of material should not be held by hand. Use some form of clamping to hold the material down when cutting it.
- NEVER use your foot or leg to support the material being cut. You can be seriously injured by this careless act.
- The material to be cut should be placed with its good side down, if possible. Because the blade cuts upward into the material, any splintering will be on the side which is uppermost.
- Use just enough force to let the blade cut without laboring. Hardness and toughness can vary in the same piece of material, and a knotty or wet section can put a heavier load on the saw. When this happens, reduce pressure to keep the speed of the blade constant. Forcing the saw beyond its capacity will result in rough and inaccurate cuts. It will also overheat the motor and the saw blade.
- Take the saw to the material. Never place the saw in a fixed, upside-down position and feed material into it. Use a table saw instead.
- If the cut gets off line, don't force the saw back onto line. Withdraw the blade and either start over on the same line or begin on a new line.
- If cutting right-handed, keep the cord on that side of your body. Stand to one side of the cutting line. Never reach under the material being cut.
- Always keep your free hand on the long side of the lumber and clear of the saw. Maintain a firm, well-balanced stance, particularly when working on uneven footing.
- Plywood, wet lumber, and lumber with a twisted grain tend to tighten around a blade and may cause kickback. Kickback occurs when an electric saw stalls suddenly and jerks back toward the operator. The momentarily exposed blade may cause severe injury.

Pocket Cutting

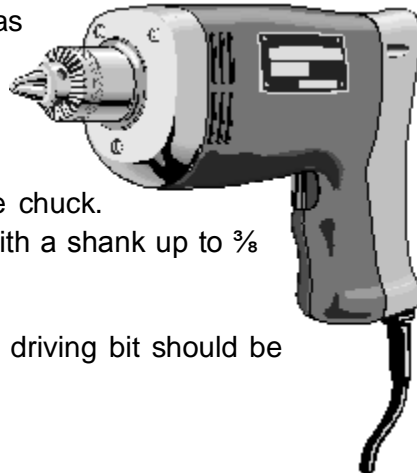
- Tilt saw forward.
- Rest front of shoe on wood.
- Retract lower guard.
- Lower saw until front teeth almost touch wood.
- Release guard to rest on wood.
- Switch on the saw.
- Keep the saw tilted forward and push it down and forward with even pressure gradually lowering it until shoe rests flat on wood.
- Follow these steps with extreme care.

13.4.3.4 Drills

Types

Trim carpenters will generally select a ¼ or ⅜ inch trigger-controlled variable speed drill. Simply by increasing pressure on the trigger, you can change drill speed from 0 to 2,000 rpm.

Carpenters working in heavy structural construction such as bridges, trusses, and waterfront piers usually select the slower but more powerful one- or two-speed reversible $\frac{1}{2}$ or $\frac{1}{4}$ inch drill.



Size of the drill is determined by the maximum opening of the chuck. For instance, a $\frac{3}{8}$ inch drill will take only bits or attachments with a shank up to $\frac{3}{8}$ inch wide.

For drywall screws, a drywall screw gun should be used. The driving bit should be replaced when worn.

Attachments

Attachments such as speed-reducing screwdrivers, disk sanders, and buffers can help prevent fatigue and undue muscle strain. A right-angle drive attachment is very useful in tight corners and other hard-to-reach places.

Cutting and drilling attachments must be kept sharp to avoid overloading the motor.

Never crowd or push the tool beyond capacity. Such handling can burn out the motor, ruin the material, and injure the operator in the event of a kickback.

Some attachments, such as hole saws, spade bits, and screwdrivers, require considerable control by the operator. If you do not feed the attachment slowly and carefully into the material, the drill can stop and severely twist or break your arm. Stock should be clamped or otherwise secured to prevent it from moving. This will also enable you to control the tool with both hands and absorb sudden twists or stops caused by obstructions such as knots or hidden nails.

You must restrain the drill just before the bit or cutting attachment emerges through the material, especially when oversized spade bits are used. Sides of the bit often become hooked on the ragged edge of the nearly completed hole and make the drill come to a sudden stop that can wrench your arm.

At the first sign of the bit breaking through the material, you should withdraw the drill and complete the work from the other side. This will produce a cleaner job and prevent the material from cracking or splintering. The same result can be obtained by clamping a back-up piece to the material and drilling into that.

Select the bit or attachment suitable to the size of the drill and the work to be done. To operate safely and efficiently, the shanks of bits and attachments must turn true. Make sure that the bit or attachment is properly seated and tightened in the chuck.

Some operations require the use of an impact or hammer drill. For instance, drilling large holes in concrete or rock with a carboloy bit should be done with an impact drill

Follow manufacturer's instructions when selecting and using a bit or attachment, especially with drills or work you are not unfamiliar with.

Working with Small Pieces

- Drilling into small pieces of material may look harmless, but if the pieces are not clamped down and supported, they can spin with the bit before the hole is completed.
- If a small piece starts to twist or spin with the drill, you can be injured. Small work pieces should be properly secured and supported. Never try to drill with one hand and hold a small piece of material with the other.

Drilling from Ladders

- Standing on a ladder to drill holes in walls and ceilings can be hazardous. The top and bottom of the ladder must be secured to prevent the ladder from slipping or sliding when the operator puts pressure on the drill.
- When drilling from a ladder, never reach out to either side. Overreaching can cause the ladder to slide or tip.
- Never stand on the top step or paint shelf of a stepladder. Stand at least two steps down from the top. When working from an extension ladder, stand no higher than the fourth rung from the top.
- Never support yourself by holding onto a pipe or any other grounded object. Electric current can travel from the hand holding the drill through your heart to the hand holding the pipe. A minor shock can make you lose your balance. A major shock can badly burn or even kill you.

Operation

- Always plug in the drill with the switch OFF.
- Before starting to drill, turn on the tool for a moment to make sure that the shank of the bit or attachment is centered and running true.
- Punch a layout hole or drill a pilot hole in the material so that the bit won't slip or slide when you start drilling. A pilot hole is particularly important for drilling into hard material such as concrete or metal.
- With the drill OFF, put the point of the bit in the pilot hole or punched layout hole.
- Hold the drill firmly in one hand or two hands, as necessary, at the correct drilling angle.
- Turn on the switch and feed the drill into the material with the pressure and control required by the size of the drill and the type of material.
- Don't enlarge a hole by reaming it out with the sides of the bit. Switch to a larger bit.
- While drilling deep holes, especially with a twist bit, withdraw the drill several times with the motor running to clear the cuttings.
- Never support material on your knee while drilling. Material should be firmly supported on a bench or other work surface for drilling.
- Unplug the drill and remove the bit as soon as the work is finished.
- When drilling into floors, ceilings, and walls, beware of wiring and plumbing.
- Rotary and hammer drills generate extreme torque and must be handled with caution. Take occasional breaks to relax your arms and shoulders.

Drilling Timbers

- When drilling timbers with a self-feeding auger bit, do not underestimate the physical pressure required to maintain control of the tool. Such work calls for a heavy-duty, low-rpm drill, ½ or ¼ inch in size.
- Never attempt to drill heavy timbers by yourself, especially when working on a scaffold or other work platform. If the self-feeding auger bit digs into a hidden knot or other obstruction, the sudden torque can twist or wrench your arm and throw you off balance.

Other Materials

- The main hazard in drilling materials other than wood is leaning too heavily on the tool. This can not only overload and burn out the motor but also cause injury if you are thrown off balance by the drill suddenly twisting or stopping.
- Always use a drill powerful enough for the job and a bit or attachment suited to the size of the drill and the nature of the work. As at other times, punching a layout hole or drilling a pilot hole can make the job safer and more efficient.
- A drill press stand is ideal for drilling holes in metal accurately and safely. Small pieces can be clamped in a vise and bolted to the table. This prevents the work piece from spinning when the drill penetrates the metal.
- A drill press can also be used for cutting large holes in wood with a hole saw or speed bit. The stability of the press and the operator's control over cutting speed eliminate sudden torque.

13.4.3.5 Planes

Electric planes are available in various types and sizes, and are operated in similar ways. Depending on specific features adjustments between models may differ.

Planes may be equipped with:

- outfeed tables (back shoes) that are either fixed or movable;
- infeed tables (front shoes) that move straight up and down or move up and down on an angle to keep the gap between cutter head and table as small as possible; or
- cutter heads with two or more straight blades (also called knives or cutter blades) or cutter heads with two curved blades.

Never operate an electric plane while wearing a scarf, open jacket, or other loose clothing. Keep long hair tied up. Always wear eye protection and practice good housekeeping.

Standard Plane

- Hold with both hands to avoid contact with cutter blades.
- Always keep both hands on the plane until motor stops.
- Use the edge guide to direct the plane along the desired cut. Never try to guide the plane with your fingers. If the plane runs into an obstruction or starts to vibrate, your fingers can slide into the unprotected cutter head.

Block Plane (Electric)

Designed for use on small surfaces, the block plane is operated with only one hand. It is more dangerous than the larger, standard plane.

You may tend to support the work with one hand while operating the block plane with the other. Any unexpected twist or movement can force the plane or the material to kick back and injure you. Keep your free hand well out of the way, in case the plane slips accidentally.

Maintaining Blades

- To avoid striking staples, nails, sand, or other foreign objects, make sure the work is free of obstructions.
- Keep blades in good condition and sharp. A sharp blade is safer to use than a dull blade that requires more pressure. A dull blade will float over the work and can bounce off, causing injury.
- Use a fine-grit oilstone when sharpening blades. Blades can be re-sharpened several times if they are not nicked or cracked.

Changing Blades

Time and patience is required when raising or replacing cutter blades. Blades must be the same weight and seated at the same height to prevent the cutter head from vibrating. Any deviation can cause the head to run off balance. Blades can fly out and injure you or fellow workers.

Removing Blades

- Disconnect the plane from the power source.
- Turn the plane upside down and secure it in a fixed position.
- Hold the cylinder head stationary by tapping a softwood wedge between the cutterhead and the bearing (some tools are equipped with a locking device).
- Loosen all the screws and lift out one blade and throat piece.
- Turn the cutter head and repeat this procedure with other blades.
- If necessary, clean parts thoroughly with recommended solvent

Installing Blades

- Replace one throat piece and blade.
- Tighten the two end screws lightly.
- Take a hardwood straight edge and use the outfeed table (back shoe) as a gauge. Raise or lower the blade until both ends are level with the outfeed table at the blade's highest point of revolution.
- Tighten up the remaining screws.
- Set the rest of the blades in the same way.
- Turn the cylinder head and make sure that all blades are the same height.
- Tighten up all the screws.
- Double-check the height of all blades. Tightening can sometimes shift the set.
- Double-check all the screws.

- Turn the tool right side up and plug it in.
- Hold the tool in both hands with the cutter blades facing away from you and switch it on.

Operation

- Always disconnect the plane from the power source before adjusting or changing blades or the cutter head.
- For safe operation make sure that blades (at their highest point of revolution) are exactly flush with the outfeed table.
- Make sure to support work securely for safety and accuracy.
- Use a jack (e.g. when planing doors and large pieces of plywood) to secure material and keep edges clear of dirt and grit.
- When using an electric block plane, clamp or fasten the workpiece whenever possible. Keep your free hand well away from plane and material.
- When using the standard power plane, adjust edge guide to desired guidance.
- Adjust depth of cut to suit the type and width of wood to be planed.
- To start a cut, rest the infeed table (front shoe) firmly on the material with cutter head slightly behind the edge of the material. After finishing a cut, hold both hands on the plane until motor stops.

13.4.3.6 Radial Arm Saws

The motor and blade of the radial arm saw are suspended above the table. Because the motor and blade assembly can be locked in different positions and can travel during the cut, you must pay special attention to keeping fingers and hands clear.

Injuries involving radial arm saws tend to be serious. By using appropriate guards and procedures, however, you can safely use the saw for crosscuts, miter cuts, ripping, and dados.

Set-Up

- The saw must be adequately powered for the work.
- The saw should be installed in a well-lit area out of the way of traffic, with enough space to store and handle long lengths of wood. Locating the machine with its back to a wall or partition can help to keep flying pieces from hitting anyone.
- Where possible, mark the floor with yellow warning lines to keep other personnel back from the saw.
- Make sure all safety guards and devices are in place.
- Choose the right blade for the job. A sharp tungsten carbide combination blade is good for both crosscutting and ripping without frequent re-sharpening.

General Procedures

- Follow basic saw safety.
- If you don't have someone to help with long stock, use a roller stand or extension table to support the work.
- Always return the motor head to the column stop.

- When crosscutting or mitering, keep hands at least six inches away from the blade. Do not adjust length of cut until the motor is back at column.
- Slope the table top back slightly to keep the blade at the column, thereby preventing contact with stock being placed in position.
- Do not allow the blade to cut too quickly when crosscutting or mitering.
- Avoid drawing the blade completely out of the cut. The cut piece, whether large or small, often moves. When the saw is rolled back towards the column, the teeth can grab the piece and shoot it in any direction.
- Do not cut by pushing the saw away from you into the stock. The material can lift up and fly over the fence.

Ripping and Crosscutting

- For regular ripping, turn the motor away from the column to the in-rip position. Feed stock into the saw from the right side.
- To cut wide stock, change the saw to the out-rip position. Feed stock into the saw from the left side. Remember – the blade must turn up and toward you when feeding the stock.
- Do not force the cut. Allow the blade through the wood at its own pace.
- To avoid kickback, take the following precautions:
- Maintain proper alignment of blade with fence.
- Adjust anti-kickback device to $\frac{1}{8}$ inch below the surface of stock being fed.
- Use a sharp blade, free of gum deposits and with teeth properly set.
- When binding occurs, stop saw and open kerf with a wedge.
- After completing cut, remove stock from rotating blade to prevent overheating and possible kickback.
- Always push stock all the way through past the blade.
- Do not leave machine with motor running.
- Use a push stick when ripping narrow pieces. Have suitably sized and shaped pushsticks for other jobs as well. See information on pushsticks and feather boards under Table Saws.

Jigs

The control provided by a well-made jig is essential for making irregular cuts safely and accurately.

Keep commonly used jigs on hand. Jigs such as those for making stair and doorframe wedges and tapers are designed to carry stock past the blade with the saw locked in the rip position.

When you are drawing the saw into the stock, clamp or nail jigs to the table to prevent slipping.

Re-Sawing With Blade Horizontal

The rip fence on the radial arm saw is too low for supporting material to be re-sawn on edge. Therefore the material must be laid flat on the table and the motor must be turned so the blade is parallel to the table. The closeness of the arbor requires an auxiliary table top and fence to re-saw thin stock.

Because the kickback fence can't be used and controlling stock is sometimes difficult, re-sawing on the radial arm saw can be hazardous.

If no other equipment is available, rip the stock halfway through, then turn it around and complete the cut.

On the second cut, be sure to push the two halves well past the blade once they have been cut apart. Pushsticks and featherboards clamped to the table can reduce hazards.

Dadoes

A dado head is an essential tool for cutting grooves, rabbets, and dadoes. A groove is cut with the grain; a dado is cut across the grain; and a rabbet is a shoulder cut along the edge of a board.

The most common dado head consists of two outside cutters and several inside chippers between the outside cutters.

Another type is sometimes called a quick-set dado, consisting of four tapered washers and a blade. By rotating the locking washers, the blade will oscillate and cut a groove to the desired width.

Because of their small size, dado heads do not run at the peripheral feed speed on a big radial arm saw. As a result, the blade feeds itself too fast, either stopping the motor or lifting the work and throwing it back. To prevent this, make several light passes, lowering the dado head $\frac{1}{8}$ to $\frac{1}{4}$ inch each time.

Dado heads require guards for safety. Always make sure guards are in place before starting work.

Proper rotation of the teeth is up and toward you.

Other Accessories

Rotary accessories of various types are advertised as turning the radial arm saw into a multifunction machine.

Remember that the saw has its limitations.

Possible problems include the following:

- Shaper heads run too slow for safe and smooth work.
- Grinding stones may run too fast or slow and are not recommended.
- Sanding drums tend to run too fast and may burn the wood.

13.4.3.7 Routers

With special guides and bits, the portable electric router can be used to cut dadoes, grooves, mortises, dovetail joints, moldings, and internal or external curves. Routers are especially useful for mortising stair stringers and recessing hinges and lockplates on doors. The router motor operates at very high speed (up to 25,000 rpm) and turns clockwise.

- When starting a router with a trigger switch in the handle, keep both hands on the tool to absorb the starting torque.
- When starting a router with a toggle switch on top of the motor, hold the router firmly with one hand and switch on power with the other, then put both hands on the tool for control and accuracy.
- Always wear eye protection. Hearing protection may also be required. Remember, the speed and power of a router requires that it be operated with both hands.

Operation

- Always support and secure the work in a fixed position by mechanical means such as a vise or clamps. Never try to hold the work down with your hand or knee. Never rely on a second person to hold the material. Human grip is no match for the torque and kickback that a router can generate.
- Make sure that the bit is securely mounted in the chuck and the base is tight.
- Set the base on the work, template, or guide and make sure that the bit can rotate freely before switching on the motor.
- For work along edges such as bevels and moldings, make sure that the cutting edge of the router bit contacts the material to the left of the cutting direction.
- Otherwise the router will kick back or fly away from you.
- When routing outside edges, guide the router around the work counter-clockwise. Splinters left at corners by routing across the grain will be removed by the next pass with the grain.
- Feed the router bit into the material at a firm but controllable speed. There is no rule on how fast to cut. When working with softwood, the router can sometimes be moved as fast as it can go. Cutting may be very slow, however, with hardwood, knotty or twisted wood, and larger bits.
- Listen to the motor. When the router is fed into the material too slowly, the motor makes a high-pitched whine. Push too hard and the motor makes a low growling noise. Forcing the tool can cause burnout or kickback. Cutting through knots may cause slowdown or kickback.
- When the type of wood or size of bit requires going slow, make two or more passes to prevent the router from burning out or kicking back.
- If you are not sure about depth of cut or how many passes to make, test the router on a piece of scrap similar to the work.
- When the cut is complete, switch off power and keep both hands on the router until the motor stops. In lifting the tool from the work, avoid contact with the bit.

13.4.3.8 Saber, Scroll and Jigsaws

The saber saw, or portable jigsaw is designed for cutting external or internal contours. The saw should not be used for continuous or heavy cutting that can be done more safely and efficiently with a circular saw.

The stroke of the saber saw is about $\frac{1}{2}$ inch for the light duty model and about $\frac{1}{4}$ inch for the heavy duty model.

The one-speed saw operates at approximately 2,500 strokes per minute. The variable-speed saw can operate from one to 2,500 strokes per minute.

The reciprocating saw is a heavier type of saber saw with a larger and more rugged blade. The tool is often used by drywall and acoustical workers to cut holes in ceilings and walls. Equipped with a small swivel base, the saw can be used in corners or free-hand in hard-to-reach places. The reciprocating saw must be held with both hands to absorb vibration and to avoid accidental contact.

Eye protection is a must. You may also need respiratory protection.

Choosing the Proper Blade

Various blades, ranging from 7 to 32 teeth per inch, are available for cutting different materials. For the rough cutting of stock such as softwood and composition board, a blade with 7 teeth per inch will cut the fastest. For all-round work with most types of wood, a blade with 10 teeth per inch is satisfactory.

Cutting

The saber saw cuts on the upstroke. Splintering will therefore occur on the top side of the material being cut. Consequently, the good side should be facing down. The degree of splintering depends on the type of blade, the vibration of the material, and the feed of the saw.

To avoid vibration, the material should be clamped or otherwise secured and supported as close to the cutting line as possible. If the material vibrates excessively or shifts during cutting, the saw can run out of control, damaging the blade and injuring the operator.

- Before starting a cut make sure that the saw will not contact clamps, the vise, workbench, or other support.
- Never reach under the material being cut.
- Never lay down the saw until the motor has stopped.
- Do not try to cut curves so tight that the blade will twist and break.
- Always hold the base or shoe of the saw in firm contact with the material being cut.

Note: When sawing into floors, ceilings, or walls, always check for plumbing and wiring.

External Cut

To start an external cut (from the outside in), place the front of the shoe on the material. Make sure that the blade is not in contact with the material or the saw will stall when the motor starts.

Hold the saw firmly and switch it on. Feed the blade slowly into the material and maintain an even pressure. When the cut is complete, do not lay down the saw until the motor has stopped.

Inside Cuts

To start an inside cut (pocket cut), first drill a lead hole slightly larger than the saw blade. With the saw switched off, insert the blade into the hole until the shoe rests firmly on the material. Do not let the blade touch the material until the saw has been switched on.

It is possible to start an inside cut without drilling a lead hole first — but only when it's absolutely necessary. To do this, rest the front edge of the shoe on the material with the saw tipped backward. Keep the blade out of contact with the material.

Switch on the saw and slowly feed the blade into the material while lowering the back edge of the shoe. When the shoe rests flat on the material and the blade is completely through, proceed with the cut. Any deviation from this procedure can cause the blade to break and injure the operator or workers nearby.

Never try to insert a blade into, or withdraw a blade from, a cut or a lead hole while the motor is running. Never reach under the material being cut.

13.4.3.9 Table Saws

Types

The table saw most often used in construction is the 10-inch belt-driven tilting arbor saw. The dimension refers to the diameter of the saw blade recommended by the manufacturer.

Although some saws are direct-drive, with the blade mounted right on the motor arbor, most are belt-driven.

Both types are equipped with a fixed table top and an arbor that can be raised, lowered, or tilted to one side for cutting at different depths and angles.

Basket Guards

Basket guards may be fastened to the splitter or hinged to either side of the saw on an L-shaped or S-shaped arm.

Basket guards can protect the operator from sawdust, splinters, and accidental contact with the blade. Keep the basket guard in place for normal operations such as straight and bevel ripping and miter cutting. When the guard is removed to permit cutting of tenons, finger joints, rabbets, and similar work, use accessories such as feather boards, holding jigs, push sticks, and saw covers.

Some split basket guards have a see-through cover. One side can be moved sideways for a blade tilted to 45 degrees.

One side can be lifted up while the other remains as a protective cover.

Sheet metal baskets fastened to the splitter are less effective because you cannot see the saw blade.

Kickback

Kickback occurs when stock binds against the saw blade.

The blade can fire the wood back at you with tremendous force, causing major injuries to abdomen, legs, and hands.

- Never stand directly behind the blade when cutting. Stand to one side. See that other workers stand clear as well.
- Make sure the rip fence is aligned for slightly more clearance behind the blade than in front. This will help prevent binding.
- Use a sharp blade with teeth properly set for the wood being cut. A dull or badly gummed blade will cause friction, overheating, and binding.
- Install a splitter to keep the kerf (cut) open behind the blade. Also effective are anti-kickback fingers attached to the splitter.

Splitters

Splitters prevent the kerf from closing directly behind the blade. Ideally, they should be slightly thinner than the saw blade and manufactured from high tensile steel. Splitters are not always needed with carbide-tipped saw blades, whose relatively wide kerf may provide the desirable clearance. A wide kerf alone, however, is often not enough to keep some boards from closing behind the cut and binding against the blade.

In general, it is impossible to predict how a board will behave during ripping. It may remain straight, presenting no problems. On the other hand, the release of internal stresses may make the two ripped portions behind the blade either close up or spread apart.

Disappearing splitters with anti-kickback fingers can be pushed down when in the way of a workpiece and pulled up if necessary after the machine has been shut off.

Roller Stand

You risk injury when you try to maintain control over long pieces of stock single-handedly, especially if the stock begins to bind on the blade and kick back.

A roller stand provides the needed support. Adjust it to a height slightly lower than the saw table to allow for sagging of the material. Be sure to set up the stand so the roller axis is at 90 degrees to the blade. Otherwise, the roller could pull the stock off to one side and cause binding.

Whatever the design, a support stand should be standard equipment in every carpentry and millwork shop. It can be used as an extension to a workbench, jointer, or bandsaw and is especially important with the table saw.

Extensions

Made of wood or metal, table top extensions installed behind and to both sides of the machine can make the cutting of large sheets of plywood and long stock safer and more efficient.

In most cases a space must be provided between extension and saw top for adjusting the basket guard and allowing scrap to fall clear.

Blades

Table saw blades are basically similar to those for circular saws. The teeth on carbide-tipped, hollow-ground, and taper blades do not need setting.

Blade Adjustment

Proper adjustment of cutting depth holds blade friction to a minimum, removes sawdust from the cut, and results in cool cutting.

Sharp blades with properly set teeth will keep the work from binding and the blade from overheating and kicking back.

The blade should project the depth of one full tooth above the material to be cut. When using carbide-tipped blades or miter blades only half a tooth should project above the material.

Blade Speed

The right cutting speed is important. The blade should turn at the correct rpm to yield the recommended cutting speed.

When not in motion, saw blades, especially large blades, are usually not perfectly flat because of internal tensions. At the right operating speeds, however, the blades straighten out as a result of centrifugal force and cut smoothly at full capacity.

Blades running too fast or too slow tend to start wobbling either before or during a cut. If cutting continues, the blade will overheat and may cause kickback, damage the equipment, and injure the operator.

Rip Fence

The rip fence is used mainly to guide the stock and maintain correct width of cut. The fence on small saws is usually clamped down at both the front and back of the table by pushing down a lever or turning a knob. Adjust the fence slightly wider at the back to let the wood spread out behind the cut and reduce the risk of kickback.

You can add a piece of hardwood to the rip fence in order to rip thin pieces of wood and make dadoes and rabbets. The auxiliary fence can be set close to the cutters without the risk of contact between the blade and the steel fence.

Pushsticks and Feather Boards

Narrow pieces can be cut safely and efficiently with the help of pushsticks, which should be painted or otherwise marked to prevent loss.

To rip narrow, short pieces, a push block is the right choice. The shoe holds the material down on the table while the heel moves the stock forward and keeps it from kicking back.

Different designs of pushsticks are required for cutting different kinds of stock.

The heel of the pushstick should be deep enough to prevent it from slipping and strong enough to feed the stock through the saw.

You can also use one or two feather boards to rip narrow stock safely. A feather board clamped immediately in front of the saw blade will provide side pressure to the stock without causing binding and kickback. Use a push block to feed stock all the way through.

Operation

- Follow basic saw safety.
- Keep the floor around the saw clear of scrap and sawdust to prevent slipping and tripping.
- Always stop the machine before making adjustments. Before making major adjustments, always disconnect the main power supply.
- Select a sharp blade suitable for the job.
- Use the safety devices such as pushsticks and feather boards.
- Make sure nobody stands in line with a revolving blade.
- Don't let anyone or anything distract you when you are operating the saw.
- Whenever possible, keep your fingers folded in a fist rather than extended as you feed work into the saw.
- Never reach around, over, or behind a running blade to control the stock.
- Follow the manufacturer's recommendations in matching the motor size to the saw. Underpowered saws can be unsafe.
- Table saws should be properly grounded. Check the power supply for ground and always use a ground fault circuit interrupter. This is mandatory for saws used outdoors or in wet locations.
- Table saws should be equipped with an on-off switch so power can be shut off quickly in an emergency.
- A magnetic starter switch is preferable to a mechanical toggle because it prevents the saw from starting up again unexpectedly after an interruption in power.
- When purchasing a new table saw, try to get one equipped with an electric brake. The brake stops blade rotation within seconds of the operator turning off the saw. The reduced risk of injury is worth the extra cost.
- Extension cords should be of sufficient wire gauge for the voltage and amperage required by the saw and for the length of the run.

13.4.4 Pneumatic Tools

- Eye protection is required, and head and face protection is recommended for employees working with pneumatic tools.
- Screens must also be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.
- Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected.
- All pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed, which operate at more than 100 p.s.i. pressure at the tool shall have a safety device on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in contact with the work surface.
- Compressed air shall not be used for cleaning purposes except where reduced to less than 30 p.s.i. and then only with effective chip guarding and appropriate personal protective equipment. The 30 p.s.i. requirement does not apply for concrete form, mill scale and similar cleaning purposes.
- Compressed air guns should never be pointed toward anyone. Workers should never “dead-end” them against themselves or anyone else. A chip guard must be used when compressed air is used for cleaning.
- The manufacturer’s safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded.
- Replace worn-out absorption pads and springs. Too much vibration of the tool can damage nerves in fingers, hands, and other body parts. This is called “white finger disease” or Raynaud’s Syndrome.
- Some tools have a high decibel rating – for instance, jack hammers and impact drills. To prevent hearing loss, always wear hearing protection.
- Never tamper with safety devices.
- Keep hands away from discharge area – on nailers in particular.
- Match the speed rating of saw blades, grinding wheels, cut-off wheels, etc. to tool speed. Too fast or too slow a rotation can damage the wheels, release fragments, and injure workers.
- Never use air to blow dust or dirt out of work clothes. Compressed air can enter the skin and bloodstream with deadly results.
- Turn off the pressure to hoses when the system is not in use.
- Turn off the air pressure when changing pneumatic tools or attachments.
- Most air-powered tools need very little maintenance. At the end of the shift, put a teaspoon of oil in the air inlet and run the tool for a second or two to protect against rust.
- Dust, moist air, and corrosive fumes can damage the equipment. An inline regulator filter and lubricator will extend tool life.

Hand & Power Tools

- Before start-up, check the couplings and fittings, blow out the hose to remove moisture and dirt, and clean the nipple before connecting the tool. Set the air pressure according to the manufacturer's specifications and open gradually.
- Compressed air can be dangerous.
- Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.

Air-powered tools include:

- | | | |
|--------------------|-------------------|----------------|
| • jack hammers | • staplers | • air nozzles |
| • chipping hammers | • framing nailers | • saws |
| • drills | • wrenches | • buffers |
| • grinders | • brad nailers | • impact tools |
| • sanders | • winches | • sprayers |

13.4.4.1 Airhose

Hose and hose connections used for conducting compressed air to utilization equipment shall be designed for the pressure and service to which they are subjected.

The use of hoses for hoisting or lowering tools shall not be permitted.

All hoses exceeding ½-inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.

Make sure hoses are clear of traffic and pose no tripping hazards.

Never “kink” a hose to stop air flow.

Hazards

Air embolism: This is the most serious hazard, since it can lead to death. If compressed air from a hose or nozzle enters even a tiny cut on the skin, it can form a bubble in the bloodstream – with possible fatal results.

Physical damage: Compressed air directed at the body can easily cause injuries – including damage to eyes and ear drums.

Flying particles: Compressed air at only 40 pounds per square inch can accelerate debris to well over 70 miles per hour when it is used to blow off dust, metal shavings, or wood chips. These particles then carry enough force to penetrate the skin.

WARNING: Make sure that air pressure is set at a suitable level for the tool or equipment being used. Before changing or adjusting pneumatic tools, turn off air pressure.

13.4.4.2 Abrasive Blast Cleaning Nozzles

The blast cleaning nozzles shall be equipped with an operating valve which must be held open manually. A support shall be provided on which the nozzle may be mounted when it is not in use.

13.4.4.3 Airless Spray Guns

Airless spray guns of the type which atomize paints and fluids at high pressures (1,000 pounds or more per square inch) shall be equipped with automatic or visible manual safety devices which will prevent pulling of the trigger to prevent release of the paint or fluid until the safety device is manually released.

In lieu of the above, a diffuser nut which will prevent high pressure, high velocity release, while the nozzle tip is removed, plus a nozzle tip guard which will prevent the tip from coming into contact with the operator, or other equivalent protection, shall be provided.

13.4.4.4 Jackhammers

Use of heavy jackhammers can cause fatigue and strains. Heavy rubber grips reduce these effects by providing a secure handhold. Workers operating a jackhammer must wear safety glasses and safety shoes that protect them against injury if the jackhammer slips or falls. A face shield also should be used.

Working with noisy tools such as jackhammers requires proper, effective use of appropriate hearing protection.

13.4.5 Fuel-Powered Tools

All fuel powered tools shall be stopped while being refueled, serviced, or maintained, and fuel shall be transported, handled, and stored in accordance with OSHA regulations.

When fuel powered tools are used in enclosed spaces, OSHA requirements for concentrations of toxic gases and use of personal protective equipment, shall apply.

13.4.5.1 Chainsaws

Each year in The United States, construction workers are injured while using chainsaws. Generally the injuries result from two types of accidents:

- The operator makes accidental contact with the revolving chain
- The operator is struck by the object being cut, usually a tree or heavy limb.

Many of these injuries are serious. While the chainsaw is relatively easy to operate, it can be lethal. As with all high-speed cutting tools, it demands the full attention of even the trained and experienced operator.

Requirements

Chainsaws can be powered by electric motors or gasoline engines. Both saws are designed to provide fast cutting action with a minimum of binding in the cut, even though wood may be sap-filled or wet. Both afford about the same performance in terms of horsepower and they are equipped with similar controls and safety devices.

Regulations require that chainsaws used in construction must be equipped with a chain brake. Make sure that the saw is equipped with a chain brake mechanism, and not simply a hand guard, which is similar in appearance.

Regulations also require that chainsaws used in construction must be equipped with “anti-kickback” chains. These chains incorporate design features intended to minimize kickback while maintaining cutting performance

Protective Clothing & Equipment

- Eye protection in the form of plastic goggles is recommended. A faceshield attached to the hard hat will not provide the total eye protection of close-fitting goggles.
- Leather gloves offer a good grip on the saw, protect the hands, and absorb some vibration. Gloves with ballistic nylon reinforcement on the back of the hand are recommended.
- Since most chainsaws develop a high decibel rating (between 95 and 115 dBA depending on age and condition), adequate hearing protection must be worn, especially during prolonged exposure.
- Trousers or chaps with sewn-in ballistic nylon pads provide excellent protection, particularly for the worker who regularly uses a chainsaw.

Kickback

Kickback describes the violent motion of the saw that can result when a rotating chain is unexpectedly interrupted.

The cutting chain’s forward movement is halted and energy is transferred to the saw, throwing it back from the cut toward the operator.

The most common and probably most violent kickback occurs when contact is made in the “kickback zone”.

Contact in this zone makes the chain bunch up and try to climb out of the track. This most often happens when the saw tip makes contact with something beyond the cutting area such as a tree branch, log, or the ground.

To minimize the risk of kickback:

- use a low-profile safety chain;
- run the saw at high rpm when cutting;
- sharpen the chain to correct specifications;
- set depth gauges to manufacturers’ settings;
- maintain correct chain tension;
- hold the saw securely with both hands;
- don’t operate the saw when you are tired;
- know where the bar tip is at all times;
- don’t allow the cut to close on the saw; and
- make sure the chain brake is functioning.

Starting

When starting, hold the saw firmly on the ground or other level support with the chain pointing away from your body and nearby obstructions. Use a quick, sharp motion on the starter pull. Never “drop start” the saw.

This leaves only one hand to control a running saw and has resulted in leg cuts. Use the proper grip.

Site Hazards

- Take extra care when making pocket cuts. Start the cut with the underside of the chain tip, then work the saw down and back to avoid contact with the kickback zone. Consider an alternative such as a saber saw.
- Be particularly careful to avoid contact with nails, piping, and other metallic objects. This is especially important when making a pocket cut through framing lumber such as a subfloor or when cutting used lumber such as trench shoring, lagging, or blocking timbers.
- Use chainsaws to cut wood only. They are not designed to cut other materials.

When using a chainsaw to trim rafter ends, take the following steps to avoid injury:

- Cut down from the top of the rafter. Don't cut from underneath.
- Use a harness, lanyard, and lifeline to prevent falls or work from a secure scaffold at eaves level.
- The extension cord on an electric chainsaw should be secured on the roof above the operator with enough working slack. This will prevent the weight of a long cord from pulling the operator off balance.
- Keep both hands firmly on the saw.

Maintenance

Well-maintained cutting components are essential for safe operation. A dull or improperly filed chain will increase the risk of kickback.

- Inspect and maintain your saw according to the manufacturer's recommendations regarding chain tension, wear, replacement, etc. Check for excessive chain wear and replace chain when required. Worn chains may break!
- Select the proper size files for sharpening the chain.

Two files are necessary:

- Flat: for adjusting depth gauge
- Round: for sharpening cutters and maintaining drive links.

You must choose the correct round file for your chain to avoid damaging the cutters. Consult the owner's manual or the supplier to be sure of file size.

A round file used in combination with a file holder or a precision filing guide will give the best results.

Adjusting Chain Tension

- Follow the manufacturer's instructions on chain tension. In general, the chain should move easily around the bar by hand without showing noticeable sag at the bottom.
- Be generous with chain lubricating oil. It is almost impossible to use too much. Most late model saws have automatic oilers. But operators must still remember to fill the chain-oil reservoir.

13.4.5.2 Quick-Cut Saws

Hand-held portable circular cut-off saws are commonly known as "quick-cut saws" in construction. They are widely used for cutting concrete, masonry products, sheet metal products (both steel and aluminum), and light steel sections such as angles and channels.

Hazards

Quick-cut saws are high-powered compared to similar tools. Hazards include high-speed blade rotation, blade exposure during operation, and exhaust from the internal combustion engine (the usual power source).

The saws also create clouds of dust when dry-cutting masonry and showers of hot sparks when cutting metal products, especially steel.

These hazards can result in cuts, kickbacks, exposure to carbon monoxide fumes, exposure to dusts (silica from concrete and masonry products in particular), burns, flying particles hitting the eye, and other injuries from flying material when work is not secured for cutting or when blades fly apart.

These hazards can be controlled by:

- Using quick-cut saws properly and wearing the right protective equipment such as eye, hearing, and respiratory protection as well as face shields and gloves
- Keeping saws in good working condition, equipped with proper blades or disks, and used with all guards in place
- Securing work to keep it from shifting during cutting
- Being cautious around sharp edges left by cuts

Training

Instruct workers in the care, maintenance, and operation of quick-cut saws. Read and understand the operating manual, review the major points.

The operating manual should be available on the job, not only for instruction but for ready reference if something goes wrong with the saw or it must be used for work outside the operator's experience.

Time spent on instruction will reduce accidents and injuries as well as prolong the service life of the saw.

As a minimum you should know:

- care of the saw;
- installing disks and blades;
- mixing fuel and fueling the saw;
- starting the saw;
- supporting and securing work to be cut;
- proper cutting stance and grip;
- proper cutting techniques for different material;
- respiratory protection against dusts; and
- how to inspect and store abrasive disks.

Care

Quick-cut saws must be serviced and maintained in accordance with the manufacturers' instructions.

Replacement parts should be those recommended by the manufacturer.

Cracked, broken, or worn parts should be replaced before the saw is used again. Guards and air-intakes should be cleaned regularly and often. Abrasive disks should be checked before installation and frequently during use. Correct any excessive blade vibration before trying to make a cut.

In confined areas, make sure that ventilation is adequate. Gasoline-driven saws release carbon monoxide gas — odorless, colorless, and highly toxic.

Starting

Most of the following procedures are for gasoline-powered quick-cut saws:

- Use caution when preparing the oil/gasoline mixture and when fuelling the saw. No smoking or ignition sources should be allowed in the area where fuel is mixed or tanks are filled.
- Fill the tank outdoors in a well-ventilated space at least 10 feet from the area where the saw will be used. Spilled fuel should be wiped off the saw.
- Avoid fuelling the saw on or near formwork. Gasoline spills are a fire hazard. Use a funnel to avoid spills.
- Do not overfill the saw or run it without securing the fuel tank cap. Gasoline seeping from the tank can saturate your clothing and be ignited by sparks thrown off from metal cutting. The only cap to use is one supplied by the manufacturer.
- Check the saw for leaks. Sometimes vibration makes gas lines leak.
- Start the saw in an area clear of people and obstacles. Under no circumstances should anyone be standing in front of the saw as it starts or while it's running.
- Put the saw on a smooth hard surface for starting.
- The guard should be properly set for the type of cut beforehand.

- Assume a solid well-balanced stance. Do not wrap the starter cord around your hand — this can cause injury.
- Set one foot on the rear handle, put one hand on the top handle to lift the blade off the surface, and use the other hand to pull the starter cord. Warning: Always shut off saw before fuelling. Keep fuel container clear of work area. Once the saw is running, release the throttle and make sure the engine drops to idle without the disk or blade moving.
- Run the engine at full throttle and let the disk or blade run freely to make sure it turns on the arbor without wobbling or vibrating.

Support

One of the major hazards with quick-cut saws is failure to support and secure the work to be cut.

The saw is powerful enough to throw material around unless it is securely held and supported. Standing on material to hold it down is not recommended.

For repeated cuts of masonry or metal pieces, a jig is ideal for efficiency and safety. The jig should be designed and built to hold material in place after measurement without further manual contact.

Stance and Grip

The quick-cut saw is a heavy, powerful tool that must be held by hand.

Operators need a secure stance with legs apart for balance and support. The saw should be held at a comfortable, balanced location in front of you.

Grip the saw firmly with one hand on each handle. Hold your forward arm straight to keep the saw from kicking back or climbing out of the cut.

Cutting

Although skill in handling the quick-cut saw can only be learned through practice, some safety considerations and operating techniques must always be kept in mind, even by the most experienced operators.

Work should be supported so that the disk or blade will not bind in the cut. Support heavy materials on both sides of the cut so the cut piece will not drop or roll onto the operator's foot. Light materials can generally be allowed to fall. In all cases the cut should be as close as possible to the supporting surface.

Kickback and Pull-In

Kickback can happen extremely fast and with tremendous power. If a segment of the disk or blade contacts the work, the disk or blade starts to climb out of the cut and can throw the saw up and back toward you with great force.

- For cutting, keep the throttle wide open. Ease the blade down onto the cut line. Don't drop or jam the blade down hard. Move the saw slowly back and forth in the cut.
- Hold the saw so that disk or blade is at right angles to the work and use only the cutting edge of the disk or blade. Never use the side of a disk for cutting. A worn disk will almost certainly shatter and may cause severe injury.
- Beware of blade run-on. The blade may continue to rotate after the cut and run away with a saw set down too soon.
- Don't force the saw to one side of the cut. This will bend the disk or blade and cause it to bind, possibly to break.
- Water cooling is recommended for cutting masonry materials. It prolongs disk life and reduces dust exposure.
- Keep pressure on the saw reasonably light. Although more pressure may be necessary for hard materials, it can cause an abrasive disk to chip or go "out of round."
- An "out of round" disk will make the saw vibrate. If lowering the feed pressure does not stop vibration, replace the disk.
- Don't carry the saw any distance with the engine running. Stop the engine and carry the saw with the muffler away from you.

To avoid kickback, take the following steps:

- Secure and support the material at a comfortable position for cutting. Make sure that material will not move, shift, or pinch the blade or disk during cutting.
- Keep steady balance and solid footing when making a cut.
- Do not support the work on or against your foot or leg.
- Use both hands to control the saw. Maintain a firm grip with thumb and fingers encircling the handles.
- Never let the upper quarter segment of blade or disk contact the material.
- Run the saw at full throttle.
- Do not cut above chest height.
- When re-entering a cut, do so without causing blade or disk to pinch. Pull-in occurs when the lower part of the disk or blade is stopped suddenly – for instance, by a cut closing up and binding. The saw pitches forward and can pull you off balance.

Protective Equipment

In addition to the standard equipment mandatory on construction sites, operators of quick-cut saws should wear snug-fitting clothing, hearing protection, eye and face protection, and heavy-duty leather gloves.

The dry cutting of masonry or concrete products calls for respiratory protection as well. See the chapter on Personal Protective Equipment.

For general dust hazards, a half-mask cartridge respirator with NIOSH-approval for dust, mist, and fumes should provide adequate protection when properly fitted and worn by a clean-shaven person.

Disks and Blades

Disks and blades are available in three basic types:

- abrasive disks
- diamond-tipped blades
- carbide-tipped blades

Use only the disks and blades compatible with the saw and rated for its maximum rpm. Blades or disks may fly apart if their rpm is not matched to saw rpm. If you have any doubts, consult the operating manual or a reputable supplier.

Abrasive Disks —Types and Uses

Type	Uses	Materials
Concrete	All-around use, most economical for cutting concrete and masonry. Water-cooling recommended to increase disk life and to reduce dust.	Concrete, stone, masonry products, cast iron, aluminum, copper, brass, cables, hard rubber, plastics
Metal	Primarily for steel, not suited for masonry products. Water-cooling is not recommended with metal abrasive disks	Steel, steel alloys, other hard metals such as cast iron

Diamond Disks and Blades — Types and Uses

Diamond disks are normally used with water cooling. They are now available for dry cutting, which may be necessary to avoid staining some masonry products.

When dry-cutting with a diamond blade, let the blade cool for 10-15 seconds every 40-60 seconds. This can be done simply by pulling the saw out of the cut.

Type	Uses	Materials
Diamond Abrasive Disk	Cuts faster than other abrasive disks and creates less dust. Water-cooling is absolutely necessary to prevent heat build-up that can make disk disintegrate.	Stone, all masonry and concrete products. Not recommended for metal
Dry-Cut Diamond Blade	Fast cuts, lots of dust, very expensive. Let blade cool for 10-15 seconds every 40-60 seconds. Continuous cutting will damage the blade.	Stone, all masonry and concrete products. Not recommended for metal.

Carbide-Tipped Blades

These blades must be used with care. If a carbide-tipped blade encounters material harder than what it is designed to cut, the tips may fly off.

A carbide-tipped blade used with a quick-cut saw must be designed for that purpose. It must also be used only to cut the materials specified by the manufacturer.

Inspection / Installation

- Inspect disks and blades before installing them.
- Make sure that contact surfaces are flat, run true on the arbor, and are free of foreign material.
- Check that flanges are the correct size and not warped or sprung. Check the label to make sure that the disk or blade is approved for use on high-speed quick-cut saws and has a rated rpm suitable to the saw being used. A periodic service check may be necessary to ensure that the rpm still meets the manufacturer's requirement.
- Inspect the disk or blade for damage. Abrasive disks tapped lightly with a piece of wood should ring true. If the sound is dull or flat, the disk is damaged and should be discarded.
- Make sure that diamond or carbide tips are all in place. Do not use diamond or carbide-tipped blades or disks if any tips are missing.
- Do not drop abrasive disks. Discard any disk that has been dropped.
- Use the proper bushing on the arbor so that the disk runs true on the shaft without wobbling or vibrating.
- Discard badly worn disks that are uneven or "out of round."

13.4.5.3 Power Lawnmowers

Power lawnmowers of the walk-behind, riding-rotary, and reel power lawnmowers shall be guarded in accordance with the machine guarding requirements in 29 CFR 1910.212, General requirements for all machines.

All power-driven chains, belts, and gears shall be so positioned or otherwise guarded to prevent the operator's accidental contact therewith, during normal starting, mounting, and operation of the machine.

A shutoff device shall be provided to stop operation of the motor or engine. This device shall require manual and intentional reactivation to restart the motor or engine.

All positions of the operating controls shall be clearly identified.

The words, "Caution. Be sure the operating control(s) is in neutral before starting the engine," or similar wording shall be clearly visible at an engine starting control point on self-propelled mowers.

Walk-Behind & Riding Rotary Mowers

The mower blade shall be enclosed except on the bottom and the enclosure shall extend to or below the lowest cutting point of the blade in the lowest blade position.

Guards which must be removed to install a catcher assembly shall comply with the following:

Warning instructions shall be affixed to the mower near the opening stating that the mower shall not be used without either the catcher assembly or the guard in place.

The catcher assembly or the guard shall be shipped and sold as part of the mower.

The instruction manual shall state that the mower shall not be used without either the catcher assembly or the guard in place.

The catcher assembly, when properly and completely installed, shall not create a condition which violates the limits given for the guarded opening.

Openings in the blade enclosure, intended for the discharge of grass, shall be limited to a maximum vertical angle of the opening of 30 deg. Measurements shall be taken from the lowest blade position.

The total effective opening area of the grass discharge opening(s) shall not exceed 1,000 square degrees on units having a width of cut less than 27½ inches, or 2,000 square degrees on units having a width of cut 27½ inches or over.

The word "Caution." or stronger wording, shall be placed on the mower at or near each discharge opening.

Blade(s) shall stop rotating from the manufacturer's specified maximum speed within 15 seconds after declutching, or shutting off power.

In a multi-piece blade, the means of fastening the cutting members to the body of the blade or disc shall be so designed that they will not become worn to a hazardous condition before the cutting members themselves are worn beyond use.

The maximum tip speed of any blade shall be 19,000 feet per minute.

Walk-Behind Rotary Mowers

The horizontal angle of the opening(s) in the blade enclosure, intended for the discharge of grass, shall not contact the operator area.

There shall be one of the following at all openings in the blade enclosure intended for the discharge of grass:

- A minimum unobstructed horizontal distance of 3 inches from the end of the discharge chute to the blade tip circle.
- A rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools. The bottom of the bar shall be no higher than the bottom edge of the blade enclosure.

The highest point(s) of the front of the blade enclosure, except discharge openings, shall be such that any line extending a maximum of 15 deg. downward from the horizontal toward the blade shaft axis (axes) shall not intersect the horizontal plane within the blade tip circle. The highest point(s) on the blade enclosure front, except discharge-openings, shall not exceed 1 ¼ inches above the lowest cutting point of the blade in the lowest blade position. Mowers with a swingover handle are to be considered as having no front in the blade enclosure and therefore shall comply with paragraph (e)(2)(i) of this section.

The mower handle shall be fastened to the mower so as to prevent loss of control by unintentional uncoupling while in operation.

A positive upstop or latch shall be provided for the mower handle in the normal operating position(s). The upstop shall not be subject to unintentional disengagement during normal operation of the mower. The upstop or latch shall not allow the center or the handle grips to come closer than 17 inches horizontally behind the closest path of the mower blade(s) unless manually disengaged.

A swing-over handle, which complies with the above requirements, will be permitted.

Wheel drive disengaging controls, except deadman controls, shall move opposite to the direction of the vehicle motion in order to disengage the drive. Deadman controls shall automatically interrupt power to a drive when the operator's actuating force is removed, and may operate in any direction to disengage the drive.

Riding Rotary Mowers

The highest point(s) of all openings in the blade enclosure, front shall be limited by a vertical angle of opening of 15 deg. and a maximum distance of 1¼inches above the lowest cutting point of the blade in the lowest blade position.

Hand & Power Tools

Opening(s) shall be placed so that grass or debris will not discharge directly toward any part of an operator seated in a normal operator position.

There shall be one of the following at all openings in the blade enclosure intended for the discharge of grass:

A minimum unobstructed horizontal distance of 6 inches from the end of the discharge chute to the blade tip circle.

A rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools. The bottom of the bar shall be no higher than the bottom edge of the blade enclosure.

Mowers shall be provided with stops to prevent jackknifing or locking of the steering mechanism.

Vehicle stopping means shall be provided.

Hand-operated wheel drive disengaging controls shall move opposite to the direction of vehicle motion in order to disengage the drive. Foot-operated wheel drive disengaging controls shall be depressed to disengage the drive. Deadman controls, both hand and foot operated, shall automatically interrupt power to a drive when the operator's actuating force is removed, and may operate in any direction to disengage the drive.

13.4.6 Hydraulic Tools

The fluid used in hydraulic powered tools shall be fire-resistant fluids approved under Schedule 30 of the U.S. Bureau of Mines, Department of the Interior, and shall retain its operating characteristics at the most extreme temperatures to which it will be exposed.

The manufacturer's safe operating pressures for hoses, valves, pipes, filters, and other fittings shall not be exceeded.

13.4.6.1 Jacks

Loading & Marking

The operator shall make sure that the jack used has a rating sufficient to lift and sustain the load.

The rated load shall be legibly and permanently marked in a prominent location on the jack by casting, stamping, or other suitable means.

All jacks shall have a positive stop to prevent overtravel.

Hydraulic jacks exposed to freezing temperatures shall be supplied with an adequate antifreeze liquid.

Operation & Maintenance

In the absence of a firm foundation, the base of the jack shall be blocked. If there is a possibility of slippage of the cap, a block shall be placed in between the cap and the load.

The operator shall watch the stop indicator, which shall be kept clean, in order to determine the limit of travel. The indicated limit shall not be overrun.

After the load has been raised, it shall be cribbed, blocked, or otherwise secured at once.

Hydraulic jacks exposed to freezing temperatures shall be supplied with an adequate antifreeze liquid.

All jacks shall be properly lubricated at regular intervals.

Each jack shall be thoroughly inspected at times which depend upon the service conditions. Inspections shall be not less frequent than the following:

- For constant or intermittent use at one locality, once every 6 months,
- For jacks sent out of shop for special work, when sent out and when returned,
- For a jack subjected to abnormal load or shock, immediately before and immediately thereafter.

Repair or replacement parts shall be examined for possible defects.

Jacks which are out of order shall be tagged accordingly, and shall not be used until repairs are made.

13.4.7 Powder-Actuated/Explosive-Actuated Tools

Explosive-actuated fastening tools that are actuated by explosives or any similar means, and propel a stud, pin, fastener, or other object for the purpose of affixing it by penetration to any other object shall meet OSHA design requirements. This requirement does not apply to devices designed for attaching objects to soft construction materials, such as wood, plaster, tar, dry wallboard, and the like, or to stud-welding equipment.

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

Operators and assistants using tools shall be safeguarded by means of eye protection. Head and face protection shall be used, as required by working conditions.

The tool shall be tested each day before loading to see that safety devices are in proper working condition. The method of testing shall be in accordance with the manufacturer's recommended procedure.

Any tool found not in proper working order, or that develops a defect during use, shall be immediately removed from service and not used until properly repaired.

Hand & Power Tools

Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any employees. Hands shall be kept clear of the open barrel end.

Loaded tools shall not be left unattended.

Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick, or hollow tile.

Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side.

No fastener shall be driven into a spalled area caused by an unsatisfactory fastening.

Fasteners should not be fired through pre-drilled holes for two reasons:

- Unless the fastener hits the hole accurately, it will probably shatter the edge.
- The fastener derives its holding power from compressing the material around it. A pre-drilled hole reduces this pressure and therefore the fastener's holding power. (This is why studs and pins driven into steel should penetrate completely through the metal. Otherwise the compressed steel trying to regain its original position can loosen the fastener by pushing against the point. With the tip completely through the metal the same pressure only works to squeeze the pin tighter.)

Firing explosive-actuated tools from ladders is not recommended. From a ladder it can be difficult to press the tool muzzle against the base material with enough pressure to fire. For tasks overhead or at heights, work from a scaffold or another approved work platform to ensure solid, balanced footing. As an alternative use a manufacturer's pole accessory if the reach is normal ceiling height (8-10 feet). The pole secures the tool and permits firing by the operator standing below.

Tools shall not be used in an explosive or flammable atmosphere.

All tools shall be used with the correct shield, guard, or attachment recommended by the manufacturer.

Powder-actuated tools used by employees shall meet all other applicable requirements of American National Standards Institute, A10.3-1970, Safety Requirements for Explosive-Actuated Fastening Tools.

13.4.7.1 Hazards

Flying Particles – This is the major hazard. On impact, materials may break up, blow apart, or spall off. This often happens when fasteners are fired too close to a corner of masonry or concrete or when they strike materials such as glazed tile, hollow tile, or thin marble tile.

Ricochets – These usually result when the tool is not held at right angles to the base material, or the fastener hits a particularly hard material such as stone or hardened steel. Always check the base material to ensure that it can safely accept the fastening device.

Noise – Powder-actuated tools create an extreme pulse of sound when fired. Operators and others in the area should wear hearing protection – especially when the tool is operated in a confined space.

Sprains and Strains – These injuries usually result from using the tool repeatedly in awkward, cramped, or unbalanced positions. You should try to work from a balanced position on a solid surface.

Explosions – There is always the risk of explosion or fire when the tools are used in atmospheres contaminated by flammable vapor, mist, or dust. The work area must be ventilated – mechanically if necessary.

Blow-Through – When the base material does not offer enough resistance, the fastener may pass completely through and fly out the other side. This is particularly dangerous when fasteners penetrate walls, floors, or ceilings where others may be working. If necessary, areas behind, around, and under material should be kept clear of people.

13.4.7.2 Types of Tools

High-Velocity Tools

High-velocity powder-actuated tools use the expanding gases from the exploding cartridge to propel the fastener. The gases push directly against the fastener. These tools are rarely used in construction, except in special cases to penetrate thick steel or very hard material — they are usually used in military, salvage, or underwater applications. No one should operate high velocity tools without special training.

The muzzle end of the tool shall have a protective shield or guard at least 3 ½ inches in diameter, mounted perpendicular to and concentric with the barrel, and designed to confine any flying fragments or particles that might otherwise create a hazard at the time of firing.

Where a standard shield or guard cannot be used, or where it does not cover all apparent avenues through which flying particles might escape, a special shield, guard, fixture, or jig designed and built by the manufacturer of the tool being used, which provides this degree of protection, shall be used as a substitute.

The tool shall be so designed that it cannot be fired unless it is equipped with a standard protective shield or guard, or a special shield, guard, fixture, or jig.

The firing mechanism shall be so designed that the tool cannot fire during loading or preparation to fire, or if the tool should be dropped while loaded.

Firing of the tool shall be dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.

The tool shall be so designed as not to be operable other than against a work surface, and unless the operator is holding the tool against the work surface with a force at least 5 pounds greater than the total weight of the tool.

Hand & Power Tools

The tool shall be so designed that positive means of varying the power are available or can be made available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force.

The tool shall be so designed that all breeching parts will be reasonably visible to allow a check for any foreign matter that may be present.

Low-Velocity-Piston Type

Most powder-actuated tools used in construction are low-velocity. The expanding gases from the exploding cartridge push against a piston which in turn drives the fastener into the base material.

Many different low-velocity tools are available, from single-shot models to semi-automatic models using multiple cartridges in strip or disk holders. Some tools are specific to one size of fastener or type of cartridge. Most can be fitted with various pistons, base plates, spall stops, and protective shields for different jobs.

The muzzle end of the tool shall be designed so that suitable protective shields, guards, jigs, or fixtures, designed and built by the manufacturer of the tool being used, can be mounted perpendicular to the barrel. A standard spall shield shall be supplied with each tool.

The tool shall be designed so that it shall not in ordinary usage propel or discharge a stud, pin, or fastener while loading or during preparation to fire, or if the tool should be dropped while loaded.

Firing of the tool shall be dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.

The tool shall be so designed as not to be operable other than against a work surface, and unless the operator is holding the tool against the work surface with a force at least 5 pounds greater than the total weight of the tool.

The tool shall be so designed that positive means of varying the power are available or can be made available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force.

The tool shall be so designed that all breeching parts will be reasonably visible to allow a check for any foreign matter that may be present.

Hammer-Operated Piston Tools

The muzzle end of the tool shall be so designed that suitable protective shields, guards, jigs, or fixtures, designed and built by the manufacturer of the tool being used, can be mounted perpendicular to the barrel. A standard spall shield shall be supplied with each tool.

The tool shall be so designed that it shall not in ordinary usage propel or discharge a stud, pin, or fastener while loading, or during preparation to fire, or if the tool should be dropped while loaded.

Firing of the tool shall be dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.

The tool shall be so designed that positive means of varying the power are available or can be made available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force.

The tool shall be so designed that all breeching parts will be reasonably visible to allow a check for any foreign matter that may be present.

13.4.7.3 Pistons

Specialized pistons are available for different fasteners. Such pistons are designed for the fastener and should not be used with other types. Misusing a tool with a specialized piston can result in under- or over-driven fasteners or fasteners leaving the barrel misaligned, leading to ricochets. Some general-purpose tools can take various types of pistons.

13.4.7.4 Fasteners

Fasteners used with powder-actuated tools are made of special steel to penetrate materials without breaking or bending. Never use any kind of substitute for a properly manufactured fastener.

Generally pins and studs should not be used on hard, brittle, or glazed materials such as cast iron, marble, tiles, and most stone. The fastener will either fail to penetrate and ricochet or the base material will shatter.

Materials whose hardness or ductility is unknown should be tested first. Try to drive a pin into the material with a normal hammer. If the pin point is blunted or fails to penetrate at least $\frac{1}{16}$ ", a powder-actuated tool should not be used.

Fasteners are invariably fitted with a plastic guide device. Its purpose is twofold. When the fastener is inserted into the barrel the guide keeps the fastener from dropping out. It also aligns the fastener inside the barrel so it will penetrate the base material at right angles.

Fasteners used in tools shall be only those specifically manufactured for use in such tools.

Pins

Pins are fasteners designed to attach one material to another, such as wood to concrete. They resemble nails, but there the similarity stops. Ordinary nails cannot be used as fasteners in powder-actuated tools.

Head diameters for pins are available between ¼" and ¾". Lengths vary from ½" to 3". Washers of various types and diameters are available for different applications.

Pins should be selected for appropriate length, head size, and application. As a general rule, pins need not be driven into concrete more than 1". Using a longer pin is generally unnecessary and also requires a stronger cartridge.

Follow the manufacturer's directions on length, penetration, and appropriate material. For example, one cut-nail fastener is available for fastening drywall to relatively soft base materials, but is recommended for virtually no other application. Testing may be necessary on some masonry materials that vary widely in hardness and durability.

Studs

Studs are fasteners consisting of a shank which is driven into the base material and an exposed portion to which a fitting or other object can be attached. The exposed portion may be threaded for attachments made with a nut.

Studs are also available in an eye-pin configuration for running wire through the eye.

Clip Assemblies

Fastening to the base material is done by a pin, but the pin is attached to a clip assembly configured to secure a uniquely shaped item. Clip assemblies are available, for instance, to hold conduit. One ceiling configuration comes with pre-tied 12 gauge wire.

13.4.7.5 Cartridges

There shall be a standard means of identifying the power levels of loads used in tools.

No load (cased or caseless) shall be used if it will accurately chamber in any existing approved commercially available low-velocity piston tool or hammer operated piston tool - low-velocity type and will cause a fastener to have a mean velocity in excess of 300 feet per second when measured 6.5 feet from the muzzle end of the barrel. No individual test firing of a series shall exceed 300 feet per second by more than 8 percent.

Manufacturers recommend certain cartridges for certain applications. Because recommendations cannot cover every possibility, testing may be required with unfamiliar base materials.

Cartridges come in .22, .25, and .27 caliber sizes. Larger calibers hold more powder which drives the fastener further – or into harder base materials. In addition, all three calibers are available with different levels of powder charge. For some tools there may be as many as six different powder charges available. Some manufacturers produce tools that use a long-case version of the .22- caliber cartridge. It is critical that you understand cartridge selection and cartridge identification systems.

COLOR	NUMBER	CARTRIDGE POWER
Grey	1	Lowest
Brown	2	
Green	3	
Yellow	4	
Red	5	
Purple	6	Highest

Shots may be packaged/loaded as single cartridges, strips of ten in a plastic holder, or a round disk holding ten cartridges. The tool model will determine the caliber and how the tool is to be loaded.

Number identifications are printed on the outside of cartridge packages. Cartridge tips are color-dipped for identification. Some strip cartridges are held in a plastic strip the same color as the cartridge tips.

The general rule is to start with the weakest cartridge and increase one cartridge color/load number at a time to reach the penetration required. Too strong a charge may cause shattering, ricochets, or blow-through. Too weak a cartridge will keep the fastener from seating itself properly.

Tool Power Controls

Many tools feature a “power control” device. This allows an operator to make a tool adjustment so that either all or only part of the available cartridge power is used. Power controls may ultimately let manufacturers market only one cartridge in each caliber.

The goal would be to handle every application which the caliber is capable of performing with one cartridge, power-controlled to the appropriate driving force needed.

13.4.7.6 Operating Requirements.

Before using a tool, the operator shall inspect it to determine to his satisfaction that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.

When a tool develops a defect during use, the operator shall immediately cease to use it, until it is properly repaired.

Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any workmen.

No tools shall be loaded unless being prepared for immediate use, nor shall an unattended tool be left loaded.

In case of a misfire, the operator shall hold the tool in the operating position for at least 30 seconds. He shall then try to operate the tool a second time. He shall wait another 30 seconds, holding the tool in the operating position; then he shall proceed to remove the explosive load in strict accordance with the manufacturer’s instructions.

Hand & Power Tools

A tool shall never be left unattended in a place where it would be available to unauthorized persons.

Tools shall not be used in an explosive or flammable atmosphere.

All tools shall be used with the correct shield, guard, or attachment recommended by the manufacturer.

Any tool found not in proper working order shall be immediately removed from service. The tool shall be inspected at regular intervals and shall be repaired in accordance with the manufacturer's specifications.

Driving Fasteners

Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick, or hollow tile.

Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying-missile hazard on the other side.

Fasteners shall not be driven directly into materials such as brick or concrete closer than 3 inches from the unsupported edge or corner, or into steel surfaces closer than one-half inch from the unsupported edge or corner, unless a special guard, fixture, or jig is used. (Exception: Low-velocity tools may drive no closer than 2 inches from an edge in concrete or one-fourth inch in steel.)

When fastening other materials, such as a 2- by 4-inch wood section to a concrete surface, it is permissible to drive a fastener of no greater than $\frac{7}{32}$ -inch shank diameter not closer than 2 inches from the unsupported edge or corner of the work surface.

Fasteners shall not be driven through existing holes unless a positive guide is used to secure accurate alignment.

No fastener shall be driven into a spalled area caused by an unsatisfactory fastening.

Fastening Steel

Low-velocity powder-actuated tools should not be used on hardened steels, tool steels, or spring steels. Where the grade of steel is unknown, test by trying to hammer the fastener in. If the pin is blunted, bent, or fails to enter at least $\frac{1}{16}$ " , do not use a low-velocity powder actuated tool – it's not up to the job.

Don't try to fire a fastener any closer than $\frac{1}{2}$ " to the free edge of steel. Keep in mind that this applies only to steel. When fastening steel to concrete, you must consider the allowable margin for concrete as well: $2\frac{1}{2}$ ".

When fastening two pieces of thin sheet steel to a base material, hold the sheets together. Gaps caused by bending may lead to ricochets.

Special spall stops or protective shields are required for applications such as fastening sheet metal to masonry or sheet metal to structural steel. Consult the operating manual or the manufacturer to ensure that the right components are being used for the job.

Fastening Concrete and Masonry

Concrete and masonry materials are not always uniform in consistency or hardness. As a result, they may spall, chip, or cause a ricochet when the fastener strikes a spot or layer harder than the rest. Use the spall guard recommended by the manufacturer.

Once material is spalled or left with a ricochet hole, do not fire a second pin any closer than 2" to the damaged area. The area may be weakened and spall further or cause a ricochet off its sloped edge.

Pins tend to cause breaks near the edges of concrete and masonry. Don't drive pins closer than 2½" to a free edge.

Misfires

With misfired cartridges, follow the procedures stated in the operating manual for the tool you are using. Because of the wide variety of tools available, procedures for misfires may differ.

When such information is not available, take the following steps:

- Continue to hold the tool against the base material for at least 30 seconds. This protects against a delayed discharge of the cartridge.
- Remove the cartridge from the tool. During removal keep the tool pointed safely toward soft material such as wood. Never use any kind of prying device to extract the cartridge from the chamber. If the cartridge is wedged or stuck, tag the tool "DEFECTIVE and LOADED" and lock it in its storage container. Never try to dismantle a tool with a cartridge stuck or wedged in it. Again, tag it "DEFECTIVE and LOADED," lock it away, and call the manufacturer's representative for help.
- Place misfired cartridges in a container of water.
- Keep the misfired cartridge separate from unused cartridges and return it to the manufacturer for disposal. Never throw misfired cartridges in the garbage.
- Be cautious. The problem may be a misfired cartridge, but the tool may also be defective. Check the tool for obvious damage, perform function tests, and use the tool only if it operates properly.

Maintenance

- Tools in regular use should be cleaned daily. Tools used intermittently should be cleaned after firing.
- All parts of the tool exposed to detonation gases from the cartridge should be cleaned and lightly oiled according to the manufacturer's instructions. The cartridge magazine port, cartridge chamber, and piston sleeve should be wiped clean but never be oiled.
- The tool brush supplied is adequate for most fouling.

- Stubborn carbon should be loosened with a manufacturer's spray detergent oil. Tools being checked for immediate use should be wiped dry of oil.
- Failure to clean the tool as recommended can lead to corrosion, pitting, fouling, and failure to work properly. Ideally, the tool should be cleaned before being returned to storage.
- Tools with a power control adjustment will accumulate additional powder residue from firing—especially when the control is set to restrict the amount of cartridge strength being used. Semi-automatic tools may also accumulate powder residue. These tools need to be cleaned more often.
- Sluggish performance may indicate that a tool needs cleaning. Tool action will slow to the point where a competent operator can detect the difference. Most manufacturers recommend major maintenance, inspection, and cleaning every six months. This involves stripping, inspecting, and cleaning parts not covered in daily maintenance.

Storage

Regulations require that both the tool and the cartridges be stored in a locked container with explosive loads of different strengths in separate containers. Cartridges should only be removed from the locked container when they are going to be used immediately.

The tool must require two separate actions before it will fire:

- pressure against the surface of the material
- action of the trigger.
- Explosive-actuated tools must be stored in a locked container when not in use or when left unattended.
- The tool must not be loaded until ready for immediate use.
- Whether loaded or unloaded, the tool must never be pointed at anyone.
- Cartridges must be marked or labeled for easy identification. Cartridges of different strengths must be stored in separate containers.
- Misfired cartridges must be placed in a container of water and be removed from the project.

13.4.8 Abrasive Wheel Tools

13.4.8.1 Portable Abrasive Wheel Safety Guards

Abrasive wheels shall be used only on machine provided with appropriate safety guards.

Exceptions are made for the following:

- Wheels used for internal work while within the work being ground
- Mounted wheels used in portable operations 2 inches and smaller in diameter
- Types 16, 17, 18, 18R, and 19 cones, and plugs, and threaded hole pot balls where the work offers protection.

A safety guard shall cover the spindle end, nut and flange projections. The safety guard shall be mounted so as to maintain proper alignment with the wheel, and the strength of the fastenings shall exceed the strength of the guard. The spindle end, nut, and outer flange may be exposed on portable machines designed for, and used with, type 6, 11, 27, and 28 abrasive wheels, cutting off wheels, and tuck pointing wheels.

Cup Wheels (Types 6 and 11)

Cup wheels (Types 6 and 11) shall be protected by:

- Safety guards as specified above; or,
- Special "revolving cup guards" which mount behind the wheel and turn with it. They shall be made of steel or other material with adequate strength and shall enclose the wheel sides upward from the back for one-third of the wheel thickness. The mounting features shall conform with all regulations. It is necessary to maintain clearance between the wheel side and the guard. The clearance shall not exceed one-sixteenth inch; or,
- Some other form of guard that will ensure as good protection as that which would be provided by the guards above.

Vertical Portable Grinders

Safety guards used on machines known as right angle head or vertical portable grinders shall have a maximum exposure angle of 180 deg., and the guard shall be so located so as to be between the operator and the wheel during use. Adjustment of guard shall be such that pieces of an accidentally broken wheel will be deflected away from the operator.

Other Portable Grinders

The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on other portable grinding machines shall not exceed 180 deg. and the top half of the wheel shall be enclosed at all times.

13.4.8.2 Abrasive Wheel Tool Mounting and Inspection

Immediately before mounting, all wheels shall be closely inspected and sounded by the user. The wheel must be tapped gently with a light nonmetallic implement, such as the handle of a screwdriver for light wheels, or a wooden mallet for heavier wheels. If they sound cracked (dead), they shall not be used. This is known as the "Ring Test".

The spindle speed of the machine shall be checked before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel.

Grinding wheels shall fit freely on the spindle and remain free under all grinding conditions. A controlled clearance between the wheel hole and the machine spindle (or wheel sleeves or adaptors) is essential to avoid excessive pressure from mounting and spindle expansion. To accomplish this, the machine spindle shall be made to nominal (standard) size plus zero minus .002 inch, and the wheel hole shall be made suitably oversize to assure safety clearance under the conditions of operating heat and pressure.

All contact surfaces of wheels, blotters, and flangers shall be flat and free of foreign matter.

When a bushing is used in the wheel hole it shall not exceed the width of the wheel and shall not contact the flanges.

Flanges and Blotters must be used in accordance with OSHA machine guarding regulations.

13.5 *Forms & Attachments*

On the following pages, please find the following document(s):

- Hand & Power Tools Safety Training Documentation

14 Hazardous Energy Control (Lockout/Tagout)

14.1 Policy Statement

Pyro Combustion & Controls Inc. is committed to taking every precaution to ensure the safety and health of all employees and to comply with all applicable regulatory requirements, laws and industry best practices in the effort to provide an accident-free, injury-free and illness-free workplace.

Accordingly, *Pyro Combustion & Controls Inc.* has adopted this Hazardous Energy Control program to establish engineering controls and work practices to prevent the unintentional release of hazardous energy during maintenance and servicing of machinery and equipment.

14.2 Responsibilities

Preventing the unintentional release of potentially harmful energy in the workplace, especially during maintenance and servicing operations, is a cooperative effort.

14.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Establish a program for affixing lockout or tagout devices to energy isolating devices and otherwise disable equipment to prevent unexpected release of energy;
- Ensure the use of safe lockout/tagout procedures by authorized employees.
- Provide all hardware for isolating, securing or blocking equipment from energy sources;
- Conduct and certify inspections of the energy control procedures at least annually;
- Provide training to ensure the purpose and function of the energy control program are understood by employees and the knowledge and skills required for the safe application, use, and removal of the energy controls are acquired by authorized employees;
- Ensure training includes limitations of tags in the energy control program (if applicable);
- Inform outside employers who may have employees engaged in activities covered by the hazard control program about the lockout or tagout procedures; and
- Certify that employees complete and repeat training as needed.

14.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Assist in inspections of the hazardous energy control procedures;
- Assist in lockout/tagout training;
- Monitor workplace for hazards relating to energy control program;
- Encourage employees to voice concerns over hazardous energy control program; and
- Offer recommendations from employees about the hazardous energy control program.

14.2.3 Employee Responsibilities

Authorized employees (employees who perform maintenance or servicing on equipment that must be locked out or tagged out) are expected to:

- Participate in training related to lockout/tagout procedures and hazardous energy control;
- Comply with all hazardous energy control procedures when maintaining or servicing equipment that requires such controls; and
- Review lockout/tagout procedure with inspector during periodic evaluation.

Affected employees (employees who operate or use equipment for which maintenance and servicing requires lockout or tagout) must participate and comply with the following:

- training over the purpose and use of the energy control procedure;
- training about the procedure and the prohibition to attempt to restart or reenergize equipment that has been locked out or tagged out; and
- the hazardous energy control program.

14.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on hazardous energy control. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to the educational level, literacy, and language of employees.

14.3.1 Training Components

Gary Pfizenmayer will ensure that every employee will be trained in the following minimum elements:

- The purpose and function of the energy control program;
- The prohibition of attempts to restart or reenergize locked out or tagged out equipment;
- When tagout systems are used, at least the following limitations of tags for hazardous energy control:
 - Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock;
 - When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated;
 - Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are, or may be, in the area in order to be effective;
 - Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace;
 - Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program;
 - Tags must be attached securely to energy isolating devices so that they will not be inadvertently or accidentally detached during use;
- The recognition of hazardous energy sources;
- The type and magnitude of energy available in the workplace; and
- The methods and means necessary for energy isolation and control.

14.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

14.3.3 Retraining

Retraining will reestablish proficiency and introduce new or different control measures whenever the following occur:

- A change in job assignment, equipment or process presents a new hazard;
- A change in the energy control procedures;
- A periodic inspection reveals deviations from, or inadequacies in, employee knowledge or use of the energy control procedures.

14.4 Policy

14.4.1 Hazardous Energy

At the worksite, a number of hazardous energy sources may be present to which workers could be exposed if not properly controlled:

- **Potential:** Stored energy that can be drawn upon to do work. Suspended loads, compressed springs, and pressurized hydraulic systems are examples. Potential energy can be converted to kinetic energy and many of the other energy forms below.
- **Kinetic:** Energy resulting from moving objects such as released loads and uncoiling springs. When these objects are released, their potential energy is converted to kinetic energy.
- **Flammable:** Energy converted from the combustion of gasses, liquids, solid chemicals, and vapors.
- **Chemical:** The capacity of a substance to do work or produce heat through a change in its composition. Chemical energy can be converted from gasses, liquids, solid chemicals, and vapors.
- **Electrical:** Energy generated through the conversion of other forms such as mechanical, thermal, or chemical energy. Energy stored between plates of a charged capacitor is an example of potential electrical energy. Typical electrical energy sources include open buss bars, motors, and generators.
- **Thermal:** Energy transferred from one body to another as the result of a difference in temperature. Heat flows from the hotter to the cooler body. Sources include mechanical work, radiation, chemical reactions, and electrical resistance.

14.4.2 Energy Control Procedures

14.4.2.1 Intended Use of Procedure

This procedure establishes the minimum requirements for the lockout of energy isolating devices during maintenance or servicing on machines or equipment. The process stops the process, isolates it from potentially hazardous energy sources, and locks out equipment before employees perform any servicing or maintenance and prevents unexpected energization or start-up of the machine or equipment (or any unexpected release of stored energy or chemicals) from causing injury.

All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. Authorized employees must perform the lockout in accordance with this procedure. No employee will attempt to start, energize, or use a piece of locked out equipment.

These procedures do not apply when servicing or maintaining equipment during normal production operations unless:

- The activity involves removing guards or other safety devices;
- An employee places him/herself in an area where work is actually being performed; and
- An employee places him/herself in a dangerous area during the normal operating cycle.

14.4.2.2 Authorized Employees

Any employee whose job requires him or her to perform lockout/tagout to service or maintain a piece of equipment is an “authorized employee” and must comply with all expectations of authorized employees in regards to safe lockout/tagout procedures.

Other employees who use equipment that require lockout/tagout for maintenance and service, work in areas where such work is being performed, or will be affected by lockout/tagout procedures will require some training regarding lockout/tagout procedures, but are forbidden to perform the work of an authorized employee. They may not implement lockout/tagout procedures without appropriate training authorized by management.

14.4.2.3 Steps for Controlling Hazardous Energy

See Figure 1 for an outline of the hazardous energy control procedure.

Notify Employees

Before an authorized employee applies lockout or tagout devices, he or she must notify affected employees to prevent unexpected changes to work conditions that could introduce needless risk and to allow affected employees to clear areas that may be hazardous.

Prepare for Shutdown

Before any employee turns off any equipment, the authorized employee will be aware of the type and magnitude of the energy, the hazards of the energy and the means to control it.

Authorized personnel will review lockout/tagout procedures for the piece of equipment and all the possible hazardous energy sources to help ensure an understanding of the controls that are necessary to prevent an injury.

The authorized employee will be especially mindful of energy that can be stored or accumulated after a shutdown.

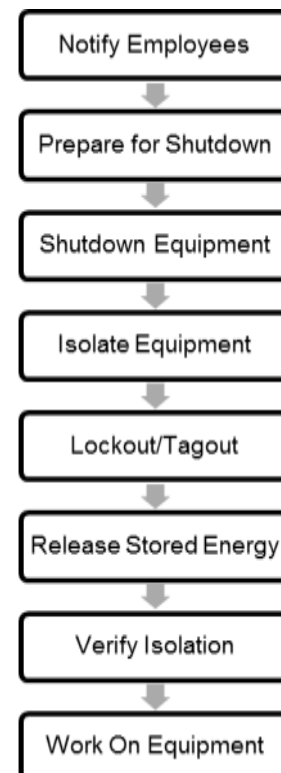


Figure 1

Equipment Shutdown

Shutdown of machinery and equipment must occur in an orderly manner using the shutdown procedures on the lockout/tagout procedures associated with each machine or piece of equipment.

Equipment Isolation

All energy isolation devices necessary to control energy to the equipment will be located and operated to completely de-energize the equipment and isolate it from energy sources. The authorized employee, or team leader will verify operation of each energy isolation device.

- Disconnect or shut down engines or motors.
- De-energize electrical circuits.
- Block fluid flow in hydraulic or pneumatic systems.
- Block machine and equipment parts against motion.

Lockout/Tagout

The authorized employee will affix a lockout or tagout device to each energy-isolating device. Lockout devices will hold the energy isolating device in a “safe” position, and the authorized employee must affix tagout devices to indicate the prohibition on moving energy isolating devices from a safe position. If it would be possible to lock the device, but only tags are used, attach the tag where the lock would have been; otherwise, locate the tag as close as possible so that it is clear to anyone who might want to operate the equipment.

Release Stored Energy

Immediately after applying lockout or tagout devices, the authorized employee will ensure all potentially hazardous stored or residual energy is relieved, disconnected, restrained, and otherwise rendered safe.

- Lower suspended parts
- Discharge capacitors.
- Release or block springs that are under compression or tension.
- Vent fluids from lines, pressure vessels, tanks, or accumulators — but never vent toxic, flammable, or explosive substances directly into the atmosphere.

If stored energy can be re-accumulated, the authorized employee will verify that the energy is isolated until maintenance is complete or the energy no longer exists.

Verify Isolation

The authorized employee will verify the machinery or equipment is actually isolated and de-energized before starting work on locked out or tagged out equipment.

14.4.2.4 Steps for Release From Lockout/Tagout

See Figure 2 for an outline of the steps to release equipment from lockout/tagout.

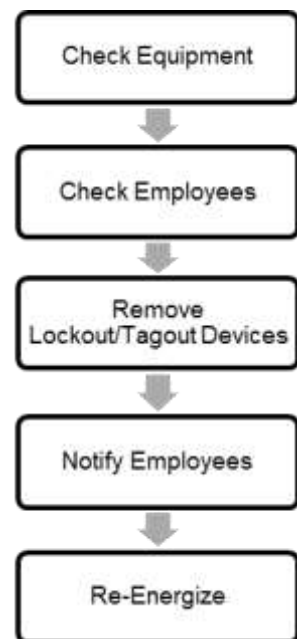


Figure 2

Check Equipment

Make sure machinery or equipment is properly re-assembled. Inspect machinery or equipment to ensure removal of nonessential items.

Check Employees

Make sure all employees are safely outside danger zones. Notify affected employees about the removal of lockout/tagout devices and that energy is going to be re-applied.

Remove Devices

Only the authorized employee who applied the lockout/tagout device may remove the device.

Notify Employees

The authorized employee will notify all affected employees that the lockout or tagout devices have been removed from the equipment.

14.4.2.5 Special Cases

Employee Leaves Before Releasing Lockout/Tagout Device

If the authorized employee is not available to remove the lockout/tagout device he or she attached another authorized employee may begin the following procedure:

- Verify that the authorized employee who applied the device is off premises;
- Make all reasonable efforts to inform him/her that his/her lockout or tagout device has been removed; and
- Ensure that the authorized employee is aware of the removal of the device before he or she resumes work.

Temporary Lockout/Tagout Removal

Whenever authorized employees remove lockout/tagout devices to test or position machines and equipment, or their components, the authorized employee will complete the following procedures in the sequence presented:

- Clear the machine or equipment of tools and materials.
- Remove employees from danger zones.
- Remove lockout/tagout devices.
- Energize and proceed with testing or positioning.
- De-energize all systems and re-apply lockout/tagout devices.

Outside Personnel

Employees of another company engaged in servicing or maintenance of equipment that requires lockout or tagout will follow lockout/tagout procedures that provide at least as much protection as established lockout/tagout procedures for that equipment. To ensure safety, management from our company and representatives from the outside employer will inform one another of their respective lockout or tagout procedures.

The owner also will ensure employees understand and comply with contracted personnel lockout/tagout procedures as appropriate.

Group Lockout/Tagout

When a group performs servicing, the group will use a procedure that provides protection equivalent to the protection provided by the personal lockout or tagout.

Shift Changes

Procedures during shift changes or changes to personnel will provide for an orderly transfer of lockout or tagout device protection and minimize exposure to hazards from the unexpected energization or start-up of the machine or equipment, or the release of stored energy for both the oncoming and off-going personnel.

14.4.3 Protective Materials

14.4.3.1 Provided by Employer

Employees will be provided with any device or hardware for isolating, securing or blocking equipment from energy sources. If a device is altered, damaged or destroyed in a way that compromises its ability to protect the authorized employee, the authorized employee will inform a supervisor immediately and not attempt to use the device.

14.4.3.2 Singularly Identified

Devices used in lockout and tagout procedures will not be used for any purpose other than for isolating, securing or blocking equipment from energy sources, and no devices other than those specified in the lockout/tagout procedure will be used to that end.

14.4.3.3 Durable

The devices used for lockout/tagout will be able to withstand the environmental and weather conditions present during use. Tagout devices need to remain legible and not deteriorate regardless of weather conditions or corrosive environments.

14.4.3.4 Standardized

At the worksite, devices used to isolate, secure or block equipment from energy sources will be consistent in color, shape or size. Tagout devices will have a standardized design.

14.4.3.5 Substantial

Lockout devices must have structural integrity to require excessive force or specialized tools to remove them. Tagout devices and their means of attachment need to prevent inadvertent removal. The means of attachment will not be reusable, and need to have an unlocking strength of at least 50 lbs. The general design and basic characteristics of tagout attachment means will be at least equivalent to a one-piece, all environment-tolerant nylon cable tie.

14.4.3.6 Identifiable

Any device used to isolate, secure or block equipment from energy sources will indicate the identity of the employee applying the device.

14.4.4 Periodic Inspections & Program Review

The safety coordinator and the safety committee will conduct regular inspections of the energy control procedure to ensure the employees are following procedure and meeting all applicable standards. If the safety coordinator uses the inspected energy control procedure, another authorized employee who does not use the energy control procedure will perform the inspection.

The inspector will review with each authorized employee their responsibility under the energy control procedure and correct any identified deviation or inadequacy in the energy control procedure.

Where tagout systems are used, the review will include a detail of the limitations of tags relative to locks in hazardous energy control.

14.4.4.1 Certification

Each periodic inspection must be certified. The certification shall identify the following:

- The machine or equipment on which the energy control procedure was used;
- The date of the inspection;
- The employees included in the inspection; and
- The person performing the inspection.

14.5 Forms & Attachments

On the following pages, please find the following documents:

- Lockout/Tagout Procedure
- Lockout/Tagout Inspection Certification Form
- Hazardous Energy Control Training Record Sheet

Hazardous Energy Control

Lockout/Tagout	
Company:	This procedure establishes the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is done on machines or equipment. It shall be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.
Equipment:	
1. Notify Employees: Notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance. (Document name or job title of authorized and affected employees)	
Authorized Employees	Affected Employees
2. Prepare for Shutdown: The authorized employee shall refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy.	
3. Equipment Shutdown: If the machine or equipment is operating, shut it down by the normal stopping procedure.	
Type of Operating Controls: Location of Operating Controls: Shutdown Procedure:	
Type(s) of Energy	Magnitude/Nature
<input type="checkbox"/> Mechanical	
<input type="checkbox"/> Potential	
<input type="checkbox"/> Electrical	
<input type="checkbox"/> Thermal	
<input type="checkbox"/> Chemical	
4. Equipment Isolation: Set the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).	
Type(s) of energy isolating device(s)	Location(s) of energy isolating device(s)
5. Lock out the energy isolating device(s) with assigned individual lock(s).	

Lockout/Tagout (pg. 2)	
Company:	Equipment:
<p>6. Release Stored Energy: Stored or residual energy (such as that in capacitors, springs, elevated machine members, hydraulic systems, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.</p>	
Type(s) of Energy	Method(s) to dissipate or restrain
<input type="checkbox"/> Mechanical	
<input type="checkbox"/> Potential	
<input type="checkbox"/> Electrical	
<input type="checkbox"/> Thermal	
<input type="checkbox"/> Chemical	
<p>7. Verify Isolation: Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate.</p>	
Method to verify isolation:	
<i>Caution: Return operating control(s) to neutral or "off" position after verifying the isolation of the equipment.</i>	
<p>8. The machine or equipment is now locked out.</p>	

Restoring Equipment to Service

When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken:

1. Check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.
2. Check the work area to ensure that all employees have been safely positioned or removed from the area.
3. Verify that the controls are in neutral.
4. Remove the lockout devices and reenergize the machine or equipment.
 Note: The removal of some forms of blocking may require reenergization of the machine before safe removal.

Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

15

Ladders & Stairs

15.1 Policy Statement

Ladders are valuable tools, but they present a range of hazards that need to be taken into account to be used safely. Safe ladder use demands awareness not only of how to use ladders safely, but also how to select the right ladder for a job, how to store and maintain ladders and how to recognize ladders that may be hazardous.

15.2 Responsibilities

Preventing injuries from ladder use is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

15.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- ensure all ladders meet safety requirements and are maintained in safe, working condition;
- select ladders to purchase according to needs of operations;
- ensure employees are trained in safe ladder selection and use;
- remove ladders from service when they are no longer safe to be used; and
- ensure employees use ladders as safely as possible.

15.2.2 Safety Committee Responsibilities

It is the responsibility of the safety committee to:

- develop and provide training on ladder safety and fall hazards;
- suggest recommendations to management to increase ladder safety;
- assist in hazard analyses and periodic walkthroughs and safety reviews to ensure continued safe ladder use.

15.2.3 Employee Responsibilities

Employees are expected to:

- participate actively in ladder safety training;
- recommend safety improvements and report safety hazards to supervisor, safety team or other appropriate personnel;
- report damaged or otherwise unsafe ladders;
- follow safe practices when using ladders; and
- transport and store ladders according to best safe practices.

15.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on ladder and stair safety. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to the educational level, literacy, and language of employees.

15.3.1 Training Components

Gary Pfizenmayer will ensure that every employee is trained by a competent person in the following minimum elements:

- the nature of fall hazards in the work area;
- the correct procedures for erecting, maintaining, and disassembling the fall protection systems to be used;
- the proper construction, use, placement, and handling of stairways and ladders; and
- the maximum intended load-carrying capacities of ladders used. In addition, retraining must be provided for each employee, as necessary, so that the employee maintains the understanding and knowledge acquired through compliance with the standard.

15.3.2 Training Records

Training records will include the following information:

- the dates of the training sessions;
- the contents or a summary of the training sessions;
- the names and qualifications of persons conducting the training; and
- the names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

15.4 Policy

15.4.1 General Requirements

Anytime there is a break in elevation of 19 inches or more, and no ramp, runway, embankment or hoist is provided, *Pyro Combustion & Controls Inc.* will provide either a stairway or a ladder.

The point of access between levels must always allow free passage. If work being performed limits free access, another point of access must be provided.

Ensure that all necessary fall protection is in place before employees are permitted to work from elevation. Consult the chapter on Fall Protection for more information.

Consult the chapter on Scaffold Safety for requirements on ladders used to access scaffolds.

15.4.2 Ladders

Most ladder falls involve portable ladders that move, tilt, or shift while a worker is climbing or descending. Unstable or slippery base surfaces are the primary reasons ladders fail.

Other reasons include a misstep or a slip of the foot, loss of balance, an overreach, and being struck by a vehicle or other object.

15.4.2.1 General

- If a work area for 25 or more employees can be accessed only by a ladder (or anytime two-way traffic relies on a ladder), *Pyro Combustion & Controls Inc.* will provide either a double-cleated ladder or two or more separate ladders to serve two-way traffic.
- Ladder rungs, cleats, and steps must be parallel, level, and uniformly spaced when the ladder is in position for use.
- Rungs, cleats, and steps of portable and fixed ladders (except as provided below) must not be spaced less than 10 inches apart, nor more than 14 inches apart, along the ladder's side rails.
- Rungs, cleats, and steps of step stools must not be less than 8 inches apart, nor more than 12 inches apart, between center lines of the rungs, cleats, and steps.
- Rungs, cleats, and steps at the base section of extension trestle ladders must not be less than 8 inches nor more than 18 inches apart, between center lines of the rungs, cleats, and steps. The rung spacing on the extension section must not be less than 6 inches nor more than 12 inches.
- Ladders must not be tied or fastened together to create longer sections unless they are specifically designed for such use.
- A metal spreader or locking device must be provided on each stepladder to hold the front and back sections in an open position when the ladder is being used.
- When splicing side rails, the resulting side rail must be equivalent in strength to a one-piece side rail made of the same material.
- Two or more separate ladders used to reach an elevated work area must be offset with a platform or landing between the ladders, except when portable ladders are used to gain access to fixed ladders.
- Ladder components must be surfaced to prevent injury from punctures or lacerations, and prevent snagging of clothing.
- Wood ladders must not be coated with any opaque covering, except for identification or warning labels which may be placed only on one face of a side rail.

Ladders & Stairs

- Ladders with conductive metal sides will be marked with the words “WARNING — Do not use around energized electrical equipment” and may not be used around energized electrical equipment.

Portable Ladders

Workers can reduce ladder fall risks by doing the following:

- Frequently inspecting & maintaining ladders.
- Matching tasks to appropriate ladders.
- Setting up ladders correctly.
- Climbing & descending ladders properly.

These specifications must be met for any portable ladder in use during construction activities:

- Non-self-supporting and self-supporting portable ladders must support at least four times the maximum intended load; extra heavy-duty type 1A metal or plastic ladders must sustain 3.3 times the maximum intended load. The ability of a self-supporting ladder to sustain loads must be determined by applying the load to the ladder in a downward vertical direction. The ability of a non-self-supporting ladder to sustain loads must be determined by applying the load in a downward vertical direction when the ladder is placed at a horizontal angle of 75.5 degrees.
- The minimum clear distance between side rails for portable ladders must be 11.5 inches.
- The rungs and steps of portable metal ladders must be corrugated, knurled, dimpled, coated with skid-resistant material, or treated to minimize slipping.

Non-Self-Supporting Ladders

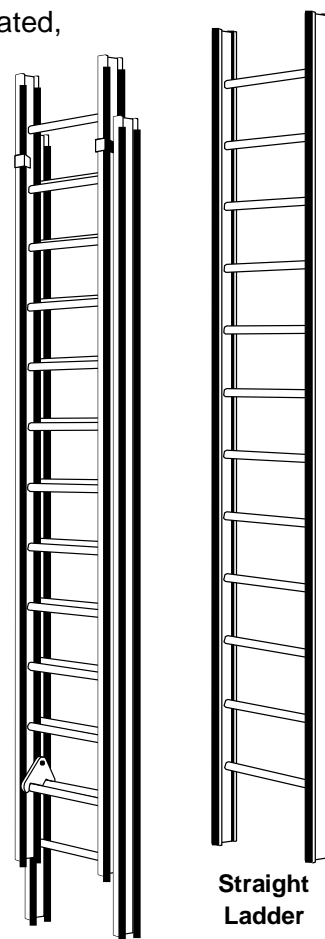
Single Portable or Straight Ladders

The single portable or straight ladder is indispensable for general use. It is the most common type of portable ladder and has the widest range of applications. When used on slippery surfaces, this ladder must have slip-resistant feet or be secured to prevent it from sliding.

Rubber or neoprene ladder shoes are recommended for smooth, dry surfaces, and spikes are recommended for snow or ice. Single portable ladders must not be longer than 30 feet and are intended for use by only one worker at a time. Such ladders are available in wood, metal, and reinforced fiberglass.

Extension or Section Ladder

Extension ladders offer the greatest length in a general purpose ladder. The ladder consists of two or more sections that travel in guides or brackets, allowing adjustable lengths. The sections must be assembled so that the sliding upper section is on top of the lower section. Each section must overlap its adjacent section a minimum distance, based on the ladder's overall length. See Table 2.



Extension
Ladder

Straight
Ladder

The overall length is determined by the lengths of the individual sections, measured along the side rails.

Note: Install positive stops on individual ladder sections to ensure the required overlap.

Number of Sections for metal ladders	Maximum Length (in feet)
one section (or any section of a multiple-section ladder)	30
two-section ladder	48
more than two sections	60

Table 1

Normal Length of Ladder (in feet)	Overlap (in feet)
Up to and including 36	3
Over 36, up to and including 48	4
Over 48, up to 60	5

Table 2

Extension ladders are made of wood, metal, or reinforced fiberglass. Wood ladders cannot have more than two sections and must not exceed 60 feet. Metal and fiberglass ladders can have as many as three sections; however, the overall length must not exceed 72 feet. See Table 1. Individual sections of any extension ladder must not be longer than 30 feet. Extension ladders are for use by only one person at a time.

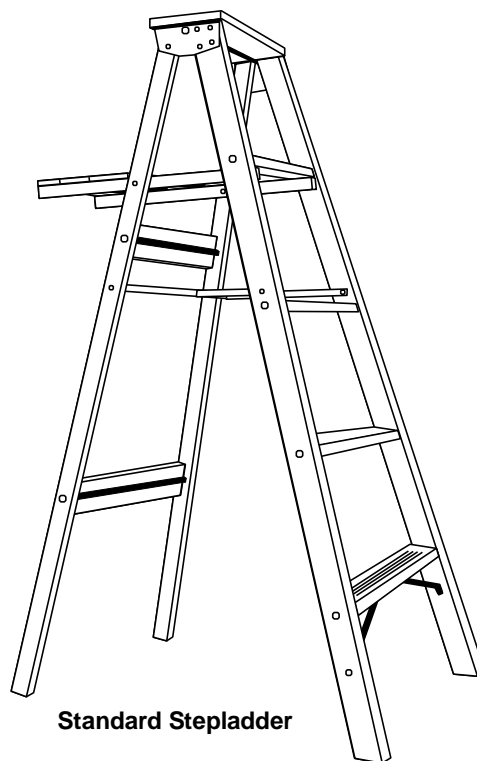
Make sure extension ladders have non-slip bases if there is a chance the ladder can slip. Cord-face ladder shoes are recommended for wet surfaces, rubber or neoprene ladder shoes for smooth dry floor surfaces, and steel spikes for ice or snow. Be careful if you use an extension ladder on oily, metal, or concrete surfaces. Place the ladder securely and tie it off to prevent it from slipping.

Self-supporting Ladders

Standard Stepladder

The standard stepladder, a general purpose ladder, has flat steps and a hinged back. It is self-supporting and nonadjustable. An industrial model, designed for heavy service demands, has oversize back legs, heavy-duty flat steps, and knee braces that increase rigidity and durability.

Standard stepladders should be used only on surfaces that offer firm, level footing such as floors, platforms, and slabs. They are available in metal, wood, or reinforced fiberglass versions, and are intended to support only one worker at a time. Remember not to stand on, or work from, the top step. The ladders must have a metal spreader or locking arms. They cannot be longer than 20 feet, measured along the front edge of the side rails.



Standard Stepladder

Ladders & Stairs

Two-Way Stepladder

The two-way stepladder is similar to the industrial standard stepladder; however, each side of this ladder has a set of steps. The extra set of steps offers convenience and versatility: One person can work from either side or two people can work from the ladder at the same time — one on each side.

Platform Ladder

The platform ladder is a special-purpose ladder that has a large stable platform from which you can work at the highest standing level. The ladder's length is determined by the length of the front edge of the side rail from the bottom of the ladder to the base of the platform. The length of a platform ladder cannot exceed 20 feet.

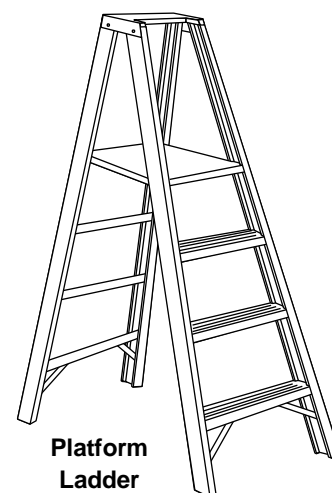
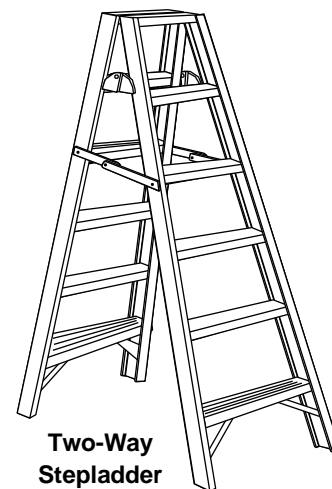
Trestle Ladder

A trestle ladder is a self-supporting portable ladder that has two sections hinged at the top, forming equal angles with the base. A variation of the trestle ladder, the extension trestle ladder, includes a vertically adjustable single ladder that can be locked in place. (The single extension section must lap at least three feet into the base section.) Trestle ladders are used in pairs to support planks or staging. The rungs are not intended to be used as steps.

The angle of spread between open front and back legs must be $5\frac{1}{2}$ inches per foot of length. The length cannot be more than 20 feet, measured along the front edge of the side rails. Rails must be beveled at the top and have metal hinges to prevent spreading. Metal spreaders or locking devices are also required to keep the rails in place.

Ladder Storage

- The storage area should be well ventilated.
- Wood ladders should not be exposed to moisture or excessive heat. Avoid storing ladders near stoves, steam pipes, or radiators.
- Store straight or extension ladders in flat racks or on wall brackets. Make sure there are enough brackets to support the ladder so that it does not sag. If the ladder rails have a lateral curve, the wall brackets should match the curve.
- Store stepladders vertically, in a closed position, to reduce the risk of sagging or twisting. Secure stored ladders so that they will not tip over if they are struck.
- Store ladders, especially wood ladders, promptly after using them. Exposure to moisture and sun will shorten the life of a wood ladder.



Transporting Ladders

- When you hand-carry a ladder, keep the front end elevated, especially around blind corners, in aisles, and through doorways. You will reduce the chance of striking another person with the front of the ladder.
- When you transport a ladder in a truck or trailer, place it parallel to the bed. Avoid tossing, throwing, or dropping it in the bed.
- If you transport a long ladder on a short truck bed over long distances, support the ladder so it will not sag or bend.
- Drive slowly over rough terrain. Tie the ladder securely to eliminate nicking, gouging, chafing, and road shock.

Fixed Ladders

- A fixed ladder must be capable of supporting at least two loads of 250 pounds each, concentrated between any two consecutive attachments. Fixed ladders also must support added anticipated loads caused by ice buildup, winds, rigging, and impact loads resulting from the use of ladder safety devices.
- Individual rung/step ladders must extend at least 42 inches above an access level or landing platform either by the continuation of the rung spacings as horizontal grab bars or by providing vertical grab bars that must have the same lateral spacing as the vertical legs of the ladder rails.
- Each step or rung of a fixed ladder must be capable of supporting a load of at least 250 pounds applied in the middle of the step or rung.
- The minimum clear distance between the sides of individual rung/step ladders and between the side rails of other fixed ladders must be 16 inches.
- The rungs of individual rung/step ladders must be shaped to prevent slipping off the end of the rungs.
- The rungs and steps of fixed metal ladders must be corrugated, knurled, dimpled, coated with skid-resistant material, or treated to minimize slipping.
- The minimum perpendicular clearance between fixed ladder rungs, cleats, and steps, and any obstruction behind the ladder must be 7 inches, except that the clearance for an elevator pit ladder must be 4.5 inches.
- The minimum perpendicular clearance between the centerline of fixed ladder rungs, cleats, and steps, and any obstruction on the climbing side of the ladder must be 30 inches. If obstructions are unavoidable, clearance may be reduced to 24 inches, provided a deflection device is installed to guide workers around the obstruction.
- The step-across distance between the center of the steps or rungs of fixed ladders and the nearest edge of a landing area must be no less than 7 inches and no more than 12 inches. A landing platform must be provided if the step-across distance exceeds 12 inches.
- Fixed ladders without cages or wells must have at least a 15-inch clear width to the nearest permanent object on each side of the centerline of the ladder.

- Fixed ladders must be provided with cages, wells, ladder safety devices, or self-retracting lifelines where the length of climb is less than 24 feet but the top of the ladder is at a distance greater than 24 feet above lower levels.
- If the total length of a climb on a fixed ladder equals or exceeds 24 feet, the following requirements must be met: fixed ladders must be equipped with either:
 - ladder safety devices;
 - self-retracting lifelines, and rest platforms at intervals not to exceed 150 feet;
 - a cage or well, and multiple ladder sections, each ladder section not to exceed 50 feet in length. These ladder sections must be offset from adjacent sections, and landing platforms must be provided at maximum intervals of 50 feet.
- The side rails of through or side-step fixed ladders must extend 42 inches above the top level or landing platform served by the ladder. For a parapet ladder, the access level must be at the roof if the parapet is cut to permit passage through it; if the parapet is continuous, the access level is the top of the parapet.
- Steps or rungs for through-fixed-ladder extensions must be omitted from the extension; and the extension of side rails must be flared to provide between 24 inches (61 cm) and 30 inches clearance between side rails.
- When safety devices are provided, the maximum clearance between side rail extensions must not exceed 36 inches.

Cages for Fixed Ladders

- Horizontal bands must be fastened to the side rails of rail ladders, or directly to the structure, building, or equipment for individual-rung ladders.
- Vertical bars must be on the inside of the horizontal bands and must be fastened to them.
- Cages must not extend less than 27 inches, or more than 30 inches from the centerline of the step or rung, and must not be less than 27 inches wide.
- The inside of the cage must be clear of projections.
- Horizontal bands must be spaced at intervals not more than 4 feet apart measured from centerline to centerline.
- Vertical bars must be spaced at intervals not more than 9.5 inches apart measured from centerline to centerline.
- The bottom of the cage must be between 7 feet and 8 feet above the point of access to the bottom of the ladder. The bottom of the cage must be flared not less than 4 inches between the bottom horizontal band and the next higher band.
- The top of the cage must be a minimum of 42 inches above the top of the platform, or the point of access at the top of the ladder. Provisions must be made for access to the platform or other point of access.

Wells for Fixed Ladders

- Wells must completely encircle the ladder.
- Wells must be free of projections.
- The inside face of the well on the climbing side of the ladder must extend between 27 inches and 30 inches from the centerline of the step or rung.
- The inside width of the well must be at least 30 inches.
- The bottom of the well above the point of access to the bottom of the ladder must be between 7 feet and 8 feet.

Ladder Safety Devices and Related Support Systems for Fixed Ladders

- All safety devices must be capable of withstanding, without failure, a drop test consisting of a 500-pound weight dropping 18 inches.
- All safety devices must permit the worker to ascend or descend without continually having to hold, push, or pull any part of the device, leaving both hands free for climbing.
- All safety devices must be activated within 2 feet after a fall occurs, and limit the descending velocity of an employee to 7 feet/second or less.
- The connection between the carrier or lifeline and the point of attachment to the body belt or harness must not exceed 9 inches in length.

Mounting Ladder Safety Devices for Fixed Ladders

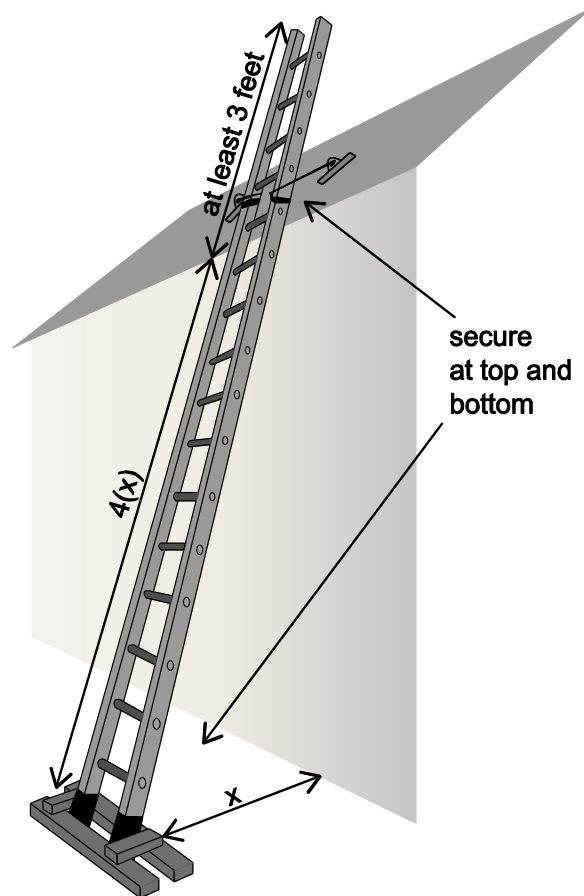
- Mountings for rigid carriers (rails) must be attached at each end of the carrier, with intermediate mountings, spaced along the entire length of the carrier, to provide the necessary strength to stop workers' falls.
- Mountings for flexible carriers (cables) must be attached at each end of the carrier. Cable guides for flexible carriers must be installed with a spacing between 25 feet and 40 feet along the entire length of the carrier, to prevent wind damage to the system.
- The design and installation of mountings and cable guides must not reduce the strength of the ladder.
- Side rails, and steps or rungs for side-step fixed ladders must be continuous in extension.

15.4.2.2 Use

- Inspect ladders for damage or wear before use.
- When portable ladders are used for access to an upper landing surface, the side rails must extend at least 3 feet above the upper landing surface. When such an extension is not possible, the ladder must be secured, and a grasping device such as a grab rail must be provided to assist workers in mounting and dismounting the ladder. A ladder extension must not deflect under a load that would cause the ladder to slip off its support.
- Ladders must be maintained free of oil, grease, and other slipping hazards.
- Ladders must not be loaded beyond the maximum intended load for which they were built nor beyond their manufacturer's rated capacity.

Ladders & Stairs

- Ladders must be used only for the purpose for which they were designed.
- Non-self-supporting ladders must be used at an angle where the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder. Wood job-made ladders with spliced side rails must be used at an angle where the horizontal distance is one-eighth the working length of the ladder.
- Fixed ladders must be used at a pitch no greater than 90 degrees from the horizontal, measured from the back side of the ladder.
- Ladders must be used only on stable and level surfaces unless secured to prevent accidental movement.
- Ladders must not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental movement. Slip-resistant feet must not be used as a substitute for the care in placing, lashing, or holding a ladder upon slippery surfaces.
- Ladders placed in areas such as passageways, doorways, or driveways, or where they can be displaced by workplace activities or traffic, must be secured to prevent accidental movement, or a barricade must be used to keep traffic or activities away from the ladder.
- The area around the top and bottom of the ladders must be kept clear.
- The top of a non-self-supporting ladder must be placed with two rails supported equally unless it is equipped with a single support attachment.
- Ladders must not be moved, shifted, or extended while in use.
- Ladders must have nonconductive siderails if they are used where the worker or the ladder could contact exposed energized electrical equipment.
- The top or top step of a stepladder must not be used as a step.
- Cross-bracing on the rear section of stepladders must not be used for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.
- Ladders must be inspected by a competent person for visible defects on a periodic basis and after any incident that could affect their safe use.
- Single-rail ladders must not be used.
- When ascending or descending a ladder, the worker must face the ladder.
- Each worker must use at least one hand to grasp the ladder.



Portable Ladder Use

- A worker on a ladder must not carry any object or load that could cause the worker to lose balance and fall.

15.4.2.3 Structural Defects of Ladders

- Portable ladders with structural defects-such as broken or missing rungs, cleats, or steps, broken or split rails, corroded components, or other faulty or defective components-must immediately be marked defective, or tagged with "Do Not Use" or similar language and withdrawn from service until repaired.
- Fixed ladders with structural defects-such as broken or missing rungs, cleats, or steps, broken or split rails, or corroded components-must be withdrawn from service until repaired.
- Defective fixed ladders are considered withdrawn from use when they are:
 - immediately tagged with "Do Not Use" or similar language;
 - marked in a manner that identifies them as defective; or
 - blocked (such as with a plywood attachment that spans several rungs).
- Ladder repairs must restore the ladder to a condition meeting its original design criteria, before the ladder is returned to use.

Angle to Horizontal	Rise (inches)	Tread Run (inches)
30 deg. 35'	6 ½	11
32 deg. 08'	6 ¾	10 ¾
33 deg. 41'	7	10 ½
35 deg. 16'	7 ¼	10 ¼
36 deg. 52'	7 ½	10
38 deg. 29'	7 ¾	9 ¾
40 deg. 08'	8	9 ½
41 deg. 44'	8 ¼	9 ¼
43 deg. 22'	8 ½	9
45 deg. 00'	8 ¾	8 ¾
46 deg. 38'	9	8 ½
48 deg. 16'	9 ¼	8 ¼
49 deg. 54'	9 1/2	8

Table 1

15.4.3 Stairways

15.4.3.1 General

- Landings for stairways that will not be a permanent part of the structure on which construction work is being performed must be at least 30 inches in the direction of travel and extend at least 22 inches in width at every 12 feet or less of vertical rise.
- Stairs shall be installed between 30 deg. and 50 deg. from horizontal. See Table 1.
- Riser height and tread depth shall be uniform within each flight of stairs, including any foundation structure used as one or more treads of the stairs. Variations in riser height or tread depth shall not be over ¼-inch in any stairway system.
- Where doors or gates open directly on a stairway, a platform shall be provided, and the swing of the door shall not reduce the width of the platform to less than 20 inches.
- Metal pan landings and metal pan treads, when used, shall be secured in place before filling with concrete or other material.
- All parts of stairways shall be free of hazardous projections, such as protruding nails.
- Slippery conditions on stairways shall be eliminated before the stairways are used to reach other levels.

15.4.3.2 Temporary Service

Except during construction of the actual stairway, stairways with metal pan landings and treads must not be used where the treads and/or landings have not been filled in with concrete or other material, unless the pans of the stairs and/or landings are temporarily filled in with wood or other material. All treads and landings must be replaced when worn below the top edge of the pan.

Except during construction of the actual stairway, skeleton metal frame structures and steps must not be used (where treads and/or landings are to be installed at a later date) unless the stairs are fitted with secured temporary treads and landings.

Temporary treads must be made of wood or other solid material and installed the full width and depth of the stair.

15.4.3.3 Stairrails

The following general requirements apply to all stairrails and handrails:

- Stairways having four or more risers, or rising more than 30 inches in height, whichever is less, must have at least one handrail. A stairrail also must be installed along each unprotected side or edge. When the top edge of a stairrail system also serves as a handrail, the height of the top edge must not be more than 37 inches nor less than 36 inches from the upper surface of the stairrail to the surface of the tread.
- Winding or spiral stairways must be equipped with a handrail to prevent using areas where the tread width is less than 6 inches.
- Stairrails must not be less than 36 inches in height.
- Screens or mesh, when used, must extend from the top rail to the stairway step, and along the opening between top rail supports.
- Intermediate vertical members, such as balusters, when used, must not be more than 19 inches apart.
- Other intermediate structural members, when used, must be installed so that there are no openings of more than 19 inches wide.

15.4.3.4 Handrails

- Handrails and the top rails of the stairrail systems must be capable of withstanding, without failure, at least 200 pounds of weight applied within 2 inches of the top edge in any downward or outward direction, at any point along the top edge.
- The height of handrails must not be more than 37 inches nor less than 30 inches from the upper surface of the handrail to the surface of the tread.
- The height of the top edge of a stairrail system used as a handrail must not be more than 37 inches nor less than 36 inches from the upper surface of the stairrail system to the surface of the tread.
- Stairrail systems and handrails must be surfaced to prevent injuries such as punctures or lacerations and to keep clothing from snagging.
- Handrails must provide an adequate handhold for employees to grasp to prevent falls.

- The ends of stairrail systems and handrails must be constructed to prevent dangerous projections such as rails protruding beyond the end posts of the system.
- Temporary handrails must have a minimum clearance of 3 inches between the handrail and walls, stairrails systems, and other objects.
- Unprotected sides and edges of stairway landings must be provided with standard 42-inch guardrail systems.

15.4.3.5 Midrails

- Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members must be provided between the top rail and stairway steps of the stairrail system.
- Midrails, when used, must be located midway between the top of the stairrail system and the stairway steps.

15.5 Forms & Attachments

On the following pages, please find the following document(s):

- General Ladder Setup Procedure
- Setting Up an Extension Ladder
- Ladders & Stairs Safety Training Documentation

General Ladder Setup Procedure

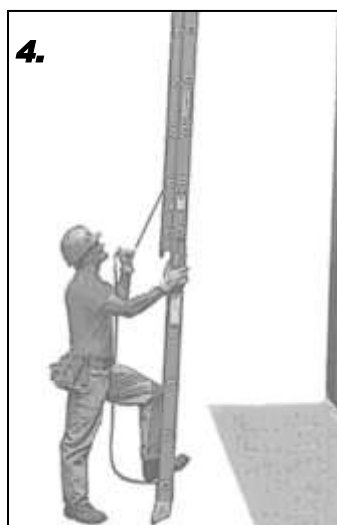
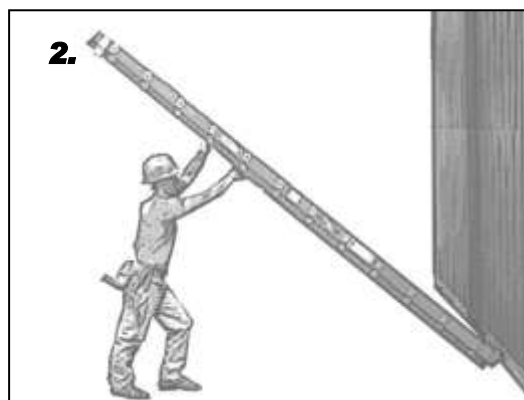
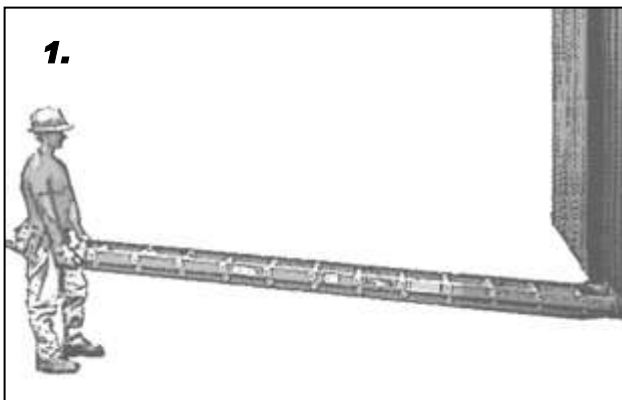
1. Move the ladder near your work. Get help if it is too difficult to handle alone.
2. Make sure there are no electrical wires overhead.
3. Set up the ladder on a secure, level surface or secure it so that it cannot be displaced.
4. Lock the spreaders on a stepladder. Secure the lock assembly on extension ladders.
5. Use traffic cones or other barriers to protect the base of the ladder if vehicles or pedestrians could strike it.
6. Make sure that a non-self-supporting ladder extends at least three feet above the top support point for access to a roof or other work level.
7. Angle non-self-supporting ladders properly. The length of the side rails from the ladder's base to the top support points (the working length) should be four times the distance from ladder's base to the structure (the set-back distance).

Quick tip — 4:1 Ladder Setup

A non-self-supporting ladder should have a set-up angle of about 75 degrees — a 4:1 ratio of the ladder's working length to set-back distance.

Here's how to achieve it: Stand at the base of the ladder with your toes touching the rails. Extend your arms straight out in front of you. If the tips of your fingers just touch the rung nearest your shoulder level, the angle of your ladder has a 4:1 ratio.





Setting Up an Extension Ladder

1. The ladder should be closed. Position the ladder with the base section on top of the fly section. Block the bottom of the ladder against the base of the structure.
2. Make sure there is clearance and no electrical lines are overhead. Carefully “walk” the ladder up until it is vertical. Keep your knees bent slightly and your back straight.
3. Firmly grip the ladder, keep it vertical, and carefully move back from the structure about one quarter the distance of the ladder’s working length. This allows you to place it at the correct angle against the structure.
4. Raise the fly section. After the bottom rung of the fly section clears the bottom rung of the base section, place one foot on the base rung for secure footing.
5. Lean the ladder against the structure. The distance from the base of the ladder to the structure should be one quarter the distance of the ladder’s working length. Make sure the ladder extends three feet above the top support points for access to a roof or other work level. Both rails should rest firmly and securely against the structure.

16**Fall Protection**

16.1 Policy Statement

Pyro Combustion & Controls Inc. has implemented this policy to ensure that proper safe work practices and procedures are followed to protect employees from the fall hazards. *Gary Pfizenmayer* is designated as the Program Administrator responsible for managing and supervising the Fall Protection Program.

16.2 Responsibilities

Providing sufficient protection to prevent falling from height is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

16.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Provide adequate and timely resources to support the fall protection program;
- Identify fall hazards and implement procedures to eliminate or control them;
- Develop and maintain written fall protection procedures wherever an active fall protection system is being used;
- Inform authorized employees about a foreseeable fall hazard before exposure;
- Provide continuous fall protection or ensure that such protection is available to employees and within regulations;
- Provide training to operate any active fall protection systems;
- Ensure supervision of employees exposed to fall hazards; and
- Verify all fall protection procedures are understood and followed.

16.2.2 Fall Protection Program Administrator

It is the responsibility of *Gary Pfizenmayer* to:

- Develop and implement the managed fall protection program;
- Be knowledgeable of current fall protection regulations, standards, equipment and systems;
- Advise and provide guidance to managers, employees, and other departments on all managed fall protection program matters;
- Establish and assign all duties and responsibilities outlined in this standard to trained and qualified individuals;

- Provide or verify that the personnel have the necessary resources to accomplish their duties and responsibilities;
- Establish and implement a system to identify, and eliminate or control, new and existing fall hazards;
- Ensure that written procedures for fall protection, rescue and evacuation are developed for every foreseeable fall hazard to which persons are exposed;
- Develop training programs for all Authorized Persons;
- Verify that all Authorized Persons are provided with training;
- Provide participation (personally or other Qualified person) in the investigation of all incidents related to falls from heights, including:
 - Reviewing incident reports,
 - Taking corrective action to eliminate causes,
 - Making necessary reports to management, and
 - Maintaining an incident report system;
- Measure and evaluate the effectiveness of the managed fall protection program by:
 - Conducting periodic program evaluations, and
 - Making improvements.

16.2.3 Qualified Person Responsibilities

Pyro Combustion & Controls Inc. employees who are identified as “a qualified person” are expected to:

- Analyze and design all anchor points for structural engineering strength requirements as set by this standard and also be in compliance with local and state building code requirements;
- Analyze and design all horizontal lifeline systems for structural engineering strength requirements and also be in compliance with local and state building code requirements;
- Establish the clearance requirements for each fall protection system selected;
- Verify the fall protection equipment system is adequate for the specific fall hazard abatement option;
- Maintain a safety factor of 2.0 against failure of the structural system for both anchor points and horizontal lifeline systems; and
- Establish adequate vertical and horizontal clearance requirements for each fall protection system. Swing fall consideration shall be analyzed and limitation requirements shall be established for each fall protection system.

16.2.4 Competent Person Responsibilities

Pyro Combustion & Controls Inc. employees who are identified as “a competent person” are expected to:

- Stop work if unsafe;
- Conduct a fall hazard survey to identify fall hazards;
- Establish the clearance requirements for each fall protection system;
- Verify that available clearance is adequate before allowing persons to work at heights;
- Supervise, for work restraint, travel restraint, work positioning, and non-certified fall arrest anchorages:
 - Installation,
 - Use, and
 - Inspection;
- Verify that fall protection systems have been installed and inspected in compliance with this standard and all applicable federal, state, and local regulations;
- Identify, evaluate, and impose limits on the workplace activities to control fall hazard exposures and swing falls;
- Communicate limits to all Authorized Persons who utilize the fall protection systems.
- Prepare, update, and approve written fall protection, rescue, and evacuation procedures.
- Specify that written fall protection, rescue, and evacuation procedures include:
 - Anchorage locations,
 - Connecting means,
 - Body supports, and
 - Other required fall protection equipment.
 - Review the written procedures as workplace activities change for needed additional practices, procedures, or training;
- Verify that Authorized Persons:
 - Are trained and authorized;
 - Have had the fall protection, rescue, and evacuation procedures reviewed with them before work begins.
 - Provide or ensure that a prompt rescue can be accomplished with the rescue and evacuation procedures;
 - Participate in the investigation of all incidents related to falls from heights;
 - Immediately remove from service all damaged equipment or components (and equipment or components that have experienced a fall arrest);
 - Inspect for damage and follow the manufacturer’s instructions for damaged equipment and equipment that has experienced a free-fall arrest; and
 - Periodically inspect all fall protection equipment as per the manufacturer’s requirements and applicable regulations.

16.2.5 Authorized Person Responsibilities

Pyro Combustion & Controls Inc. employees who are identified as “an authorized person” are expected to:

- Follow the instructions of the program administrator and the Competent Person regarding the use of fall protection systems;
- Understand and adhere to the fall protection procedures;
- Notify the Competent Person of unsafe or hazardous conditions or acts that may cause injury before proceeding with workplace activities;
- Correctly use, inspect, maintain, store, and care for fall protection equipment and systems;
- Inspect any fall protection equipment, prior to use, for defects or damage;
- Notify the Competent Person of defects and damage found from inspections; and
- Use only equipment free of defects or damage.

16.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on Fall Protection. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to the educational level, literacy, and language of employees.

16.3.1 Training Components

Gary Pfizenmayer will ensure that every employee will be trained in the following minimum elements:

- The nature of fall hazards in the work area;
- The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used;
- The use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protection to be used;
- The role of each employee in the safety monitoring system when this system is used;
- The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs;
- The correct procedures for the handling and storage of equipment and materials and the erection of overhead protection;
- The role of employees in fall protection plans; and
- The standards contained in subpart M of 29 CFR 1926.

16.3.2 Training Records

Training records will include the following information as a written certification:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of the person trained.

Employee training records will be maintained for the duration of the employee's employment.

16.3.3 Retraining

If *Pyro Combustion & Controls Inc.* has reason to believe that any affected employee who has already been trained does not have the understanding and skill required the employee must be retrained. Examples where such retraining may be required include, but are not limited to the following:

- Changes in the workplace render previous training obsolete; or
- Changes in the types of fall protection systems or equipment to be used render previous training obsolete; or
- Inadequacies in an affected employee's knowledge or use of fall protection systems or equipment indicate that the employee has not retained the requisite understanding or skill.

16.4 Policy

16.4.1 Fall Protection Requirements

Fall protection may be required in areas and activities including, but not limited to the following:

- | | | |
|---------------------------------------|--|-----------------------------------|
| • ramps, runways, and other walkways, | • leading edge work, | • precast concrete erection, |
| • excavations, | • unprotected sides and edges, | • wall openings, |
| • hoist areas, | • overhand bricklaying and related work, | • residential construction, and |
| • holes, | • roofing work, | • other walking/working surfaces. |
| • formwork and reinforcing steel, | | |

Employees will be protected from fall hazards and falling objects whenever an affected employee is above the uniform threshold height of 6 feet above a lower level. Fall protection must also be guaranteed for workers exposed to falling into dangerous equipment. Appropriate fall-protection systems are guardrail systems, safety-net systems, or personal fall-arrest systems.

Fall Protection Systems	
Type of fall-protection system	What it does
Personal fall-arrest system	Controls a fall
Personal fall-restraint system	Prevents a fall
Positioning-device system	Positions and limits fall to 2 feet
Guardrail system	Prevents a fall
Safety-net system	Controls (arrests) a fall
Warning line	Warns of fall hazard
Slide-guard system	Prevents sliding down a slopped roof

16.4.1.1 Alternative Fall Protection Methods

If work undertaken at height is leading-edge work, precast concrete erection work, or residential-type construction work, fall protection other than appropriate guardrail systems, safety-net systems, or personal fall-arrest systems may be used — provided there is a fall-protection plan that demonstrates that such systems are not feasible or would create a fall hazard.

16.4.1.2 Other Fall-Protection Requirements

If activities at height include any of the following, consult the appropriate regulation and/or policy for more information on appropriate fall protection:

- Scaffolds
- Steel erection work
- Electric transmission lines/equipment
- Cranes and derricks
- Tunneling operations
- Stairways and ladders

16.4.2 Fall Protection Systems and Methods

16.4.2.1 Planning Fall Protection

Methods, systems, and procedures to control exposure to fall hazards must be established before work commences. Careful preparation lays the groundwork for an accident-free workplace. Fall protection measures in project plans must reflect all anticipated fall hazards at the worksite. The nature and scope of the planning effort depend on the complexity and size of the project.

Planning must at least identify fall hazards and the systems and procedures to control the hazards. Effective planning reduces exposure risks for workers during a project and for others after the project is finished. For example, anchor points used by construction workers on a project might also be used to protect window cleaners or other maintenance personnel.

Use the following tips to plan:

- Identify all fall hazards that workers are likely to encounter during the project.
- Describe how workers will gain access to the worksite (by ladders or stairs, for example).
- Describe how workers will prevent tools and materials from dropping to lower levels.
- Establish procedures for inspecting, maintaining, and storing fall protection equipment.
- Identify the tasks that expose workers to fall hazards.
- Make sure workers use fall protection systems appropriate for their tasks.

- Identify anchor point locations.
- Describe the methods for setting anchors and securing lifelines.
- Identify areas in which workers may be exposed to falling objects and decide how to control the hazards.
- Describe emergency-response procedures for rescuing workers who fall.
- Post emergency responders' phone numbers and make sure workers know them.
- Describe all equipment that will be available for rescuing workers who fall.

Competent and Qualified Personnel

Effective fall protection relies on the efforts of all personnel. However, each worksite that demands fall protection measures, must have personnel onsite with the knowledge and authority to prevent injury as hazards arise.

Competent Person

A competent person can identify existing hazards as well as potential hazards and has the authority to take prompt corrective actions to eliminate such hazards and ensure employees are out of harm's way until the hazards can be eliminated.

The competent person:

- Serves as the monitor in a safety-monitoring system, is responsible for recognizing hazards that cause falls, and warns workers about hazards;
- Determines whether safety nets meet requirements;
- Inspects a personal fall-arrest system after it arrests a fall and determines whether the system is damaged;
- Evaluates alteration to a personal fall-arrest system and determines if it is safe to use;
- Supervises installation of slide-guard systems; and
- Trains employees how to recognize fall hazards and follow safety procedures

Qualified Person

A qualified person has successfully demonstrated his or her ability to solve problems relating to the project by possession of a recognized degree, certificate, or professional standing; or by extensive knowledge, training and experience.

The qualified person:

- Supervises design, installation, and use of horizontal lifeline systems to ensure that they can maintain a safety factor of at least two — twice the impact of a worker free-falling six feet;
- Supervises design, installation, and use of personal fall-restraint anchorages; and
- Supervises design, installation, and use of personal fall-arrest anchorages.

Covers for Roof Openings or Holes

Roof Openings are fall hazards and must either be covered or surrounded by a guardrail. Skylights will usually break unless guarded or screened.

A cover is necessary regardless of the fall distance and includes any rigid object used to overlay openings in floors, roofs, and other walking and working surfaces. Covers must be able to support at least twice the maximum anticipated load of workers, equipment, and materials. Covers should have full edge bearing on all four sides. All covers must be color-coded or marked with the word "Hole" or "Cover" and must be secured to prevent accidental displacement.

16.4.2.2 Conventional Fall Protection

Personal Fall Arrest System

These consist of an anchorage, connectors, and a body harness and may include a deceleration device, lifeline, or suitable combinations. If a personal fall arrest system is used for fall protection, it must do the following:

- Limit maximum arresting force on an employee to 900 pounds used with a body belt;
- Limit maximum arresting force on an employee to 1,800 pounds used with a body harness;
- Be rigged so that an employee can neither free fall more than 6 feet nor contact any lower level;
- Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet; and
- Have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet or the free fall distance permitted by the system, whichever is less.

The use of body belts for fall arrest is prohibited; however, the use of a body belt in a positioning device system is acceptable.

Personal fall arrest systems must be inspected before each use for wear damage, and other deterioration. Defective components must be removed from service.

A personal fall arrest system includes 4 elements referred to as ABCDs of Fall Arrest:

- **A: Anchorage** - a fixed structure or structural adaptation, often including an anchorage connector, to which the other components of the PFAS are rigged.
- **B: Body Wear** - a full body harness worn by the worker.
- **C: Connector** - a subsystem component connecting the harness to the anchorage, such as a lanyard.
- **D: Deceleration Device** - a subsystem component designed to dissipate the forces associated with a fall arrest event.

Anchor

An anchor provides a secure point of attachment for a lifeline, lanyard, or deceleration device and is perhaps the most important personal fall arrest system component. It must support a minimum load of 5,000 pounds – a challenging requirement, particularly on wood framed and residential-type structures. If you don't know how much weight an anchor will hold, you should have a qualified person design a complete fall protection system. The system must be installed under the supervision of the qualified person and it must maintain a safety factor of at least two – twice the impact force of a worker free-falling six feet.

Never use hoists or guardrails as anchors. They are not built to withstand the forces generated by a fall.

In addition to anchor strength consider the following:

- **Anchorage connector:** Unless an existing anchorage has been designed to accept a lanyard or lifeline, you'll need to attach an anchorage connector — a device that provides a secure attachment point. Examples include tie-off adapters, hook anchors, beam connectors, and beam trolleys. Be sure the connector is compatible with the lanyard or lifeline and appropriate for the task.
- **Attachment point:** The anchorage can be used only as the attachment point for a personal fall-arrest system; it can't be used to support or suspend platforms.
- **Location:** The anchorage should be located directly above the worker, if possible, to reduce the chance of a swing fall.
- **Fall distance:** Because a personal fall-arrest system doesn't prevent a fall, the anchorage must be high enough above a worker so that the arrest system, rather than a lower level, stops the fall. Consider free-fall distance, lanyard length, shock-absorber elongation, and body-harness stretch in determining the height of an anchorage.

Body Harness

The full-body harness has straps that distribute the impact of a fall over the thighs, waist, chest, shoulders, and pelvis. Full-body harnesses come in different styles, many of which are light and comfortable. Before you purchase harnesses, make sure that they fit those who will use them, they're comfortable, and they're easy to adjust.

A full-body harness should include a back D-ring for attaching lifelines or lanyards and a back pad for support. Never use a body belt as part of a personal fall-arrest system.

Keep the following in mind when you buy a full-body harness:

- The harness must be made from synthetic fibers;
- The harness must fit the user. It should be comfortable and easy to adjust;
- The harness must have an attachment point, usually a D-ring, in the center of the back at about shoulder level. The D-ring should be large enough to easily accept a lanyard snap hook;
- Chest straps should be easy to adjust and strong enough to withstand a fall without breaking;

Fall Protection

- Use only industrial full-body harnesses (not recreational climbing harnesses); and
- The harness must be safe and reliable. It should meet ANSI and CSA standards and the manufacturer should have ISO 9001 certification, which shows the manufacturer meets international standards for product design, development, production, installation, and service.

Connectors

An anchorage, a lanyard, and a body harness are not useful until they're linked together. Connectors do the linking; they make the anchorage, the lanyard, and the harness a complete system. Connectors include carabiners, snap hooks, and D-rings. Connectors must be dropforged, pressed or made from formed steel or equally strong material. They must be corrosion-resistant, with smooth surfaces and edges that will not damage other parts of the personal fall arrest system.

Carabiner

This high-tensile alloy steel connector has a locking gate and is used mostly in specialized work such as window cleaning and high-angle rescue. Carabiners must have a minimum tensile strength of 5,000 pounds.



Snap hook

A hook-shaped member with a keeper that opens to receive a connecting component and automatically closes when released. Snap hooks are typically spliced or sewn into lanyards and self-retracting lifelines. Snap hooks must be high-tensile alloy steel and have a minimum tensile strength of 5,000 pounds. Use only locking snap hooks with personal fall-arrest systems; locking snap hooks have self-locking keepers that won't open until they're unlocked.



D-ring

D-rings are the attachment points sewn into a full-body harness. D-rings must have a minimum tensile strength of 5,000 pounds.

Deceleration Devices

Any mechanism with a maximum length of 3.5 feet, such as a rope grab, rip stitch lanyard, tearing or deforming lanyards, self-retracting lifelines, etc. which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

Because a shock-absorbing lanyard extends up to 3.5 feet, it's critical that the lanyard stops the worker before the next lower level. Allow about 20 vertical feet between the worker's anchorage point and the level below the working surface. Always estimate the total distance of a possible fall before using a shock-absorbing lanyard.

Remember: Never use a shock-absorbing lanyard if the shock absorber is even partially extended or if the lanyard has arrested a fall.

Shock Absorbing Lanyard

Deceleration devices protect workers from the impact of a fall and include shock-absorbing lanyards, self-retracting lifelines or lanyards, and rope grabs.

Because a shock-absorbing lanyard extends up to 3.5 feet, it's critical that the lanyard stops the worker before the next lower level. Allow about 20 vertical feet between the worker's anchorage point and the level below the working surface. Always estimate the total distance of a possible fall before using a shock-absorbing lanyard.

Self-Retracting Lanyards or Lifelines

Self-retracting lanyards and lifelines offer more freedom to move than shock-absorbing lanyards. Each has a drum-wound line that unwinds and retracts as the worker moves. If the worker falls, the drum immediately locks, which reduces free-fall distance to about two feet — if the anchorage point is directly above the worker. Some self-retracting lanyards will reduce free-fall distance to less than one foot. Self-retracting lanyards are available in lengths up to 20 feet. Self-retracting lifelines, which offer more freedom, are available in lengths up to 250 feet.

Rope Grab

A rope grab allows a worker to move up a vertical lifeline but automatically engages and locks on the lifeline if the worker falls.

When using a rope grab, keep the following in mind:

- The rope grab must be compatible with the lifeline.
- The rope grab must be correctly attached to the lifeline (not upside down).
- Keep the lanyard (between the rope grab and the body harness) as short as possible.
- Keep the rope grab as high as possible on the lifeline.

Lifelines

A lifeline is a cable or rope that connects to a body harness, lanyard, or deceleration device, and at least one anchorage. There are two types of lifelines, vertical and horizontal.

Vertical Lifeline: A vertical lifeline is attached to an overhead anchorage and must be connected directly to a worker's full-body harness, lanyard, retractable device, or rope grab; it must have a minimum breaking strength of 5,000 pounds. When a worker needs to move horizontally, however, a vertical lifeline can be hazardous due to the potential for a swing fall — the pendulum motion that results when the worker swings back under the anchor point. A swing fall increases a worker's risk of striking an object or a lower level during the pendulum motion.

Beware of swing falls!

If you use a self-retracting lanyard or lifeline, work below the anchorage to avoid a swing fall. The farther you move away from the anchorage, the farther you will fall and the greater your risk of swinging back into a hard object. Swing falls are hazardous because you can hit an object or a lower level during the pendulum motion.

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Horizontal Lifeline: Unlike a vertical lifeline, the horizontal lifeline stretches between two anchorages. When you connect a lanyard or rope grab to a horizontal lifeline, you can move about freely, thus reducing the risk of a swing fall. However, horizontal lifelines are subject to much greater loads than vertical lifelines. Horizontal lifelines can fail at the anchorage points if they're not installed correctly. For this reason, horizontal lifelines must be designed, installed, and used under the supervision of a qualified person.

Sag Angles: Any load on a horizontal lifeline will cause it to deflect or sag. The sag angle is a horizontal lifeline's angle of deflection when it's subjected to a load, such as a falling worker. Reducing the sag angle (making a horizontal lifeline too tight) actually increases the force on the line during a fall. As you tighten a horizontal lifeline, you increase the impact load dramatically!

For example, when the sag angle is 15 degrees, the force on the lifeline and anchorages subjected to a load is about 2:1. However, if you decrease the sag angle to five degrees, the force increases to about 6:1.

Fall Arrest Rules

When using personal fall arrest systems:

- If you fall, the impact force to the body has to be less than 1800 pounds, achieved by using shock absorbing lanyards and a harness.
- Minimize fall distance; the maximum free fall distance can only be 6 feet.
- There cannot be any structures below in your fall distance.
- Maximum weight of an individual w/tools is 310 pounds.

Guardrails

A guardrail system consists of a top rail, midrail, and intermediate vertical member. Guardrail systems can also be combined with toeboards that prevent materials from rolling off the walking/working surface.

Guardrail systems must be free of anything that might cut a worker or snag a worker's clothing. Top rails and midrails must be at least $\frac{1}{4}$ -inch thick to reduce the risk of hand lacerations; steel and plastic banding cannot be used for top rails and midrails.

Other requirements for guardrails include:

- Wire rope used for a top rail must be marked at least every six feet with high-visibility material.
- The top rail of a guardrail must be 42 inches (plus or minus three inches) above the walking/working surface. The top-edge height can exceed 45 inches if the system meets all other performance criteria.
- Midrails must be installed midway between the top rail and the walking/working surface unless there is an existing wall or parapet at least 21 inches high.
- Screens and mesh are required when material could fall between the top rail and midrail or between the midrail and the walking/working surface.
- Intermediate vertical members, when used instead of midrails between posts, must be no more than 19 inches apart.

- A guardrail system must be capable of withstanding a 200-pound force applied within two inches of its top edge in any outward or downward direction.
- Midrails, screens, and intermediate structural members must withstand at least 150 pounds of force applied in any downward or outward direction.

Safety Nets

Safety-net systems consist of mesh nets and connecting components.

- Safety-net openings can't be more than six inches on a side, center to center.
- Safety nets must not be installed more than 30 feet below the working surface.
- An installed net must be able to withstand a drop test consisting of a 400-pound sandbag, 30 inches in diameter, dropped from the working surface.
- Inspect safety nets regularly and remove debris from them no later than the start of the next work shift

Minimum horizontal distance from the edge of working surface to the net's outer edge	
Net distance below working surface	Minimum horizontal distance
Up to 5 feet	8 feet
5 feet to 10 feet	10 feet
More than 10 feet	13 feet

16.4.2.3 Other Fall Protection Systems and Methods

Fall Restraint System

A personal fall-restraint system prevents a worker from reaching an unprotected edge and thus prevents a fall from occurring. The system consists of an anchorage, connectors, and a body harness or a body belt. The attachment point to the body belt or full-body harness can be at the back, front, or side D-rings.

The anchorage for a fall-restraint system must support at least 3,000 pounds or be designed and installed by a qualified person and have a safety factor of at least two — twice the impact force of a worker free-falling six feet.

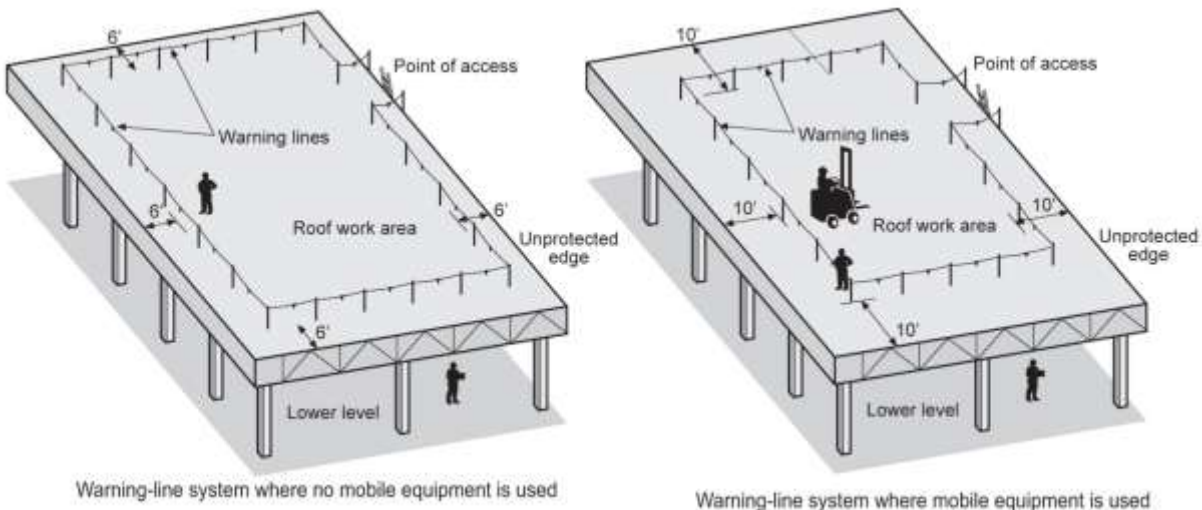
Positioning Device System

Positioning-device systems make it easier to work with both hands free on a vertical surface such as a wall or concrete form. Positioning-device systems are also called “class II Work-positioning systems” and “work-positioning systems”.

The components of a positioning-device system — anchorage, connectors, and body support — are similar to those of a personal fall arrest system. However, the systems serve different purposes. A positioning-device system provides support and must stop a free fall within two feet; a personal fall arrest system provides no support and must limit free-fall distance to six feet.

Fall Protection

- Anchorage. Positioning-device systems must be secured to an anchorage that can support at least twice the potential impact of a worker's fall or 3,000 pounds, whichever is greater.
- Connectors. Connectors must have a minimum strength of 5,000 pounds. Snap hooks and D-rings must be proof-tested to a minimum load of 3,600 pounds without deforming or breaking.
- Body support. A body belt is acceptable as part of a positioning-device system. However, it must limit the arresting force on a worker to 900 pounds and it can only be used for body support. A full-body harness is also acceptable but must limit the arrest force to 1,800 pounds. Belts or harnesses must have side D-rings or a single front D-ring for positioning.



Warning Line System

Warning line systems consist of ropes, wires, or chains, and supporting stanchions that form a barrier to warn those who approach an unprotected roof side or edge. The lines mark off an area within which one can do roofing work without using guardrails or safety nets; warning line systems can be combined with guardrail systems, personal fall arrest systems, or safety monitoring systems to protect those doing roofing work on low slope roofs (4:12 or less, 2:12 in some jurisdictions).

When mechanical equipment is not being used, the warning line shall be erected not less than 6 feet from the roof edge. When mechanical equipment is being used, the warning line shall be erected not less than 6 feet from the roof edge which is parallel to the direction of mechanical equipment operation, and not less than 10 feet (3.1 m) from the roof edge which is perpendicular to the direction of mechanical equipment operation.

Safety Monitoring System

A safety monitoring system is a set of procedures assigned to a competent person for monitoring and warning workers who may be unaware of fall hazards. A safety monitoring system used in conjunction with a controlled access zone and a fall protection plan is also appropriate in situations where conventional fall protection is not feasible.

Controlled Access Zones

The controlled access zone is best thought of as a combination of a warning line system and a safety monitoring system.

It defines an area where workers can do leading edge, overhand bricklaying and related work, or work under a fall protection plan without using conventional fall protection. All others are prohibited from entering a controlled access zone. The zone is created by erecting a control line, or lines, to restrict access to the area. The control line warns workers that access to the zone is limited to authorized persons.

Control lines must meet the following criteria:

- Consist of ropes, wires, tapes, or equivalent materials and supporting stanchions;
- Be flagged at least every 6 feet with high visibility material;
- Be no less than 39 inches from the working surface at its lowest point and no more than 45 inches from the working surface at its highest point (50 inches in overhand bricklaying operations);
- Have a minimum breaking strength of 200 lbs; and
- For work such as overhand bricklaying, the control lines should be 10-15 ft from the unprotected edge.

16.4.2.4 Protecting Workers From Falling Objects

Those who work on elevated surfaces must be familiar with systems and methods that control their exposure to fall hazards; they must also ensure that their equipment and tools don't endanger workers below them.

Common methods for protecting workers from falling objects include the following:

- Canopies suspended above the work area;
- Barricades and fences to keep people from entering unsafe areas; and
- Screens, guardrail systems, and toeboards to prevent materials from falling to lower levels.

The following guidelines will help you keep your tools and equipment where they belong:

- If you use toeboards, they must be strong enough to withstand a force of at least 50 lbs applied in any downward or outward direction and be at least 3½ inches high.
- If you need to pile material higher than the top edge of a toeboard, install panels or screens to keep the material from dropping over the edge.
- If you use canopies as falling object protection, make sure they won't collapse or tear from an object's impact.

- You can use guardrails with toeboards as falling object protection if the guardrail openings are small enough to keep the objects from falling through.
- When you do overhand bricklaying work, keep material and equipment – except masonry and mortar – at least four feet from the working edge. Remove excess mortar and other debris regularly.
- When you do roofing work, keep materials and equipment at least six feet from the roof edge unless there are guardrails along the edge. All piled, grouped, or stacked material near the roof edge must be stable and self-supporting.

16.4.3 The Fall Protection Plan

Employees doing leading edge work, precast concrete erection work, or residential construction work for whom conventional fall protection equipment is infeasible or creates a greater hazard may be protected by a fall protection plan instead. A fall protection plan used by *Pyro Combustion & Controls Inc.* will conform to the following standards:

- The fall protection plan shall be prepared by a qualified person and developed for the site where the leading edge work, precast concrete work, or residential construction work is being performed, and the plan must be maintained up to date.
- A qualified person must approve any changes to the fall protection plan.
- A copy of the fall protection plan and changes will be maintained at the job site.
- A competent person will implement the fall protection plan.
- The fall protection plan shall document the reasons why the use of conventional fall protection systems (guardrail systems, personal fall arrest systems, or safety nets systems) are infeasible or why their use would create a greater hazard.
- The fall protection plan shall include a written discussion of other measures that will be taken to reduce or eliminate the fall hazard for workers who cannot be provided with protection from the conventional fall protection systems. For example, the employer shall discuss the extent to which scaffolds, ladders, or vehicle mounted work platforms can be used to provide a safer working surface and thereby reduce the hazard of falling.
- The fall protection plan shall identify each location where conventional fall protection methods cannot be used. These locations shall then be classified as controlled access zones and adhere to all appropriate policies and regulations.
- Where no other alternative measure has been implemented, the employer shall implement a safety monitoring system.
- The fall protection plan must include a statement which provides the name or other method of identification for each employee who is designated to work in controlled access zones. No other employees may enter controlled access zones.
- In the event an employee falls, or some other related, serious incident occurs, the employer shall investigate the circumstances of the fall or other incident to determine if the fall protection plan needs to be changed (e.g. new practices, procedures, or training) and shall implement those changes to prevent similar types of falls or incidents.

16.4.4 Inspecting & Maintaining Fall-Protection Equipment

Employees will inspect fall protection systems and equipment regularly for wear or damage.

- Inspect manila, plastic or synthetic rope used for top rails or midrails or a guardrail system frequently.
- Inspect safety nets at least once a week, removing defective nets from service.
- Inspect PFASs or positioning device systems everytime they are used.
- A PFAS that has been subjected to a fall must not be used again until a competent person determines it is safe.

16.4.4.1 Lanyard Inspections

Hardware

Snaps

Inspect closely for hook and eye distortions, cracks, corrosion, or pitted surfaces. The keeper (latch) should seat into the nose without binding and should not be distorted or obstructed. The keeper spring should exert sufficient force to firmly close the keeper. Keeper locks must prevent the keeper from opening when the keeper closes.

Thimbles

The thimble must be firmly seated in the eye of the splice, and the splice should have no loose or cut strands. The edges of the thimble must be free of sharp edges, distortion, or cracks.

Lanyards

Wire Rope (Steel) Lanyard

Always wear gloves when inspecting a wire rope lanyard because broken strands can cause injury. To inspect, rotate the wire rope lanyard while watching for cuts, frayed areas or unusual wearing patterns on the wire. Broken strands will separate from the body of the lanyard.

Web Lanyard

While bending webbing over a pipe, observe each side of the webbed lanyard. This will reveal any cuts, snags or breaks. Swelling, discoloration, cracks and charring are obvious signs of chemical or heat damage. Observe closely for any breaks in stitching.

Rope Lanyard

Rotate the rope lanyard while inspecting from end-to-end for any fuzzy, worn, broken or cut fibers. Weakened areas from extreme loads will appear as a noticeable change in original diameter. The rope diameter should be uniform throughout, following a short break-in period.

Shock Absorber Pack

The outer portion of the pack should be examined for burn holes and tears. Stitching on areas where the pack is sewn to D-rings, belts or lanyards should be examined for loose strands, rips, deterioration or other signs of activation.

Shock-Absorbing Lanyard

Shock-absorbing lanyards should be examined as a web lanyard. However, also look for the warning flag or signs of deployment. If the flag has been activated, remove this shock-absorbing lanyard from service.

Common Types of Damage to Webbing and Lanyards

Heat

In excessive heat, nylon becomes brittle and has a shriveled brownish appearance. Fibers will break when flexed and should not be used above 180 degrees Fahrenheit.

Chemical

Change in color usually appears as a brownish smear or smudge. Transverse cracks appear when belt is bent over tight. This causes a loss of elasticity in the belt.

Ultraviolet Rays

Do not store webbing and rope lanyards in direct sunlight, because ultraviolet rays can reduce the strength of some material.

Molten Metal or Flame

Webbing and rope strands may be fused together by molten metal or flame. Watch for hard, shiny spots or a hard and brittle feel. Webbing will not support combustion, nylon will.

Paint and Solvents

Paint will penetrate and dry, restricting movements of fibers. Drying agents and solvents in some paints will appear as chemical damage.

16.4.4.2 Self-Retracting Lines

Check Housing

Before every use, inspect the unit's housing for loose fasteners and bent, cracked, distorted, worn, malfunctioning or damaged parts.

Lifeline

Test the lifeline retraction and tension by pulling out several feet of the lifeline and allow it to retract back into the unit. Maintain a light tension on the lifeline as it retracts. The lifeline should pull out freely and retract all the way back into the unit. Do not use the unit if the lifeline does not retract. Also check for signs of damage. Inspect for cuts, burns, corrosion, kinks, frays or worn areas. Inspect any sewing (web lifelines) for loose, broken or damaged stitching.

Braking Mechanism

Test the braking mechanism by grasping the lifeline above the load indicator and applying a sharp steady pull downward to engage the brake. There should be no slippage of the lifeline while the brake is engaged. Once tension is released, the brake should disengage and the unit should return to the retractable mode. Do not use the unit if the brake does not engage.

Snap Hook

Check the snap hook to be sure it operates freely, locks, and the swivel operates smoothly. Inspect the snap hook for any signs of damage to the keepers and any bent, cracked, or distorted components.

Anchorage Connection

Make sure the carabiner is properly seated and in the locked position between the attachment swivel/point on the device and the anchor point

16.4.4.3 Harness Inspection

Webbing

Grasp the webbing with your hands 6 inches (152 mm) to 8 inches (203mm) apart. Bend the webbing in an inverted “U”. The surface tension resulting makes damaged fibers or cuts easier to detect. Follow this procedure the entire length of the webbing, inspecting both sides of each strap. Look for frayed edges, broken fibers, pulled stitches, cuts, burns and chemical damage.

D-Rings/Back Pads

Check D-rings for distortion, cracks, breaks, and rough or sharp edges. The D-ring should pivot freely. Inspect for any unusual wear, frayed or cut fibers, or broken stitching of the D-ring attachments. Pads should also be inspected for cracks, excessive wear, or other signs of damage.

Buckles

Inspect for any unusual wear, frayed or cut fibers, or broken stitching of buckle attachments.

Tongue Buckles/Grommets

Buckle tongues should be free of distortion in shape and motion. They should overlap the buckle frame and move freely back and forth in their socket. Roller should turn freely on frame. Check for distortion or sharp edges. Inspect for loose, distorted or broken grommets. Webbing should not have additional punched holes.

Friction and Mating Buckles

Inspect the buckle for distortion. The outer bars and center bars must be straight. Pay special attention to corners and attachment points at the center bar.

Quick-Connect Buckles

Inspect the buckle for distortion. The outer bars and center bars must be straight. Make sure buckles engage properly.

Harness Fall Arrest Indicators

Inspect fall arrest indicators (located on the back D-ring pad) for signs of activation. Remove from service if broken or stretched between any of the four pairs of arrows.

16.4.4.4 Cleaning of Equipment

Basic care for fall protection safety equipment will prolong the life of the equipment and contribute to its safety performance. Proper storage and maintenance after use is as important as cleaning dirt, corrosives or contaminants off the equipment. The storage area should be clean, dry, and free of exposure to fumes or corrosive elements.

Nylon and Polyester

Wipe off all surface dirt with a sponge dampened in plain water. Squeeze the sponge dry. Dip the sponge in a mild solution of water and commercial soap or detergent. Work up a thick lather with a vigorous back and forth motion. Then wipe the belt dry with a clean cloth. Hang freely to dry but away from excessive heat.

Housing

Periodically clean the unit using a damp cloth and mild detergent. Towel dry.

Drying

Harness, belts, and other equipment should be dried thoroughly without exposure to heat, steam, or long periods of sunlight.

16.4.5 Emergency Planning

The best strategy for protecting workers from falls is to eliminate the hazards that cause falls. If you can't eliminate the hazards, you must protect workers with an appropriate fall-protection system or method. If a worker is suspended in a personal fall-arrest system, you must provide for a prompt rescue.

The emergency response plan outlines key rescue and medical personnel, equipment available for rescue, emergency communications procedures, retrieval methods, and primary first-aid requirements. Please see the chapter on Emergency Action Plans for more information.

16.4.5.1 Before Work Begins

- Identify emergencies that could affect your work site.
- Establish a chain of command.
- Document procedures for responding to emergencies and make sure they're available at the site.
- Post emergency-responder phone numbers and addresses at the work site.
- Identify critical resources and rescue equipment.
- Train on-site responders.
- Identify off-site responders and inform them about any conditions at the site that may hinder a rescue effort.
- Identify emergency entry and exit routes.
- Make sure responders have quick access to rescue and retrieval equipment, such as lifts and ladders.

16.4.5.2 During Work

- Identify on-site equipment that can be used for rescue and retrieval, such as extension ladders and mobile lifts.
- Maintain a current rescue-equipment inventory at the site. Equipment may change frequently as the job progresses.
- Re-evaluate and update the emergency-response plan when on-site work tasks change.

16.4.5.3 When an Emergency Occurs

- First responders should clear a path to the victim. Others should direct emergency personnel to the scene. You can use 911 for ambulance service; however, most 911 responders are not trained to rescue a worker suspended in a personal fall-arrest system.
- Make sure only trained responders attempt a technical rescue.
- Prohibit all nonessential personnel from the rescue site.

16.4.5.4 After an Emergency

- Report fatalities and catastrophes to OSHA within eight hours.
- Report injuries requiring overnight hospitalization with medical treatment (other than first aid) to OSHA within 24 hours.
- Identify equipment that may have contributed to the emergency and put it out of service.
- Have a competent person examine equipment. If the equipment is damaged, repair or replace it. If the equipment caused the accident, determine how and why.
- Document in detail the cause of the incident and describe how it can be prevented from happening again.
- Review emergency procedures. Determine how the procedures could be changed to prevent similar events. Revise the procedures accordingly.

16.5 Forms & Attachments

On the following pages, please find the following document(s):

- Fall Hazard Assessment
- Employee Training for Fall Protection Certification

Fall Protection

Fall Hazard Assessment			
Job Name:		Location:	
Date Assessed:	Related Operating Procedures Reviewed: <input type="checkbox"/> YES <input type="checkbox"/> NO	Location Marked and Entry Controlled: <input type="checkbox"/> YES <input type="checkbox"/> NO	
FALL HAZARD ASSESSMENT CHECKLIST			
1. Can an employee enter the area without restriction and perform work?		<input type="checkbox"/> YES	<input type="checkbox"/> NO
2. Are fall prevention systems such as cages, guardrails, toeboards, and manlifts in place?		<input type="checkbox"/> YES	<input type="checkbox"/> NO
3. Have slipping and tripping hazards been removed or controlled?		<input type="checkbox"/> YES	<input type="checkbox"/> NO
4. Have visual warnings of fall hazards been installed?		<input type="checkbox"/> YES	<input type="checkbox"/> NO
5. Can the distance a worker could fall be reduced by installing platforms, nets etc.?		<input type="checkbox"/> YES	<input type="checkbox"/> NO
6. Are any permanently installed floor coverings, gratings, hatches, or doors missing?		<input type="checkbox"/> YES	<input type="checkbox"/> NO
7. Does the location contain any other recognized safety and or health hazards?		<input type="checkbox"/> YES	<input type="checkbox"/> NO
8. Is the space designated as a Permit Required Confined Space?		<input type="checkbox"/> YES	<input type="checkbox"/> NO
9. Have anchor points been designated and load tested?		<input type="checkbox"/> YES	<input type="checkbox"/> NO
ASSESSMENT INFORMATION			
Initials	Hazard	Remarks/Recommendations	
	Total potential fall distance:		
	Number of workers involved:		
	Frequency of task:		
	Obtainable anchor point strength:		
	Required anchor point strength: (not less than 5000 lbs)		
ADDITIONAL REQUIREMENTS			
Potential environmental conditions that could impact safety:			
Initials	Condition	Remarks/Recommendations	
Possible required structural alterations:			
Initials	Alteration	Remarks/Recommendations	
Possible task modification that may be required:			
Initials	Task	Remarks/Recommendations	
Training requirements:			
Initials	Requirement	Remarks/Recommendations	
Personal protective equipment required:			
Initials	Requirement	Remarks/Recommendations	
Comments:			
<input type="checkbox"/> Approved <div style="float: right; text-align: right;"> AUTHORIZATION I certify that I have conducted a Fall Hazard Assessment of the above designated location and have detailed the findings of the assessment on this form. * Further detailed on attachment: <input type="checkbox"/> YES <input type="checkbox"/> NO </div>			
Title:		Date:	Time:
Name:		Signature:	

17**Heavy Equipment**

17.1 Policy Statement

The use of heavy equipment/mobile equipment is part of many jobs conducted by *Pyro Combustion & Controls Inc.* employees. *Pyro Combustion & Controls Inc.* recognizes the hazards associated with the operation of heavy equipment/mobile equipment, and has developed this policy to establish guidelines in an attempt to eliminate injuries or fatalities related to this type of equipment.

This policy applies to all free moving mobile equipment that may be propelled by gasoline, propane, diesel or electricity, however the policy is not intended for operators of licensed and registered (by the Department of Motor Vehicles) automobiles and similar motor vehicles intended for use by licensed motor vehicle operators on public roads and highways.

Only competent personnel may operate heavy equipment/mobile equipment. An individual's competency must be demonstrated by successful completion of the training and evaluation process specified in this policy. This policy establishes requirements to work in or around all types of mobile equipment.

17.2 Responsibilities

Preventing injuries from heavy equipment is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

17.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Only allow trained and experienced operators to operate heavy equipment;
- Ensure training occurs under people qualified and experienced with the type of equipment used;
- Ensure heavy equipment at the worksite has rollover protective structures (ROPSs) and seatbelts as required;
- Identify and inform workers of the hazards of power lines and utilities during a storm;
- Ensure efficacy of all safety features on any piece of machinery or equipment onsite;
- Establish limited access zones to keep workers away from heavy machinery; and
- Ensure each employee is trained in appropriate skills needed to do his or her job safely.

17.2.2 Employee Responsibilities

Heavy equipment operators at *Pyro Combustion & Controls Inc.* are expected to:

- Review all safe operating procedures in the operator's manual before working with a new piece of equipment;
- Inspect equipment daily;
- Maintain all walking and working surfaces free of grease and fluids;
- Keep equipment away from unstable soil, steep grades or embankments to prevent rollovers;
- Avoid heavy equipment without rollover protective structures (ROPSs);
- Always put the transmission in park, shut off the motor, set the brakes, and perform any other needed shutdown procedures/lockout of controls and/or attachments before working on or around the equipment;
- Ensure no one is behind the vehicle before backing up;
- Keep unauthorized personnel and vehicles safe with barriers;
- Ensure only essential workers are anywhere near the equipment;
- Keep coworkers off equipment and out from under suspended loads; and
- Drive equipment safely.

17.3 Training

Pyro Combustion & Controls Inc. will ensure every heavy equipment operator is competent to operate the equipment safely, as demonstrated by the successful completion of the training and evaluation specified in this section.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to educational level, literacy, and language of employees.

17.3.1 Implementation

Trainees may operate heavy equipment only:

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

Training will consist of a combination of formal instruction (e.g., lecture, discussion, interactive computer learning, video tape, written material), practical training (demonstrations performed by the trainer and practical exercises performed by the trainee), and evaluation of the operator's performance on the job-site.

All operator training and evaluation will be conducted by persons who have the knowledge, training, and experience to train heavy equipment operators and evaluate their competence.

17.3.2 Training Components

Gary Pfizenmayer will ensure that every employee will be trained in the following minimum elements:

Equipment-Related Topics

- Operating instructions, warnings, and precautions for the types of equipment the operator will be authorized to operate.
- Differences between the equipment and an automobile.
- Equipment controls and instrumentation: where they are located, what they do, and how they work.
- Engine or motor operation.
- Steering and maneuvering.
- Visibility (including restrictions due to loading).
- Implement and attachment adaptation, operation, and use limitations.
- Equipment capacity.
- Vehicle stability.
- Any equipment inspection and maintenance that the operator will be required to perform.
- Refueling and/or charging and recharging of batteries.
- Operating limitations.
- Any other operating instructions, warnings, or precautions listed in the operator's manual for the types of equipment that the employee is being trained to operate.

Workplace-Related Topics

- Surface conditions where the equipment will be operated.
- Composition of loads to be carried and load stability.
- Load maneuvering, loading, and unloading. (Includes trucks, hoppers, etc.)
- Pedestrian traffic in areas where the equipment will be operated.
- Confined areas and other restricted places where equipment will be operated.
- Hazardous (classified) locations where the equipment will be operated.
- Ramps and other sloped surfaces that could affect the vehicle's stability.
- Closed environments and other areas where insufficient ventilation or poor vehicle maintenance could cause buildup of carbon monoxide or diesel exhaust.
- Other unique or potentially hazardous environmental conditions in the workplace that could affect safe operation.

17.3.3 Duplicative Training

If an operator has previously received training in a topic specified in this section, and such training is appropriate to the equipment and working conditions encountered, additional training in that topic is not required if the operator has been evaluated and found competent to operate the equipment safely.

17.3.4 Training Records

Training records will serve to certify each operator has been trained and evaluated and will include the following information:

- The dates of the training sessions and evaluation;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training or evaluation; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

17.4 Policy

17.4.1 General Requirements

All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of the equipment.

A safety tire rack, cage, or equivalent protection shall be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.

Heavy machinery, equipment, or parts thereof, which are suspended or held aloft by use of slings, hoists, or jacks shall be substantially blocked or cribbed to prevent falling or shifting before employees are permitted to work under or between them. Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment, shall be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the motors stopped and brakes set, unless work being performed requires otherwise.

Whenever the equipment is parked, the parking brake shall be set. Equipment parked on inclines shall have the wheels chocked and the parking brake set.

The use, care and charging of all batteries shall conform to OSHA requirements.

All cab glass shall be safety glass, or equivalent, that introduces no visible distortion affecting the safe operation of any machine covered by this subpart.

17.4.1.1 Working Near Power Lines

All equipment covered under this policy shall comply with the following requirements when being moved in the vicinity of power lines or energized transmitters, except where electrical distribution and transmission lines have been deenergized and visibly grounded at point of work or where insulating barriers — not a part of (or an attachment to) the equipment or machinery — have been erected to prevent physical contact with the lines:

- For lines rated 50 kV or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet;
- For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV over 50 kV, or twice the length of the line insulator, but never less than 10 feet;
- In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV, and 10 feet for voltages over 50 kV, up to and including 345 kV, and 16 feet for voltages up to and including 750 kV;
- A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means;
- Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not alter the requirements of any other regulation of this part even if such device is required by law or regulation;
- Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded;
- Prior to work near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter shall be de-energized or tests shall be made to determine if electrical charge is induced on the crane. The following precautions shall be taken when necessary to dissipate induced voltages:
 - The equipment shall be provided with an electrical ground directly to the upper rotating structure supporting the boom, and
 - Ground jumper cables shall be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Crews shall be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load; and
- Combustible and flammable materials shall be removed from the immediate area prior to operations.

17.4.1.2 Rolling Railroad Cars

Derail and/or bumper blocks shall be provided on spur railroad tracks where a rolling car could contact other cars being worked, enter a building, work or traffic area.

17.4.2 Motor Vehicles

Motor vehicles as covered by this part are those vehicles that operate within an off-highway jobsite, not open to public traffic. The requirements of this section do not apply to equipment for which rules are prescribed in later.

17.4.2.1 General Requirements

All vehicles shall have a service brake system, an emergency brake system, and a parking brake system. These systems may use common components, and shall be maintained in operable condition.

Whenever visibility conditions warrant additional light, all vehicles, or combinations of vehicles, in use shall be equipped with at least two headlights and two taillights in operable condition.

All vehicles, or combination of vehicles, shall have brake lights in operable condition regardless of light conditions.

All vehicles shall be equipped with an adequate audible warning device at the operator's station and in an operable condition.

No employer shall use any motor vehicle equipment having an obstructed view to the rear unless:

- The vehicle has a reverse signal alarm audible above the surrounding noise level; or
- The vehicle is backed up only when an observer signals that it is safe to do so.

All vehicles with cabs shall be equipped with windshields and powered wipers. Cracked and broken glass shall be replaced. Vehicles operating in areas or under conditions that cause fogging or frosting of the windshields shall be equipped with operable defogging or defrosting devices.

All haulage vehicles, whose pay load is loaded by means of cranes, power shovels, loaders, or similar equipment, shall have a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.

Tools and material shall be secured to prevent movement when transported in the same compartment with employees.

Vehicles used to transport employees shall have seats firmly secured and adequate for the number of employees to be carried.

Seat belts and anchorages meeting the DOT requirements shall be installed in all motor vehicles.

Trucks with dump bodies shall be equipped with positive means of support, permanently attached, and capable of being locked in position to prevent accidental lowering of the body while maintenance or inspection work is being done.

Operating levers controlling hoisting or dumping devices on haulage bodies shall be equipped with a latch or other device which will prevent accidental starting or tripping of the mechanism.

Trip handles for tailgates of dump trucks shall be so arranged that, in dumping, the operator will be in the clear.

Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.

All vehicles in use shall be checked at the beginning of each shift to assure that the following parts, equipment, and accessories are in safe operating condition and free of apparent damage that could cause failure while in use:

- service brakes, including trailer brake connections;
- parking system (hand brake);
- steering mechanism;
- emergency stopping system (brakes);
- tires;
- horn;
- coupling devices;
- seat belts;
- operating controls; and
- safety devices.

Correct all defects corrected before placing the vehicle in service. These requirements also apply to equipment such as lights, reflectors, windshield wipers, defrosters, fire extinguishers, etc., where such equipment is necessary.

17.4.3 Material Handling Equipment

17.4.3.1 Earthmoving Equipment

The rules under this heading apply to these types of earthmoving equipment:

- scrapers,
- loaders, crawler or wheel tractors,
- graders,
- agricultural and industrial tractors,
- bulldozers,
- off-highway trucks, and
- similar equipment.

Seat Belts

Earthmoving equipment, unless designed only for standup operation or it has no roll-over protection structure, must have seatbelts that meet Society of Automotive Engineers (SAE) specifications

Access Roadways and Grades

Any access road or grade must be constructed and maintained to accommodate construction equipment or vehicles permitted upon them.

Emergency access ramps and berms must restrain and control runaway vehicles.

Brakes

Earthmoving equipment must have a breaking system capable of stopping and holding the equipment, as specified by the appropriate SAE standard.

Fenders

Pneumatic-tired earth-moving haulage equipment whose maximum speed exceeds 15 miles per hour, shall be equipped with fenders on all wheels to meet the requirements of SAE J321a-1970, Fenders for Pneumatic-Tired Earthmoving Haulage Equipment.

Audible Alarms

Bidirectional machines, such as rollers, compacters, front-end loaders, bulldozers, and similar equipment, shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction. The horn shall be maintained in an operative condition.

Earthmoving or compacting equipment with an obstructed view to the rear may not be used in reverse gear unless the equipment has in operation a reverse signal alarm distinguishable from the surrounding noise level or an employee signals that it is safe to do so.

Scissor Points

Scissor points on all front-end loaders are a hazard to the operator during normal operation and must be guarded.

17.4.3.2 Excavating and Other Equipment

Tractors must have seatbelts for operators when seated in the normal seating arrangement for tractor operation, regardless of whether they are being used with attachments for excavating.

17.4.3.3 Lifting and Hauling Equipment

Industrial Trucks will meet all applicable requirements set forth elsewhere in OSHA regulations and the following:

- Post the rated capacity on lift trucks, stackers, etc., to be clearly visible to the operator. When auxiliary removable counterweights are provided by the manufacturer, corresponding alternate rated capacities also shall be clearly shown on the vehicle. These ratings shall not be exceeded.
- Modifications or additions that affect the capacity or safe operation of the equipment require manufacturer's written approval. If such modifications or changes are made, change the capacity, operation, and maintenance instruction plates, tags, or decals accordingly. In no case shall the original safety factor of the equipment be reduced.
- If a load is lifted by two or more trucks working in unison, the proportion of the total load carried by any one truck shall not exceed its capacity.
- Steering or spinner knobs shall not be attached to the steering wheel unless the steering mechanism is of a type that prevents road reactions from causing the steering handwheel to spin. The steering knob shall be mounted within the periphery of the wheel.
- All high lift rider industrial trucks must have overhead guards meeting configuration and structural requirements as defined in paragraph 421 of American National Standards Institute B56.1-1969, Safety Standards for Powered Industrial Trucks.

- All industrial trucks in use shall meet the applicable requirements of design, construction, stability, inspection, testing, maintenance, and operation, as defined in American National Standards Institute B56.1-1969, Safety Standards for Powered Industrial Trucks.
- Unauthorized personnel shall not be permitted to ride on powered industrial trucks. A safe place to ride shall be provided where riding of trucks is authorized.
- Whenever a truck is equipped with vertical only, or vertical and horizontal controls elevatable with the lifting carriage or forks for lifting personnel, the following additional precautions shall be taken for the protection of personnel being elevated.
- A safety platform firmly secured to the lifting carriage and/or forks.
- Means whereby personnel on the platform can shut off power to the truck.
- Protection from falling objects as indicated necessary by the operating conditions.

17.4.4 Pile Driving Equipment

17.4.4.1 General Requirements

- Boilers and piping systems which are a part of, or used with, pile driving equipment shall meet the applicable requirements of the American Society of Mechanical Engineers, Power Boilers.
- Pressure vessels part of, or used with, pile driving equipment must meet applicable requirements of the American Society of Mechanical Engineers.
- Overhead protection, which will not obscure the vision of the operator and which meets OSHA requirements, must be provided. Protection shall be the equivalent of 2-inch planking or other solid material of equivalent strength.
- Stop blocks shall be provided for the leads to prevent the hammer from being raised against the head block.
- A blocking device, capable of safely supporting the weight of the hammer, shall be provided for placement in the leads under the hammer at all times while employees are working under the hammer.
- Provide guards across the top of the head block to prevent the cable from jumping out of the sheaves.
- When the leads must be inclined in the driving of batter piles, provisions shall be made to stabilize the leads.
- Fixed leads shall be provided with ladder, and adequate rings, or similar attachment points, so the loft worker may engage his safety belt lanyard to the leads. If the leads are provided with loft platform(s), protect such platform(s) by standard guardrails.
- Steam hose leading to a steam hammer or jet pipe shall be securely attached to the hammer with an adequate length of at least ¼-inch diameter chain or cable to prevent whipping in the event the joint at the hammer is broken. Air hammer hoses shall be provided with the same protection as required for steam lines.
- Safety chains, or equivalent means, shall be provided for each hose connection to prevent the line from thrashing around in case the coupling becomes disconnected.

Heavy Equipment

- Steam line controls shall consist of two shutoff valves, one of which shall be a quick-acting lever type within easy reach of the hammer operator.
- Guys, outriggers, thrustouts, or counterbalances shall be provided as necessary to maintain stability of pile driver rigs.

17.4.4.2 Equipment

- Engineers and winchmen shall accept signals only from the designated signalmen.
- All employees shall be kept clear when piling is being hoisted into the leads.
- When piles are being driven in an excavated pit, the walls of the pit shall be sloped to the angle of repose or sheet-piled and braced.
- When steel tube piles are being “blown out”, employees shall be kept well beyond the range of falling materials.
- When it is necessary to cut off the tops of driven piles, pile driving operations shall be suspended except where the cutting operations are located at least twice the length of the longest pile from the driver.
- When driving jacked piles, all access pits shall be provided with ladders and bulkheaded curbs to prevent material from falling into the pit.

17.4.5 Site Clearing

17.4.5.1 General Requirements

- Protect employees engaged in site clearing from hazards of irritant and toxic plants and ensure each is suitably instructed in the first aid treatment available.
- All equipment used in site clearing operations shall be equipped with rollover guards meeting OSHA requirements.
- Rider-operated equipment shall be equipped with an overhead and rear canopy guard meeting the following requirements:
- The overhead covering on this canopy structure shall be 1/8-inch or greater steel plate or 1/4-inch woven wire mesh with openings no greater than 1 inch, or equivalent.
- The opening in the rear of the canopy structure shall be covered with not less than 1/4-inch woven wire mesh with openings no greater than 1 inch.

17.5 Forms and Attachments

On the following pages, please find the following document:

- Heavy Equipment Checklist

This form may be reproduced freely by *Pyro Combustion & Controls Inc.* for the purposes of implementing and maintaining a safety and health program.

Heavy Equipment Safety Checklist

Inspect daily and before use onsite

Date: ___/___/___ Time: ___:___ am/pm Equipment Type: _____

Location: _____ Inspector: _____

Item	Good	Need Repair	N/A
Tires/Tracks			
Hydraulic Oil			
Hose Condition			
Oil leak/lube			
Cab, mirrors, seat belt and glass			
Horn			
Gauges			
Lights			
Turn signals			
Backup lights and alarm			
Brakes			
Fire extinguisher			
Engine oil			

Item	Good	Need Repair	N/A
Blade/ Boom/ Ripper condition			
Exhaust system			
Transmission fluid			
Brake fluid			
Cooling system fluid			
Windshield wipers and fluid			
Coupling devices and connectors			
Fan belts/ hoses			
Cables / lines / etc.			

Notes:

18**Confined Spaces**

18.1 Policy Statement

Pyro Combustion & Controls Inc. is committed to a safe, healthful workplace for its employees. Confined work spaces that present hazards to workers demand controls to reduce exposure to those hazards. The purpose of this written program is to identify all permit spaces at this workplace and ensure authorized employees will enter, work in, and exit the spaces safely.

18.2 Responsibilities

Safety in hazardous confined spaces is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

18.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Evaluate the workplace to determine whether any spaces are permit-required confined spaces;
- Inform exposed employees of presence of permit-required confined spaces with signs or equally effective means;
- Take measures to prevent employees from entering permit spaces without permit.
- Develop and implement a written permit space program — available for inspection by employees or their representatives — if employees are permitted to enter permit spaces;
- Reevaluate, and reclassify as necessary, a non-permit confined space when there are changes in use or configuration of that space that may increase hazards to entrants;
- Abide by all applicable standards and regulations when work with a contractor involves permit space entry;
- Provide and keep in good repair all equipment necessary for the written permit space program;
- Evaluate permit space conditions when entry operations are concluded;
- Provide at least one attendant outside permit space during entry operations able to respond to an emergency;
- Designate individuals with active roles in entry operations, identify their duties and provide appropriate training;
- Develop and implement all other elements of a permit space program including, but not limited to, the following:
 - Procedures for summoning rescue and emergency services;
 - System for preparing, issuing, using and cancelling entry permits;

- Procedures to coordinate entry operations with another employer so employees of one employer don't endanger employees of another;
- Procedures for concluding entry;
- Review entry operations and the permit space program to ensure employees are protected from permit space hazards; and
- Consult with affected employees or their representatives in the development and implementation of all elements of the permit space program, and make available to them all information required for the permit space program.

18.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Assist in identifying confined spaces and permit spaces;
- Assist in training employees regarding permit space procedures;
- Participate in regular review of permit space program as necessary;
- Offer to management recommendations from employees about the permit space program; and
- Assist in confined space entry procedures and rescue operations as required.

18.2.3 Employee Responsibilities

Employees are expected to abide by the confined space entry program. These responsibilities vary according to the role the employee serves with each entry:

18.2.3.1 Authorized Entrant

Authorized entrants must:

- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
- Properly use all equipment necessary for safe entry into any permit space, as well as any equipment necessary to ensure safe conditions within the permit space and equipment to provide safe rescue from the space;
- Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space;
- Alert the attendant whenever the entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or the entrant detects a prohibited condition; and
- Exit from the permit space as quickly as possible whenever:
 - An order to evacuate is given by the attendant or the entry supervisor,
 - The entrant recognizes any warning sign or symptom of exposure to a dangerous situation,
 - The entrant detects a prohibited condition, or
 - An evacuation alarm is activated.

18.2.3.2 Attendant

Attendants must:

- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure; and possible behavioral effects of hazard exposure in authorized entrants;
- Continuously maintain an accurate count of authorized entrants in the permit space and ensure the means used to identify authorized entrants accurately identify entrants;
- Remain outside the permit space during entry operations until relieved by another attendant (If the permit entry program allows attendant entry for rescue, attendants may enter a permit space to attempt a rescue if they have been trained and equipped for rescue operations and if they have been relieved.);
- Communicate with authorized entrants as necessary to monitor entrant status and alert entrants of the need to evacuate the space;
- Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:
 - If the attendant detects a prohibited condition;
 - If the attendant detects the behavioral effects of hazard exposure in an authorized entrant;
 - If the attendant detects a situation outside the space that could endanger the authorized entrants; or
 - If the attendant cannot effectively and safely perform all the duties required;
- Summon rescue and emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from hazards;
- Takes the following actions when unauthorized persons approach or enter a permit space while entry is underway:
 - Warn the unauthorized persons that they must stay away from the permit space;
 - Advise the unauthorized persons that they must exit immediately if they have entered the permit space; and
 - Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space;
- Perform non-entry rescues as specified by the rescue procedure; and
- Perform no duties that might interfere with the primary duty to monitor and protect the authorized entrants.

18.2.3.3 Entry Supervisor

Entry supervisors must:

- Know the hazards that may be faced during entry, including information on the mode of possible exposure, signs or symptoms, and consequences of the exposure;
- Verify, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and all procedures and equipment specified by the permit are in place before allowing entry to begin;
- Terminate the entry and cancel the permit when required;
- Verify that rescue services are available and that the means for summoning them are operable;
- Remove unauthorized individuals who enter or who attempt to enter the permit space during entry operations; and
- Determine — upon transfer of responsibility for a permit space entry operation and when dictated by the hazards and operations performed within the space — that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

18.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on confined spaces. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to the educational level, literacy, and language of employees.

18.3.1 Training Components

Gary Pfizenmayer will ensure that every employee will be trained in the following minimum elements:

- How to identify a confined workspaces;
- The need for safe confined space entry procedures;
- Hazards present in confined spaces and inherent hazards presented by any confined space in the workplace; and
- The roles of individuals involved in safe confined-space entry.

Employees expected to perform duties as an entry supervisor, hazardous confined space entry attendant or authorized entrant will receive training and demonstrate the understanding, knowledge and skills necessary to participate safely in the confined space entry program, including, but not limited to the following:

- The specific hazards of all confined spaces in the workplace;
- Conditions under which a confined space may or must be reclassified under the confined space entry program;

- Conditions required to participate in alternate confined-space entry procedures and the alternate procedures for permit space entry;
- Pre-entry procedures for confined space entry;
- Any equipment provided or used as part of the confined space entry program;
- Plans and procedures for response or rescue in case of an emergency in a permit space and permit-space evacuation;
- The contents and requirements of a confined-space entry permit;
- The roles and responsibilities of each employee involved in confined space entry;
- The importance of atmospheric monitoring and how to perform such monitoring;
- Steps required following permit space entry; and
- The permit space program review process.

Training will be provided at the following times:

- Before an employee is first assigned duties that involve confined-spaces work;
- Before there is a change in the employee's assigned duties;
- When there is a change in permit-space operations that presents a hazard for which the employee has not been trained; and
- When the employee does not follow entry procedures.

18.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

18.4 Policy

18.4.1 Confined Spaces

Confined spaces are enclosed spaces that are large enough to work in but are difficult to enter and exit and are not designed to be occupied continuously.

A confined space can present life-threatening hazards that employees must control before workers may enter that space.

18.4.1.1 Permit-Required Confined Spaces

Confined spaces that may contain life-threatening hazards require workers to complete, sign and display an entry permit in accordance with confined-space entry permit regulations and the workplace permit space program.

The workplace must be assessed to determine whether any spaces present a hazard to workers and are permit-required confined spaces according to OSHA standards and industry best practices for safety. See Figure 2.

The company will implement measures necessary to prevent unauthorized entry into permit spaces and will inform exposed employees of the existence and location of permit spaces by posting signs or communicating otherwise by equally effective means. See Figure 1.



Figure 1

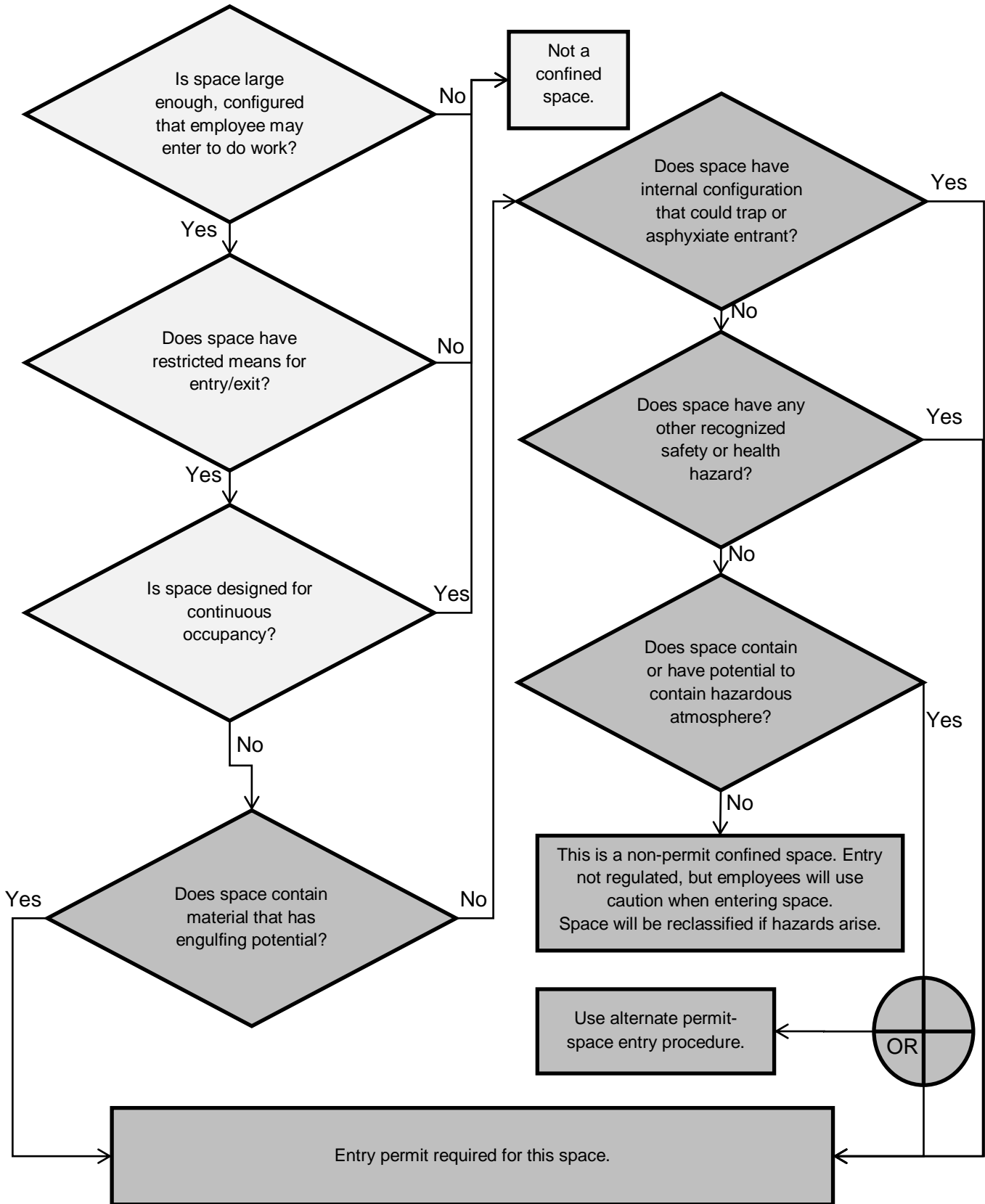


Figure 2

Confined Spaces

Hazardous Atmospheres

An atmosphere that exposes employees to the risk of death, incapacitation, impairment of ability to self-rescue, injury, or acute illness is a hazardous atmosphere and requires a permit (unless an approved alternate procedure renders the space safe for entry).

Oxygen-Deficient Atmospheres

An atmosphere with an oxygen concentration below 19.5% has insufficient oxygen for an employee and is a hazardous atmosphere. Such spaces require an approved breathing apparatus and a permit.

Flammable Atmospheres

An atmosphere is flammable, and hazardous, if any of the following conditions are true:

- Flammable gas, vapor or mist is present in excess of 10% of its lower flammable limit (LFL)
- Airborne combustible dust is present at a concentration at or above its LFL
- Atmospheric oxygen concentration exceeds 23.5%

Toxic Atmospheres

An atmospheric concentration of any substance in excess of its safe dose or permissible exposure limit (PEL) creates a hazardous atmosphere, as does any other atmospheric condition that is immediately dangerous to life or health.

Engulfing Potential

Any liquid or flowable solid that can kill by suffocation, strangulation, constriction or crushing has engulfing potential. A confined space that contains a material that can engulf an entrant is hazardous and requires a confined-space entry permit.

Trapping or Asphyxiation Risk

If the walls of a confined space converge inwardly or the floor of a confined space slopes downward to taper to a smaller cross-section an entrant runs the risk of becoming trapped and can face an asphyxiation risk. Confined spaces with such hazards are permit spaces.

Temperature Extremes

Extremely hot or cold temperatures can present problems for workers. Confined spaces can trap heat to create a condition dangerous to the life or health of a worker entering the space.

Noise

The design and acoustic properties in a confined space can amplify noise. Excessive noise can not only damage hearing and reduce reaction time to hazards but can also affect communication. This can cause a shouted warning to go unheard.

Slippery Surfaces

Slips and falls can occur on a slick, wet or icy surface, causing injury or death to workers. Further, wet environments can increase the likelihood of electric shock.

Falling Objects

Many confined spaces have openings above the worker that introduce hazards from the objects falling from above onto a worker below. Before any worker may enter a confined space, appropriate barriers must protect entrants from falling objects.

18.4.1.2 Examples of Possible Permit-Required Confined Spaces**Vaults**

A variety of vaults are found on the construction jobsite. On various occasions, workers must enter these vaults to perform a number of functions. The restricted nature of vaults and their frequently below-grade location can create an assortment of safety and health problems.

Condenser Pits

A common confined space found in the construction of nuclear power plants is the condenser pit. Because of their large size, they are often overlooked as potentially hazardous confined spaces. These below-grade areas create large containment areas for the accumulation of toxic fumes, gases, and so forth, or for the creation of oxygen-deficient atmospheres when purging with argon, freon, and other inert gases. Other hazards will be created by workers above dropping equipment, tools, and materials into the pit.

Manholes

Throughout the construction site, manholes are commonplace. As means of entry into and exit from vaults, tanks, pits, and so forth, manholes perform a necessary function. However, these confined spaces may present serious hazards which could cause injuries and fatalities. A variety of hazards are associated with manholes. To begin with, the manhole could be a dangerous trap into which the worker could fall. Often covers are removed and not replaced, or else they are not provided in the first place.

Pipe Assemblies

One of the most frequently unrecognized types of confined spaces encountered throughout the construction site is the pipe assembly. Piping of sixteen to thirty-six inches in diameter is commonly used for a variety of purposes. For any number of reasons, workers will enter the pipe. Once inside, they are faced with potential oxygen-deficient atmospheres, often caused by purging with argon or another inert gas. Welding fumes generated by the worker in the pipe, or by other workers operating outside the pipe at either end, subject the worker to toxic atmospheres. The generally restricted dimensions of the pipe provide little room for the workers to move about and gain any degree of comfort while performing their tasks. Once inside the pipe, communication is extremely difficult. In situations where the pipe bends, communication and extrication become even more difficult. Electrical shock is another problem to which the worker is exposed. Ungrounded tools and equipment or inadequate line cords are some of the causes. As well, heat within the pipe run may cause the worker to suffer heat prostration.

Ventilation Ducts

Ventilation ducts, like pipe runs, are very common at the construction site. These sheet metal enclosures create a complex network which moves heated and cooled air and exhaust fumes to desired locations in the plant. Ventilation ducts may require that workers enter them to cut out access holes, install essential parts of the duct, etc. Depending on where these ducts are located, oxygen deficiency could exist. They usually possess many bends, which create difficult entry and exit and which also make it difficult for workers inside the duct to communicate with those outside it. Electrical shock hazards and heat stress are other problems associated with work inside ventilation ducts.

Tanks

Tanks require entry for cleaning and repairs. Ventilation is always a problem. Oxygen-deficient atmospheres, along with toxic and explosive atmospheres created by the substances stored in the tanks, present hazards to workers. Heat, another problem in tanks, may cause heat prostration, particularly on a hot day. Since electrical line cords are often taken into the tank, the hazard of electrical shock is always present. The nature of the tank's structure often dictates that workers must climb ladders to reach high places on the walls of the tank.

Sumps

Sumps are commonplace. They are used as collection places for water and other liquids. Workers entering sumps may encounter an oxygen-deficient atmosphere. Also, because of the wet nature of the sump, electrical shock hazards are present when power tools are used inside. Sumps are often poorly illuminated. Inadequate lighting may create an accident situation.

Containment Cavities

These large below-grade areas are characterized by little or no air movement. Ventilation is always a problem. In addition, the possibility of oxygen deficiency exists. As well, welding and other gases may easily collect in these areas, creating toxic atmospheres. As these structures near completion, more confined spaces will exist as rooms are built off the existing structure.

Electrical Transformers

Electrical transformers are located on the jobsite. They often contain a nitrogen purge or dry air. Before they are opened, they must be well vented by having air pumped in. Workers, particularly electricians and power plant operators, will enter these transformers through hatches on top for various work-related reasons. Testing for oxygen deficiency and for toxic atmospheres is mandatory.

Heat Sinks

These larger pit areas hold cooling water in the event that there is a problem with the pumps located at the water supply to the plant--normally a river or lake--which would prevent cooling water from reaching the reactor core. When in the pits, workers are exposed to welding fumes and electrical hazards, particularly because water accumulates in the bottom of the sink. Generally, it is difficult to communicate with workers in the heat sink, because the rebar in the walls of the structure deaden radio signals.

18.4.1.3 Reclassifying Permit Spaces

Once a confined space is classified as a permit-entry space, an authority can only reclassify the space as a non-permit confined space upon elimination of all hazards within the space.

The elimination of hazards must be certified with documentation that includes the date, the location of the space, and the signature of the person who determined the reclassification.

If hazards arise within a non-permit space, each employee in the space shall exit the space. The employer shall then reevaluate the space and determine whether to reclassify it as a permit space.

1.1.1.1 Unusual Conditions

Confined Space Within a Confined Space

By the very nature of construction, situations are created which illustrate one of the most hazardous confined spaces of all — a confined space within a confined space. This situation appears as tanks within pits, pipe assemblies or vessels within pits, etc. In this situation, not only do the potential hazards associated with the outer confined space require testing, monitoring, and control, but those of the inner space also require similar procedures. Often, only the outer space is evaluated. When workers enter the inner space, they are faced with potentially hazardous conditions. A good example of a confined space within a confined space is a vessel with a nitrogen purge inside a filtering water access pit. Workers entering the pit and/or the vessel should do so only after both spaces have been evaluated and proper control measures established.

Hazards In One Space Entering Another Space

During an examination of confined spaces in construction, one often encounters situations which are not always easy to evaluate or control. For instance, a room or area which classifies as a confined space may be relatively safe for work. However, access passages from other areas outside or adjacent to the room could, at some point, allow the transfer of hazardous agents into the "safe" one. One such instance would be a pipe coming through a wall into a containment room. Welding fumes and other toxic materials generated in one room may easily travel through the pipe into another area, causing it to change from a safe to an unsafe workplace. A serious problem with a situation such as this is that workers working in the "safe" area are not aware of the hazards leaking into their area. Thus, they are not prepared to take action to avoid or control it.

18.4.2 Alternate Permit Space Entry Procedures

If the only hazard present in a permit space is an actual or potential hazardous atmosphere, alternate permit space entry procedures may be used, provided continuous forced air ventilation can render the atmosphere safe (as supported by monitoring and inspection data). The steps of the alternate procedure are as follows:

1. Eliminate conditions that would make removing an entrance cover unsafe before removing a cover.
2. Guard the opening to prevent foreign objects from entering the space.
3. With a calibrated direct-reading instrument, test the internal atmosphere for the following (in this order): oxygen content, flammable gases and vapors, and potential toxic air contaminants.
4. **NOTE:** Employees who enter the space or their authorized representative may observe pre-entry atmospheric testing.
5. Continuous air ventilation from a clean source will ventilate the area where an employee is working to eliminate any hazardous atmosphere. Continuous air ventilation must not increase hazards in the space and shall continue until all employees have left the space.
6. Test the atmosphere in the space periodically to ensure that a hazardous atmosphere has not accumulated. The space must remain free of hazardous atmosphere when an employee is in the space.
7. **NOTE:** Employees who enter the space or their authorized representative may observe periodic atmospheric testing.
8. If hazardous atmosphere is detected during entry, all employees must evacuate the space, which must then be evaluated to determine how the hazardous atmosphere developed. Take necessary measures to protect employees from the hazardous atmosphere before re-entry.
9. *Pyro Combustion & Controls Inc.* will verify the space is safe for entry and with a written certification including the date, location of the space, and the signature of the person providing the certification.

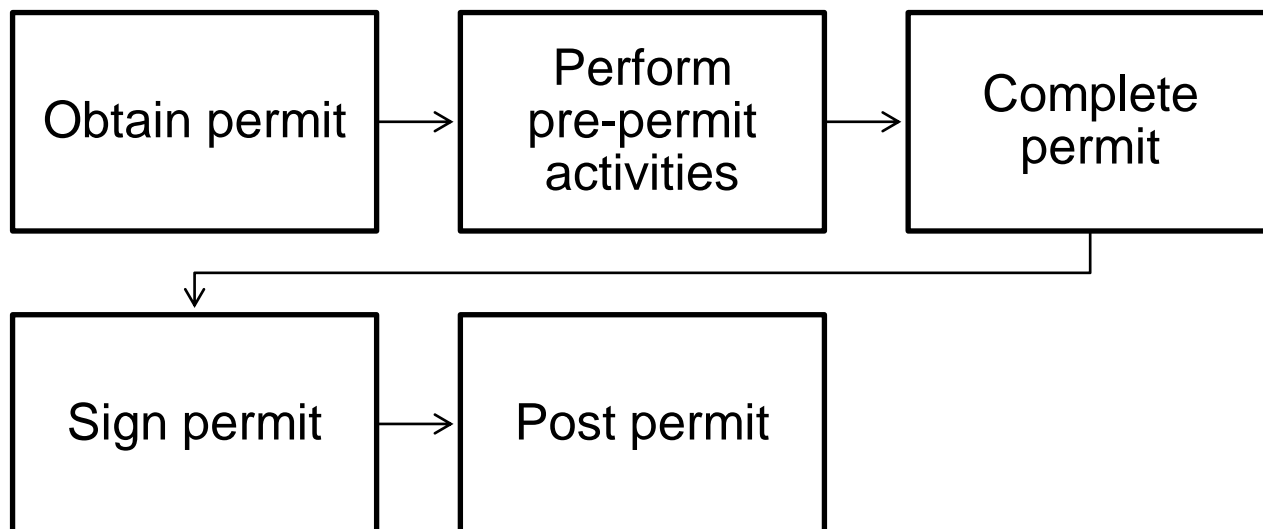


Figure 3

18.4.3 Permit Space Procedures

18.4.3.1 Pre-Entry

Before employees may enter a permit space, the employer will identify and eliminate all hazards in the space or control the hazards so employees may complete their job and exit safely. A confined-space entry permit will document the process, and must be complete and posted at the entry of the permit space before entry. See Figure 3.

Guard the space

Measures such as posting warning signs or erecting barriers will be implemented to prevent unauthorized entry into permit spaces and to protect entrants from falling objects and other hazards from outside of the space.

Test for Atmospheric Hazards

Testing the atmosphere in a confined space ensures the presence of sufficient oxygen and an absence of hazardous atmosphere. Authorized entrants or their representative may observe any monitoring or testing of the space. Monitoring of a potentially hazardous atmosphere must continue through the entry to ensure the permit remains valid.

Isolate (Lockout/Tagout)

Before any employee enters the permit space, the space must be isolated from hazards. The authorized entrant will disconnect any hazardous equipment, and prevent the flow of any hazardous chemical into the confined space according to the appropriate hazard control procedure.

Eliminate/Control Atmospheric Hazards

When possible, continuous ventilation will be provided in a confined space to eliminate atmospheric hazards and the space will be purged, inerted, flushed or ventilated as necessary to eliminate or control atmospheric hazards.

Equipment

All equipment necessary for safe entry into any permit space will be provided by the employer, as well as any equipment necessary to ensure safe conditions within permit spaces and provide safe rescue from a permit space. This may include, but is not limited to the following:

- Atmospheric testing and monitoring equipment;
- Ventilating equipment;
- Communications equipment;
- Personal protective equipment;
- Lighting equipment;
- Barriers to protect entrants from outside hazards;
- Equipment to allow authorized entrants safe ingress and egress; and
- Rescue and emergency equipment.

Plan for Emergencies

The permit space must remain safe for entrants through the entire entry and a means must be established by which the permit space entry attendant can communicate with entrants to monitor the entry and evacuate the space if hazardous conditions arise.

Before any employee enters a permit space, there must be established specific procedures for summoning rescue and emergency services to respond to emergencies that may occur during entry.

Entry Permit

Before any employee may enter a permit space, the entry supervisor must complete and sign documentation of measures to render the space safe for entry and maintain control over potential hazards to workers (an entry permit). The permit will be readily available to all authorized entrants or their representatives, posted at the entry. If the nature of the space prevents permit posting at the entry, the permit must remain available by an equally effective means.

18.4.3.2 During Entry

While employees work in permit spaces the company will ensure every effort is taken to remove hazards and provide a safe working environment.

Attendant

While employees remain in a permit space, an attendant will remain immediately outside the space to monitor conditions in the space and respond to emergencies. The attendant must remain in communication with entrants and know how to shut down hot work equipment, and any other equipment that may present a hazard to entrants.

There must also be in place an established means by which attendant responsibilities may be handed over to a relief attendant should an entry span more than one shift or the attendant otherwise requires relief from those responsibilities. This should be documented on the entry permit.

If an attendant is expected to monitor more than one confined space, there must be in place a written procedure to ensure that the attendant is able to monitor all of the spaces with the same diligence, and to ensure appropriate emergency and rescue response while continuing to attend all confined entry spaces.

Atmospheric Monitoring

If work in the permit space could cause changes in the atmospheric conditions of the space, air monitoring must continue throughout the entire entry to ensure the permit remains valid throughout the entry.

If entrants leave the permit space for an extended period, re-entry requires retesting the atmosphere.

Means of Ingress and Egress

Ladders and any other means of ingress and egress must remain secure and available to entrants during the entire entry.

Permit Space Evacuation

Workers shall immediately evacuate the permit space under any of the following conditions:

- When the attendant orders evacuation;
- When the entrant recognizes exposure to any hazard or detects a prohibited condition;
or
- Upon an evacuation alarm.

18.4.3.3 After Entry

Cancel Permit

The entry supervisor will terminate entry and cancel the permit as soon as an emergency occurs in or near the confined space or when upon completion of operations requiring permit-space entry.

Retain Permit

Entry permits will be retained for at least a year to help in the required regular evaluation of the confined space program. If entry presented any problems, the entrant, attendant or supervisor will note them on the permit to facilitate necessary revisions to the permit space program.

18.4.3.4 Contractor Entrant

If employees of another employer perform work that involves permit space entry, adhere to the following procedure:

1. Inform the contractor that the workplace contains permit-required confined spaces.
2. Ensure that the contractor has reviewed the permit-required confined space program and has its own permit-required confined space program in place prior to entry.
3. Apprise the contractor of any precautions or procedures that have been implemented for the protection of employees in or near permit spaces.
4. Coordinate entry operations with the contractor when company employees and contractor(s) will be working in or near the permit space. (There should be no doubt by any permit space entrant, attendant or entry supervisor regarding whose policy and permit space practices are to be followed.)
5. Debrief the contractor at the conclusion of the entry operation regarding the permit space program and regarding hazards confronted or created in permit space entry operations.

18.4.3.5 No Entrant

If no employee or contractor will enter a permit-required confined space, Effective measures must prevent anyone from entering the permit space. When a change in the use or configuration of a non-permit confined space might increase hazards to entrants, the space may be reevaluated and reclassified it as necessary.

18.4.4 Entry Permits

18.4.4.1 Information on Entry Permits

The entry permit that documents compliance with this section and authorizes entry to a permit space will identify:

- The permit space to be entered;
- The purpose of the entry;
- The date and authorized duration of the permit;
- The authorized entrants within the permit space;
- The personnel, by name, currently serving as attendants;
- The name of the entry supervisor, and signature or initials;
- The hazards of the permit space to be entered;
- The measures used to isolate the permit space and eliminate or control permit space hazards before entry;
- The acceptable entry conditions;
- The results of initial and periodic tests performed to ensure safe entry conditions, accompanied by the names or initials of the testers and by an indication of when the tests were performed;
- The rescue and emergency services that can be summoned and the means of summoning those services;

- The communication procedures used by authorized entrants and attendants to maintain contact during the entry;
- Equipment to be provided for compliance with this section;
- Any other information whose inclusion is necessary, given the circumstances of the particular confined space, in order to ensure employee safety; and
- Any additional permits, such as for hot work, that have been issued to authorize work in the permit space.

18.4.5 Rescue and Emergency Services

18.4.5.1 Rescue Personnel

Emergency responders must be able to respond to emergencies in a timely manner and provide rescue service personnel with equipment necessary for a safe rescue from the permit space and training in how to use it. Rescue service personnel also must receive the authorized entrants training in addition to training on assigned rescue duties. At a minimum, one rescue team member must be certified in first aid and CPR.

The site supervisor or other appropriate personnel will inform rescuers of hazards in the permit space as well as the means to control those hazards. Rescuers must practice rescue duties at least yearly, and rescue services will have access to permit spaces to practice rescue operations.

18.4.5.2 Non-entry Rescue and Retrieval Equipment

Authorized entrants who enter a permit space must wear a chest or full body harness with a retrieval line attached to the center of their backs near shoulder level or above their heads. Wristlets may be used if the employer can demonstrate that the use of a chest or full body harness is not feasible or creates a greater hazard.

The other end of the retrieval line must be attached to a mechanical device or a fixed point outside the permit space. A mechanical device must be available to retrieve someone from vertical type permit spaces deeper than five feet deep.

18.4.5.3 Safety Data Sheets

If an injured entrant is exposed to a substance for which a Safety Data Sheet (SDS) or similar written information is required to be kept at the worksite, that SDS or other written information must be made available to the medical facility personnel treating the exposed entrant.

18.4.6 Program Review

If the permit space program may fail to provide sufficient protection for employees, supervisors will authorize no entries until program revision corrects the deficiencies.

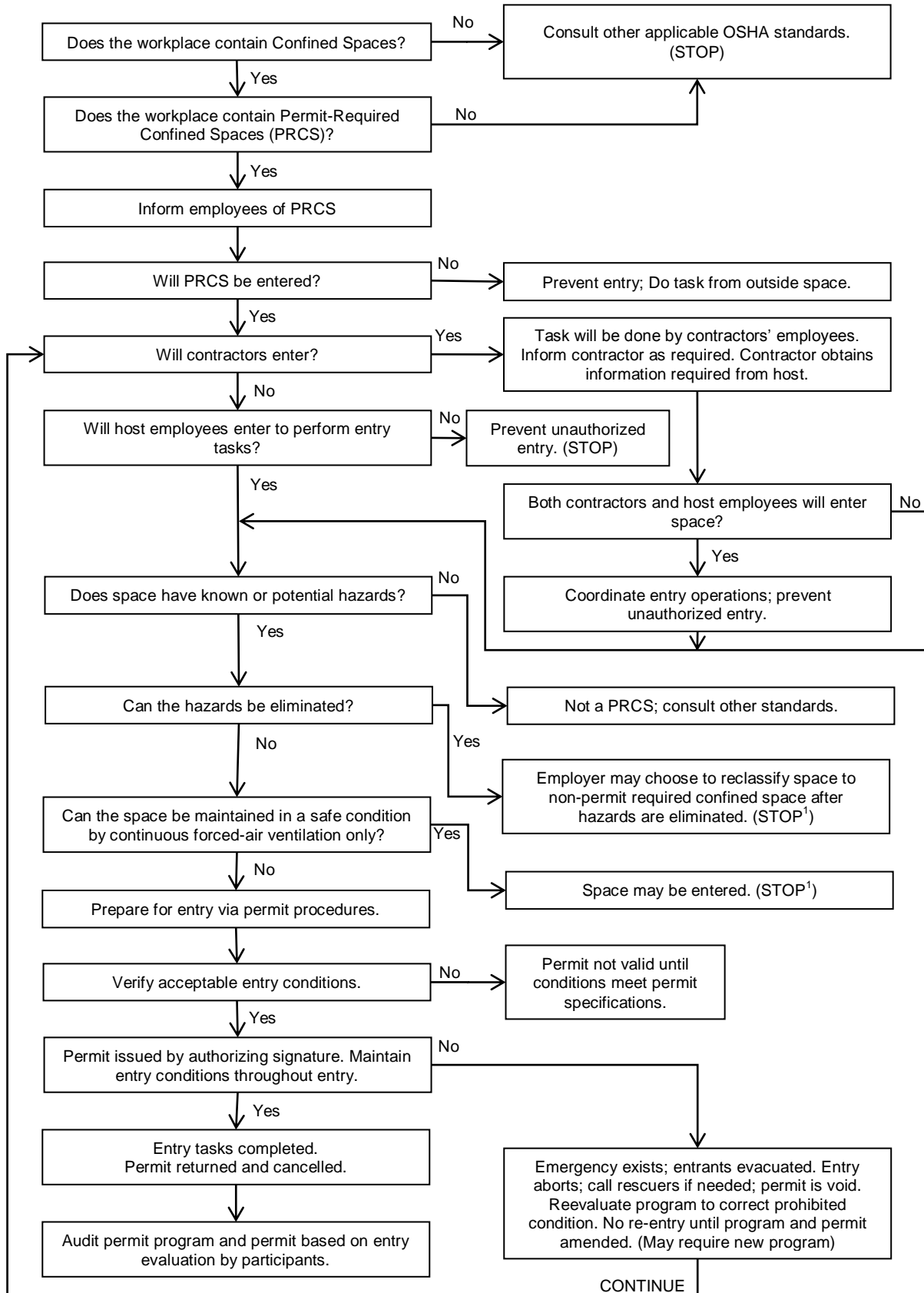
Additionally, the confined space entry program must be reviewed within a year of each entry and revised as necessary to ensure protection from confined-space hazards for all entrants.

The permit space entry program review requires an investigation of cancelled permits to identify program deficiencies that may exist.

18.5 Forms & Attachments

On the following pages, please find the following document(s):

- Confined-Space Entry Permit
- Rescue & Emergency Services
- Confined Space Entry Training Record Sheet



1) Spaces may have to be evacuated and re-evaluated if hazards arise.

Confined Spaces Entry Permit (pg. 2)									
RESCUE AND EMERGENCY SERVICES					RESCUE PROCEDURES				
Name:		Phone:							
Name:		Phone:							
Summoning Procedure:									
ATMOSPHERIC TESTING RECORD									
Condition	Acceptable Level	Pre-Entry Readings				Entry Readings			
OXYGEN	19.5% - 23.5%								
EXPLOSIVE (GAS/VAPOR)	<10% LFL								
EXPLOSIVE DUST	<LFL (5ft. Visability)								
CARBON MONOXIDE	50 ppm								
HYDROGEN SULFIDE	10 ppm								
OTHER HAZARDS (specify)									
NAME(S) OF TESTER(S)									
TESTING EQUIPMENT: Type: _____ Serial #: _____ Type: _____ Serial #: _____									
ENTRY AUTHORIZATION									
ENTRY AUTHORIZED BY:									
Name: _____					Time: _____				
Signature: _____					Date: _____				
POST ENTRY PERMIT AT ENTRANCE TO PERMIT SPACE									
ENTRY CANCELLATION									
ENTRY CANCELLED BY:									
Name: _____					Time: _____				
Signature: _____					Date: _____				
REASON FOR CANCELLATION:									
<input type="checkbox"/> Entry Operations Completed <input type="checkbox"/> Prohibited Condition Arose (specify) _____ _____									

19**Driver Safety**

19.1 Policy Statement

Driving any vehicle presents significant risks to workers. *Pyro Combustion & Controls Inc.* is committed to reducing traffic-related deaths and injuries. As part of this commitment, *Pyro Combustion & Controls Inc.* maintains a driver safety policy designed to support a culture of safety and reduce accidents.

19.2 Responsibilities

Driver safety is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

19.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Establish and maintain policies and rules in accordance with applicable regulations and best industry practices to promote safety and prevent injuries and illnesses;
- Ensure that every employee asked to drive a company car or personal car on company business has been trained in *Pyro Combustion & Controls Inc.* driver safety policy and safe driving practices;
- Record and maintain documents pertaining to the eligibility and qualification of an employee to drive a company car or a personal vehicle on company business;
- Ensure vehicles driven on company business are in good repair and adhere to all legal regulations and requirements;
- Encourage and respect the involvement of employees in the planning and implementation of safe driving policy;
- Ensure drivers participate in regular safety meetings to promote a continued culture of safety and address safety concerns;
- Devise and implement a system of disciplinary action and rewards to encourage safe driving habits, as appropriate; and
- Prevent unnecessary travel by employees.

19.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Work with *Gary Pfizenmayer* to establish and review guidelines for company vehicle selection, if appropriate;
- Work with *Gary Pfizenmayer* to establish and review qualification standards for drivers, if appropriate;
- Work with *Gary Pfizenmayer* to ensure regular safety meetings geared specifically to drivers;
- Work with employees to identify and make recommendations to increase driver safety;
- Assist in training pertaining to driver safety policy; and
- Participate in accident investigations and driver safety policy review.

19.2.3 Employee Responsibilities

Pyro Combustion & Controls Inc. employees who, as part of their job, drive a company car or their own on company business are expected to:

- Complete a driver safety course that addresses general driver safety as well as hazards specific to the job being done;
- Ensure the roadworthiness of his or her vehicle before operation;
- Operate the vehicle according to best safety practices;
- Respond to accidents and near misses according to established *Pyro Combustion & Controls Inc.* policies and procedures;
- Inform a supervisor of any changes to their Motor Vehicle Record that may impact their eligibility to drive; and
- Maintain a driver's license that permits them to perform their job in compliance with the law.

Every *Pyro Combustion & Controls Inc.* employee is expected to:

- Demonstrate awareness and understanding of *Pyro Combustion & Controls Inc.* driver safety policy;
- Make recommendations to improve *Pyro Combustion & Controls Inc.* driver safety policy; and
- Encourage and practice safe driving habits.

19.3 Training

Pyro Combustion & Controls Inc. will train every employee who will drive for work related reasons on driver safety at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to educational level, literacy, and language of employees.

19.3.1 Training Components

Gary Pfizenmayer will ensure any employee at *Pyro Combustion & Controls Inc.* who drives on work business is qualified and capable to drive. Drivers will complete training in the following minimum elements for driver safety:

- Defensive driving;
- Safe distances;
- Intersection driving;
- Poor driving conditions;
- Split-second decision making;
- Distracted driving;
- Driving in Work Zones; and
- Safety restraints.

19.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Pyro Combustion & Controls Inc. will maintain employee training records for at least 3 years from the date on which the training occurred.

19.4 Policy

Pyro Combustion & Controls Inc. recognizes that its greatest assets are its employees, a fact demonstrated by a commitment to their safety.

A driver safety program saves lives and reduces injuries. It also prevents material losses and helps *Pyro Combustion & Controls Inc.* guard against the range of liabilities that may emerge from a vehicular accident.

Driver Safety

Accordingly, management will provide resources needed to support a culture of safety and will actively encourage employees to participate in planning and implementation of the driver safety program.

If *Pyro Combustion & Controls Inc.* operates any of the following types of commercial motor vehicles in interstate commerce *Pyro Combustion & Controls Inc.* will comply with applicable U.S. Department of Transportation (DOT) safety regulations, many of which may not be detailed in this chapter.

- A vehicle with a gross vehicle weight rating or gross combination weight rating (whichever is greater) of 10,001 lb. or more;
- A vehicle designed or used to transport between 9 and 15 passengers (including the driver) for compensation;
- A vehicle designed or used to transport 16 or more passengers; or
- Any size vehicle used in the transportation of materials found to be hazardous for the purposes of the Hazardous Materials Transportation Act (49 U.S.C. 5101 et seq.) and which require the motor vehicle to be placarded under the Hazardous Materials Regulations (49 CFR chapter I, subchapter C).

Please see fmcsa.dot.gov or safetyservicescompany.com for more information.

19.4.1 Fleet

Pyro Combustion & Controls Inc. will maintain a fleet of vehicles if necessary for business in accordance with relevant regulatory standards and vehicle manufacturer's advice.

19.4.1.1 Fleet Selection

Gary Pfizenmayer will work with members of the safety committee and, if appropriate, *Pyro Combustion & Controls Inc.*'s insurance company to establish guidelines for the selection of company vehicles, which should include the following:

- the appropriate vehicle type for expected use;
- required safety equipment;
- maintenance procedures;
- inspection procedures;
- protections against unauthorized use;
- record-keeping procedures; and
- insurance.

The National Highway Transportation Administration provides information on vehicle safety according to make and model.

19.4.1.2 Preventative Maintenance

All *Pyro Combustion & Controls Inc.* vehicles will be maintained according to a regular schedule to ensure their safety and roadworthiness. All maintenance will be performed by a qualified individual or automotive shop according to the manufacturer's recommended service schedule.

In addition to regularly scheduled maintenance, fleet upkeep should include, but is not limited to:

- Basic inspections of the vehicle by the driver before every trip;
- Immediate removal from service of any vehicle with mechanical problems; and
- Managerial certification of requested repairs before return to service.

If *Pyro Combustion & Controls Inc.* requires employees to drive their own cars for company business, expectations for maintenance, inspection and upkeep will match those for vehicles owned by *Pyro Combustion & Controls Inc.*

Recordkeeping

All vehicle maintenance, repair certification, and driver review will be recorded and kept through the life of the vehicle.

19.4.1.3 Vehicle Inspection

The operator will inspect each vehicle or piece of equipment on a daily basis before and after operation. Each operator is responsible for the safe condition of the equipment. No employee may drive a vehicle having steering, brake, or other safety problems until a mechanic has made repairs. Drivers will report any other unsafe conditions to their supervisor as soon as safely possible.

19.4.2 Driver Selection, Qualification and Evaluation

Gary Pfizenmayer will work with members of the safety committee and, if appropriate, *Pyro Combustion & Controls Inc.*'s insurance company to determine the qualification standards for motor vehicle operators.

19.4.2.1 Employment History

The evaluation for any new employee anticipated to drive a company vehicle (or their own vehicle on company business) will include a reference check and review of driving history through past employers.

19.4.2.2 Licenses

Any driver of a *Pyro Combustion & Controls Inc.* vehicle or a personal vehicle on *Pyro Combustion & Controls Inc.* business will possess a valid driver's license appropriate for the vehicle that will be driven and the circumstances in which the vehicle will be driven. All government regulations and insurance company requirements will be followed in regard to driver qualification.

A driver will only operate a vehicle that requires a commercial driver's license (and any endorsement) if he or she is in possession of the appropriate license.

19.4.2.3 Motor Vehicle Records

Pyro Combustion & Controls Inc. will check the driving records of any employee expected to drive for work. Further, periodic review of a motor vehicle record (MVR) for employees expected to drive for work reasons will indicate if they remain eligible to drive a company vehicle or their own on company business.

Initial Assignment

Pyro Combustion & Controls Inc. will request and review an MVR for new applicants or current employees expected to add driving to existing responsibilities, whether operating their own vehicle or a company vehicle. The MVR review will consider the most recent three years of driving and should include motor vehicle records from all states in which the applicant has lived in that time.

MVRs and the information contained therein will remain as confidential as possible. Discussions of motor vehicle records will be restricted to individuals with a legitimate "need to know."

Any qualification standard may entail a multi-tiered or point-system approach to driver eligibility based on the frequency of the employee's anticipated work driving and the severity of traffic convictions recorded in the MVR.

Following are some examples of violations that, having occurred in the past 3 years, may warrant ineligibility to drive on company business:

- DWI/DUI;
- Negligent motor vehicle homicide;
- Operating with a suspended license;
- Using a motor vehicle for commission of a felony;
- Aggravated assault with a motor vehicle;
- Operating a motor vehicle without the owner's consent;
- Reckless, careless or negligent driving, including speeding more than 15 MPH over limit;
or
- Hit and run or leaving the scene of an accident with injury or death resulting, or property damage in excess of \$1,000.

Following are examples of violations that, having occurred more than three times in two years, may warrant ineligibility to drive:

- Minor moving violations; and
- Accidents.

Annual Review

Employees cited for a violation that may affect their eligibility to drive on company business will inform their supervisor.

In addition to the initial MVR review, a review of an employee's MVR will occur annually to confirm the driver's continued eligibility to drive for work.

19.4.2.4 Defensive Driver Training

Pyro Combustion & Controls Inc. may consider or require the completion of a driver safety course or defensive driving course in determining eligibility to drive a *Pyro Combustion & Controls Inc.* vehicle or a personal vehicle while on company business.

19.4.2.5 Driver Agreements

Employees who will operate a motor vehicle as part of their job are required to confirm awareness and understanding of *Pyro Combustion & Controls Inc.* driver safety policy.

Gary Pfizenmayer, with the safety committee, will create a "driver agreement" that allows a driver to confirm his or her awareness and understanding of this policy, driver expectations, vehicle maintenance and care requirements, and the procedures for reporting moving violations and accidents.

19.4.2.6 Driver Qualification File

Pyro Combustion & Controls Inc. will maintain a driver qualification file for every driver including all documents required to verify his or her qualifications.

19.4.3 Driver Training

19.4.3.1 Orientation

The driver safety program focuses on training and prevention. All new drivers must complete an orientation to cover:

- Policies and procedures for drivers;
- Governmental regulations;
- Maintenance guidelines and inspection procedures; and
- Driver training that encourages safe, defensive road behavior.

19.4.3.2 Meetings

Gary Pfizenmayer, with the safety committee, will plan and facilitate regular meetings of drivers to promote safe driving habits and encourage communication about the driver safety policy.

19.4.3.3 Performance Reviews

Drivers will be subject to periodic evaluation and review of safe driving habits by their supervisor. This review will be as confidential as appropriate and should detail both deficiencies and excellence in the driver's behavior as appropriate. A copy of this review will be kept in the driver qualification file.

19.4.4 Vehicle Operation

19.4.4.1 Unauthorized Use of Vehicles

Gary Pfizenmayer, with the safety committee, will determine whether or under what conditions an employee may permit another individual to drive a company vehicle.

A driver or other employee who permits an unauthorized individual to operate a company vehicle faces disciplinary action and financial accountability for any cost incurred by allowing unauthorized personnel to operate a company vehicle.

19.4.4.2 Securing Materials

The driver will prevent the unsafe movement of any materials such as tools or equipment by securing it appropriately. Drivers should secure anything that may present a hazard outside the passenger compartment.

19.4.4.3 Vehicle Occupancy

No vehicle on *Pyro Combustion & Controls Inc.* will transport more passengers than safely possible. Every adult in the vehicle must have a seatbelt. If children must be transported, each must have the appropriate child safety restraint. Vehicles may be operated only if each passenger is safely restrained in their seat.

19.4.4.4 Seat Belts

Pyro Combustion & Controls Inc. recognizes that seat belts effectively prevent injuries and loss of life in an automotive accident.

All *Pyro Combustion & Controls Inc.* employees will wear seatbelts when operating a company-owned vehicle or any vehicle on company premises or on company business. Any occupant of a vehicle owned by *Pyro Combustion & Controls Inc.*, on *Pyro Combustion & Controls Inc.* premises or in a vehicle on company business will wear a seatbelt or, if required, an appropriate child restraint system.

Pyro Combustion & Controls Inc. encourages its employees to **always** wear a seatbelt when driving or riding in an automobile, to ensure child restraints are used properly, and to encourage other passengers or drivers do the same.

19.4.4.5 Alcohol and Drug Use

Pyro Combustion & Controls Inc. **forbids employees from consuming or being under the influence of alcohol or illegal drugs during “duty hours.”** Duty hours include working hours, break periods and on-call periods. The consumption of alcohol or illegal drugs while performing company business or while in a company facility may result in disciplinary action up to and including termination.

If an employee takes prescribed medication or over-the-counter medication known to affect the ability to operate a motor vehicle or other heavy machinery, the employee will inform his or her immediate supervisor and refrain from such duties until able to do so safely.

Drivers will remain aware of driving behaviors that indicate impairment such as weaving, inappropriate speed, and erratic or abrupt driving. Staying a safe distance from drivers who may be impaired and bringing dangerous drivers to the attention of the authorities helps keep roads safe.

Drivers who operate a commercial motor vehicle as defined by the federal highway administration must possess a CDL and are subject to FHA’s regulations on alcohol and drug use and testing.

A drug free workplace policy and supporting procedures must be in place and communicated to all employees before drug testing. The rule requires pre-employment, reasonable suspicion, random, post-accident, return-to-duty and follow-up testing. For details on the program, refer to the FMCSR, Title 49, Part 382.

19.4.4.6 Distracted Driving

Driving skills rely on the focus of the vehicle operator. Every driver will devote his or her full attention to the task of driving while behind the wheel. Distractions come in many forms and contribute to 25 to 30 percent of all traffic accidents. Distractions include, but are not limited to the following:

- Text messaging and other cell phone use (even with hands-free headset);
- Reaching for an object inside the vehicle;
- Looking at an object, person or event outside the vehicle;
- Eating and drinking;
- Reading;
- Grooming and hygiene;
- Electronics use (computer, tablet, GPS);
- Adjusting non-critical controls;
- Horseplay; and
- Emotional distractions.

Text messaging while driving is strictly prohibited.

19.4.4.7 Fatigued Driving

Drowsy driving greatly increases the risk of an accident. All drivers will be trained in the dangers of driving drowsy and the importance of sufficient rest before operating a motor vehicle.

19.4.4.8 Aggressive Driving

Pyro Combustion & Controls Inc. prohibits aggressive driving while operating a company vehicle or a personal vehicle on company business. Aggressive driving behaviors include, but are not limited to the following:

- Excessive Speed;
- Tailgating;
- Failure to signal lane change;
- Running a red light;
- Passing on the right; and
- Any offensive, rude or hostile act or gesture directed at another driver.

19.4.4.9 Young Drivers

Teenage drivers are the most likely to engage in risky driving behaviors, and vehicle crashes are the leading cause of death for 15-20 year olds. Federal law prohibits drivers under 17 to operate a vehicle as part of their job, and it is at the discretion of *Gary Pfizenmayer* to prohibit driving for any employee based on a lack of driving experience.

19.4.4.10 Driving in Work Zones

Special care must be taken by all drivers in work zones. Patience and care goes a long way to contribute to driving safely around construction. Heavy machinery and workers can slow everything down, but driving rushed makes it difficult to observe other workers and leads to poor decision making. Workers must be vigilant and minimize distractions to respond quickly to the unexpected when behind the wheel, especially when driving where others are working.

19.4.5 Monitoring

As part of the *Pyro Combustion & Controls Inc.* driver safety policy, every work-related accident and near miss involving motor vehicles will be handled in a way to reduce risk and encourage future safe behaviors in the future.

Additionally, the *Pyro Combustion & Controls Inc.* driver safety policy requires periodic review of the policy itself and its impact on the safety and health of employees.

19.4.5.1 Incident, Accident Analysis, and Reporting

If an employee experiences a vehicular accident while driving a company car or a personal car on company business, he or she will do the following:

- Stop the vehicle. If it can be done safely, move the vehicle off the road;
- Call appropriate law enforcement authority if damage is done to another vehicle or property that does not belong to *Pyro Combustion & Controls Inc.* For an emergency, call 911 to summon both police and emergency medical services;
- Mark the scene as necessary for safety;
- Gather the names of other drivers and witnesses;
- Diagram the accident, noting vehicles involved, where vehicle occupants were seated at the time of the accident, the date, time and weather conditions;
- Exchange the following information with other drivers involved: License plate number, registration information and insurance information;
- Document the name and badge number of the responding law enforcement professional.
- Notify the supervisor as soon as safely possible; and
- Cooperate with law enforcement professionals and participate in *Pyro Combustion & Controls Inc.* accident investigation.

Do not assume blame or apologize. Only give statements about what happened to police or an appropriate member of *Pyro Combustion & Controls Inc.* management.

Any accident will be investigated according to *Pyro Combustion & Controls Inc.* accident investigation policy. (See chapter on “Accident Investigation” for more details.) Use the Motor Vehicle Accident Report at the end of this chapter to accompany the *Pyro Combustion & Controls Inc.* Accident/Incident Report.

Pyro Combustion & Controls Inc. will comply with all recordkeeping requirements of *Pyro Combustion & Controls Inc.* safety policy and any applicable regulatory authority.

19.4.5.2 Disciplinary Actions

Safety incidents involving an employee and a violation of *Pyro Combustion & Controls Inc.* safety policy in a company vehicle (or personal vehicle used on company business) may result in disciplinary actions up to termination, including the revocation of driving privileges as determined by management.

19.4.5.3 Reward Program

It is at the discretion of *Gary Pfizenmayer* and, if appropriate, the safety committee to devise and implement a safe driver reward program to encourage safe driving habits and reward safe driving behaviors.

19.4.5.4 Policy Review

All aspects of this policy and the *Pyro Combustion & Controls Inc.* driver safety program are subject to annual review by *Gary Pfizenmayer* and the safety committee to ensure the effectiveness of the policy to guarantee a safe working environment for *Pyro Combustion & Controls Inc.* employees.

19.5 Forms & Attachments

On the following pages, please find the following documents:

- Motor Vehicle Accident Report
- Driver Safety Training Documentation

Motor Vehicle Accident Report			
AFTER AN ACCIDENT: 1 Stay Calm 2 If the vehicles are drivable and it is safe to do so, move them safely out of traffic 3 Apply first aid (if properly trained) 4 Call police, and if necessary, ambulance 5 Take brief notes			
Vehicle Driver Name		Other Vehicle Driver Name	
Address		Address	
Phone	Driver License #	Phone	Driver License #
Vehicle Type		Other Vehicle Type	
Vehicle license Plate #		Vehicle license Plate #	
Owner's Name		Owner's Name	
Address		Address	
Vehicle Insurance Co. Name		Other Vehicle Insurance Co. Name	
Name Policy is Under	Policy #	Name Policy is Under	Policy #
Passenger Info	Passenger Info	Passenger Info	Passenger Info
ACCIDENT DETAILS			
Date of Accident		Explain how the accident happened	
Time of Accident <input type="checkbox"/> am <input type="checkbox"/> pm			
Street			
City			
State			
Approx Speed: Your MPH: Other MPH:		Describe your vehicle's damage	
Describe any Injuries			
		Describe other vehicle's damage	
Investigating Officer Name			
Phone Badge No.			
Police Department			
Investigating Officer Name			
Phone Badge No.			
Police Department			
Witness Info			
Witness Info			
Report Completed By			
Signature			

20 *Powered Industrial Trucks (Forklifts)*

20.1 *Policy Statement*

Pyro Combustion & Controls Inc. is committed to creating a safe and healthy work environment. Powered industrial trucks can help employees move material safely, but create hazards that must be controlled. This powered industrial truck safety program will ensure the safe use and service of such equipment.

Each forklift operator must be competent to operate the equipment safely, as demonstrated by the successful completion of the training and evaluation specified in OSHA regulations.

20.2 *Responsibilities*

Ensuring safety in the operation of powered industrial trucks (PITs) is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

20.2.1 *Employer Responsibilities*

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Select and purchase equipment compliant with relevant regulations and safety standards;
- Ensure safe operation of powered industrial trucks in the workplace;
- Designate areas to store fuel and batteries, change and charge batteries, and maintain PITs safely, including equipment to prevent and respond to hazard exposure;
- Ensure operators and those maintaining PITs are 18 or older, trained and competent in safety practices regarding PITs. Exceptions for trainees over 18 are permitted; and
- Provide a safe work environment, free from hazards to employees.

20.2.2 *Safety Committee Responsibilities*

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Assist in identifying hazards associated with PITs;
- Assist in providing PIT training for personnel;
- Assist in training personnel in the safe operation of PITs;
- Review safe PIT procedures yearly or as necessary to ensure safety and health; and
- Identify hazardous environments that may require special safeguards for PITs.

20.2.3 Employee Responsibilities

Pyro Combustion & Controls Inc. employees are expected to:

- Be aware of hazards associated with PITs;
- Store and handle fuel and batteries in a safe manner, according to established safe procedures;
- Actively participate in all training relevant to their position;
- Operate PITs safely, according to all relevant standards and regulations;
- Report potentially hazardous situations or maintenance concerns as soon as safely possible; and
- Load and unload PITs in a safe manner

20.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on powered industrial trucks. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to the educational level, literacy, and language of employees.

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 their competence; and
- Where such operation does not endanger the trainee or other employees.

20.3.1 Training Components

Training for PIT operation will include formal instruction, practical training, and evaluation. Trainers will demonstrate knowledge, training and experience necessary to deliver said training and evaluate operator performance.

Gary Pfizenmayer will ensure that every employee who works with powered industrial trucks will be trained in the following minimum elements:

- Truck-related topics
- Operating instructions, warnings, and precautions for the types of truck the operator will be authorized to operate;
- Differences between the truck and the automobile;
- Controls and instrumentation: where they 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;
- Vehicle stability;
- Any vehicle inspection and maintenance that the operator will be required to perform;
- Refueling and/or charging and recharging of batteries;
- Operating limitations;
- Any other operating instructions, warnings, or precautions listed in the operator's manual for the types of vehicle operated.
- Workplace-related topics
- Surface conditions where the vehicle will be operated;
- Composition of loads to be carried and load stability;
- Load manipulation, stacking, and unstacking;
- Pedestrian traffic in areas where the vehicle will be operated;
- Narrow aisles and other restricted places where the vehicle will be operated;
- Hazardous (classified) locations where the vehicle will be operated;
- Ramps and other sloped surfaces that could affect the vehicle's stability;
- Closed environments and other areas where insufficient ventilation or poor vehicle maintenance could cause a buildup of carbon monoxide or diesel exhaust; and
- Other unique or potentially hazardous environmental conditions in the workplace that could affect safe operation.

20.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

20.4 Policy

20.4.1 Design and Construction Requirements

PITs and attachments will be selected based on the work performed, with utmost concern for the safety and wellbeing of employees. All PITs will meet OSHA-approved design and construction requirements for trucks of their type.

20.4.1.1 Labels, Nameplates, Markings

Any PIT in use will bear a label that indicates approval by a nationally recognized testing lab. This durable, corrosion-resistant nameplate must be inscribed with the following information:

- Truck model and serial number;
- Truck weight;
- Designation of compliance with the mandatory requirements of ASME B56.1, "Safety Standard for Low and High Lift Trucks," applicable to the manufacturer;
- Type designation to show conformance with the requirements, such as those prescribed by Underwriters Laboratories, Inc., and Factory Mutual Research Corporation; and
- Capacity.

Before employees operate a PIT, they must demonstrate the ability to read and interpret truck nameplates to prevent overloading or other improper use.

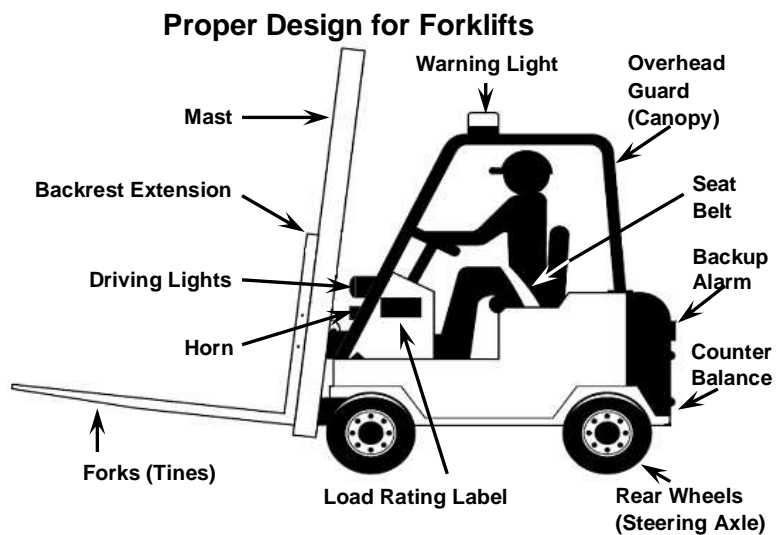
20.4.1.2 Modifications and Attachments

Any modification or addition to industrial trucks used that will affect their capacity or safe operation requires the written approval of the original manufacturer of that truck. If equipped with an after-market attachment, the truck will be marked to indicate the approximate weight of the truck with the attachment.

20.4.1.3 Safety Guards

Overhead Guard

An overhead guard provides protection against falling objects, but is likely not to protect the user from the impact of a falling capacity load. All high-lift rider trucks, order-picker trucks and rough-terrain forklift trucks must be equipped with an overhead guard in accordance with OSHA regulations and ANSI B56.1-1969, "Safety Standard for Low and High Lift Trucks."



A forklift with some of the more common features

Vertical Load Backrest

A load backrest extension prevents the load from shifting back when the carriage is lifted to full height and will be used when necessary to prevent any part of a load from falling rearward.

Seat Belts

If the PIT is equipped with a seat belt or any operator restraint system designed to contribute to the safety of truck operation, the operator is required to use the restraint.

Other Safety Guards

PITs may be equipped with a range of other devices designed to contribute to safe operation. Employees will maintain all safety equipment in good repair, and all operators must understand the use of such safety equipment and devices. These include, but are not limited to the following:

- Horns
- Flashing warning lights
- Backup alarms
- Directional signals
- Fire extinguisher
- Mirrors

Forklift classes and lift codes		
Classes	Lift codes	Description
Class I: electric motor rider trucks	1	Counterbalanced rider type, stand up
	4	Three wheel electric truck, sit down
	5	Counterbalanced rider type, cushion tires, sit down
	6	Counterbalanced rider, pneumatic or either tire type, sit down
Class II: electric motor narrow aisle trucks	1	High lift straddle
	2	Order picker
	3	Reach type outrigger
	4	Side loaders, turret trucks, swing mast and convertible turret/stock pickers
	6	Low lift pallet and platform (rider)
Class III: electric motor hand trucks	1	Low lift platform
	2	Low lift walkie pallet
	3	Tractors
	4	Low lift walkie/center control
	5	Reach type outrigger
	6	High lift straddle
	7	High lift counterbalanced
	8	Low lift walkie/rider pallet
Class IV: internal combustion engine trucks (cushion tires only)	3	Fork, counterbalanced (cushion tire)
Class V: internal combustion engine trucks (pneumatic tires only)	4	Fork, counterbalanced (pneumatic tire)
Class VI: electric and internal combustion engine tow tractors	1	Sit-down rider
Class VII: rough terrain fork lift trucks	1	All rough-terrain lift trucks
Class VIII: personnel and burden carriers	1	All personnel and burden carriers

Table 1

20.4.1.4 Forklift Classes

PITs come in a range of sizes and configurations; the industrial truck association classifies industrial trucks into eight categories that suggest the utility of the truck. Each class is subdivided by lift codes. Table 1 outlines the classifications and lift codes of PITs.

20.4.2 Industrial Truck Designations & Operating Locations

Workplace hazards may limit the types of PITs permitted in the workplace. Internal combustion engines and electric motors may ignite flammable atmospheres. This company will follow restrictions on trucks in potentially hazardous environments. OSHA provides guidelines based on NFPA standards to establish the types of safeguards that must be present in trucks used in such environments.

20.4.2.1 Designations

In addition to classification based on the configuration, use and features of the truck, PITs are categorized based on safety features and power sources to indicate in which potentially hazardous locations the truck may be used. Table 2 indicates the designations of industrial trucks based on their power sources and safeguards.

Internal Combustion Engines

Forklifts powered by internal combustion engines run on a variety of fuels, including gasoline, diesel fuel, liquid petroleum gas (LPG), and compressed natural gas. Forklifts with internal combustion engines can be quickly refueled but require regular maintenance checks for leaks of fuel or oil and worn parts to keep systems working properly. Forklifts powered by internal combustion engines used indoors may increase worker exposure to exhaust and noise.

Safeguards to exhaust, fuel and electrical systems, as well as electrical equipment limitations and temperature limitation features allow internal combustion engine trucks in certain designated locations.

Electric

Electric-powered forklifts are most commonly used indoors in warehouses. Unlike internal combustion forklifts, electric forklifts are quiet and generally non-polluting but present other hazards to address, specifically related to batteries and their charging.

Safeguards to the electrical system, motors, fittings and equipment, and special construction must still be in place for operation of such trucks in certain locations.

20.4.2.2 Locations

OSHA and NFPA classify environments to define which designations of industrial trucks are appropriate to use with the hazards present. Table 3 indicates hazardous location classifications and indicates which types of industrial trucks have sufficient safeguards for such locations.

Designations of Powered Industrial Trucks		
Power Source	Designation	Safeguards
Diesel	D	minimum
	DS	exhaust, fuel and electrical systems
	DY	exhaust, fuel and electrical systems; no electrical equipment including the ignition; temperature limitation features
Electric	E	minimum
	ES	electrical system (prevent emission of hazardous sparks, limit surface temperatures)
	EE	electrical system; electric motors and all other electrical equipment completely enclosed
	EX	electrical system; electric motors and all other electrical equipment completely enclosed; electrical fittings and equipment designed, constructed and assembled to be used in certain atmospheres containing flammable vapors or dusts
Gasoline	G	minimum
	GS	exhaust, fuel and electrical systems
Liquefied Petroleum Gas	LP	minimum
	LPS	exhaust, fuel and electrical systems

Table 2

Summary Table on Use of Industrial Trucks in Various Locations

Classes	Unclassified	Class I Locations						Class II Locations				Class III Locations		
		Locations in which flammable gases or vapors are, or may be, present in the air in quantities sufficient to produce explosive or ignitable mixtures						Locations which are hazardous because of the presence of combustible dust				Locations where easily ignitable fibers or flyings are present but not likely to be in suspension in quantities sufficient to produce ignitable mixtures		
Description of classes	None	A	B	C	D	E	F	G	Class II Locations		Class III Locations			
Groups	None	Acetylene	Hydrogen	Ethyl ether	Gasoline, Naptha, Alcohol, Acetone, Lacquer solvent Benzene	Metal dust	Carbon black coal dust, coke dust	Grain dust, flour dust, starch dust, organic dust	Class II Locations		Class III Locations			
Examples of locations or atmospheres in classes or groups	Piers and wharves inside and outside general storage, general industrial or commercial properties	Class I Locations		Class II Locations		Class III Locations		Class II Locations		Class III Locations				
Nature of hazardous conditions	None	1		2		1		2		1		2		
		Above condition exists continuously, intermittently, or periodically under normal operating conditions.		Above condition may occur accidentally as due to a puncture of a storage drum.		Explosive mixture may be present under normal operating conditions, or where failure of equipment may cause the condition to exist simultaneously with arching or sparking of electrical equipment, or where dusts of an electrically conducting nature may be present.		Explosion mixture not normally present, but where deposits of dust may cause heat rise in electrical equipment, or where such deposits may be ignited by arcs or sparks from electrical equipment.		Locations in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured, or used		Locations in which easily ignitable fibers are stored or handled (except in the process of manufacture)		
Diesel:	Type D													
	Type DS													
	Type DY													
	Electric:	Type E												
		Type ES												
		Type EE												
		Type EX												
	Gasoline:	Type G												
		Type GS												
		LP-Gas												
Type LP														
Type LPS														
Para. Ref. in No. 505	210.211	201(a)	203(a)	209(a)	204(a)	202(a)	205(a)	209(a)	206(a)	207(a)	208(a)	208(a)		

Authorized uses of trucks by types in groups of classes and divisions

*** Trucks conforming to these types may also be used — see subdivision (c)(2)(x) and (c)(2)(xii)

20.4.2.3 Other Operating Environment Concerns

Any environment in which employees operate forklifts or PITs must allow safe use. Lighting

If lighting is less than two lumens/ft² the truck will be equipped with directional lighting

Noxious Gases and Fumes

Trucks with internal combustion engines produce exhaust and fumes that may be hazardous to forklift operators and other employees. The concentration of carbon monoxide gas must not exceed 50ppm or the levels specified by OSHA, whichever is less. Trucks powered by an internal combustion engine require well-ventilated areas.

Trucks and Railroad Cars

Operators must take the following precautions when loading or unloading from trucks or railroad cars to ensure safety:

- The brakes of highway trucks shall be set and wheel chocks placed under the rear wheels to prevent the trucks from rolling when boarded with PITs;
- Wheel stops or other recognized positive protection must prevent railroad cars from moving during loading or unloading operations;
- Fixed jacks may be necessary to support a semitrailer and prevent upending during the loading or unloading when the trailer is not coupled to a tractor; and
- Positive protection must prevent railroad cars from moving while dockboards or bridge plates are in position.

Dockboards and Bridgeplates: Dockboards or bridgeplates in use must be strong enough to carry the load driven over them.

20.4.3 Maintenance and Related Concerns

Policy requires all equipment to remain in good repair and for operators to use equipment in an always-safe manner. Any power-operated industrial truck not in safe operating condition must be removed from service so authorized personnel may repair it. All maintenance, refueling and battery charging will be performed in a way to ensure the safety of employees.

20.4.3.1 Pre-operation Inspection

Industrial trucks shall be examined daily or after each shift and before being placed in service. Operators must report any defects when found so an authorized person can service the truck appropriately. An example pre-operation daily checklist is included at the end of this chapter, but one specific to the truck in service should be available from its manufacturer.

Visual Check

Before starting the vehicle, an operator must conduct a pre-operation (or pre-start) inspection to check a variety of items, including but not limited to:

- Fluid levels — oil, water, and hydraulic fluid;
- Leaks, cracks or any other visible defect including hydraulic hoses and mast chains. Operators should not place their hands inside the mast. Use a stick or other device to check chain tension;
- Tire condition and pressure including cuts and gouges;
- Condition of the forks, including the top clip retaining pin and heel;
- Load backrest extension;
- Finger guards;
- Safety decals and nameplates. Ensure all warning decals and plates are in place and legible. Check that information on the nameplate matches the model and serial numbers and attachments;
- Operator manual and legible nameplate;
- Operator compartment. Check for grease and debris; and
- All safety devices are working properly including the seat belt.

In addition to this general inspection, operators must check forklift-specific (electric or internal combustion, including liquid propane) features.

Operational Check

After completing the pre-operation inspection, operators should conduct an operational inspection with the engine running. This inspection includes:

- Accelerator linkage;
- Inch control (if equipped);
- Brakes;
- Steering;
- Drive control: forward and reverse;
- Tilt control: forward and back;
- Hoist and lowering control;
- Attachment control;
- Horn;
- Lights;
- Back-up alarm (if equipped); and
- Hour meter.

Operators must report unusual noises or vibrations, leaks and unusual operating behavior immediately for repair.

20.4.3.2 Gasoline, Diesel and Liquid Petroleum Gas

Handling and Storage

Gasoline, diesel fuel and liquefied petroleum gases on premises will be stored and handled according to the appropriate OSHA regulations, and NFPA codes and standards.

Refueling

Gas and Diesel: Refueling with gasoline or diesel presents the potential hazard of exposure to explosive fumes. Refueling will be restricted to designated safe locations, preferably outdoors, and the operator will adhere to the following requirements and recommended practices:

- Stop the engine during refueling;
- Do not smoke while refueling;
- Do not allow the forklift to become low on fuel or run out of fuel. Sediment or other impurities in the tank drawn into the fuel system can cause difficulties in starting and damage internal components;
- Fill the fuel tank at the end of each day;
- Do not fill the tank to the top; it may overflow because fuel expands as it is heated;
- Follow correct refueling procedures:
 1. Park the forklift in the designated refueling area.
 2. Place the transmission in Neutral.
 3. Lower the forks to the ground.
 4. Engage the parking brake.
 5. Shut off the engine.
 6. Open the filler cap.
 7. Fill the tank slowly (if spillage occurs, wipe off and wash area with water).
 8. Close the filler cap.

Liquid petroleum gas: Liquid petroleum gas (LPG) is a commonly used fuel for forklifts. It is a safe fuel when handled properly. However, LPG is extremely flammable and extremely cold when exposed to atmosphere. When handled improperly, it can cause serious injury or death.

Areas to refuel LPG-powered trucks must permit vapors to dissipate and must be away from heat sources. Only authorized personnel should replace LPG containers.

20.4.3.3 Changing and Charging Batteries

The lead-acid batteries that power electric trucks require routine charging. If battery-powered forklifts are used, the Safety Committee or the safety coordinator will work with the appropriate personnel to develop facility-specific safety procedures based on manufacturer's recommendations and the following guidelines:

- The operator will position the truck and apply breaks before the battery may be changed or charged;
- Appropriate lifting equipment must be used to lift the battery;
- Authorized personnel should only pour acid into water when charging batteries, never the other way around;
- Care shall be taken to assure that vent caps are functioning. The battery (or compartment) cover(s) shall be open to dissipate heat;
- Individuals should remove metal jewelry before charging or servicing batteries, and keep all other metallic objects from the top of uncovered batteries;

- Appropriate PPE should be worn;
- Check the water level. Do not add water before recharging. Record in service log;
- Check the voltage. If the battery has sealed vents, do not recharge with a current greater than 25 amperes;
- Unplug and turn off the charger before connecting or disconnecting the clamp connections;
- Attach the positive clamp (+, usually colored red) to the positive terminal first and then the negative clamp (–, usually colored black) to the negative terminal, keeping the proper polarity;
- Turn off the charger if the battery becomes hot or the electrolyte fluid comes out of the vents. Restart charging at a lower charging rate;
- Check water level after charging. Add distilled water or de-ionized water if water level is below level indicator. Record in service log;
- Return battery to forklift with lifting beam and secure in place after charging; and
- Check the indicator on the hour meter to see that battery is fully charged.

Under normal operating conditions, forklift batteries remain in service for 2,000 charge/discharge cycles. The battery maintenance program is designed to increase the life of the batteries and help protect employees.

Battery failure could lead to mechanical breakdowns and possible accidents involving forklift operators and/or other personnel.

- Do not continue a battery in service merely because it continues to deliver power.
- Do not exceed the service hours in the manufacturer's recommendations.
- Do not overcharge or undercharge batteries.
- Avoid discharging batteries beyond the manufacturer's discharge level. This can result in permanent battery damage and shorten battery life considerably.
- Warning signs of a low battery include slow starting, dim headlights, and the ammeter indicating discharge at high RPM.
- Recycle or properly dispose of batteries. Spent batteries are a hazardous waste unless properly reclaimed at a lead smelter or battery recycler.

Appropriate precautions to control the hazards from battery acid include personal protective equipment and a detailed safety procedure formulated by the safety committee to respond to an acid splash or spill.

Facilities

Only charge batteries in areas designated for that purpose, which will be equipped with any material handling equipment necessary for safe handling and servicing of batteries. Smoking and any other ignition source are forbidden in battery charging areas, including but not limited to open flames, sparks, or electric arcs.

Powered Industrial Trucks (Forklifts)

Facilities will be provided as needed for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage by trucks, and for adequate ventilation for dispersal of fumes from gassing batteries.

A properly equipped battery charging area will have:

- No smoking;
- Warning signs posted;
- Adequate fire protection;
- Ample and readily available water supply for flushing and neutralizing spilled electrolyte;
- An eyewash able to provide a 15 minute flow;
- (For large installations, there should be a plumbed drench shower and an eyewash.);
- A phone or other means of communication in the event of an emergency;
- Adequate ventilation to avoid the buildup of hydrogen gas during battery charging;
- Soda ash or other neutralization materials in the immediate area;
- A dry chemical, CO₂ or foam fire extinguisher; and
- Means to protect charging apparatus from damage from trucks.

20.4.3.4 Other Maintenance Concerns

Following are requirements of OSHA regarding the maintenance of PITs:

- Make repairs to PITs only in designated locations, away from fire hazards, never in class I, II or III locations;
- Replacement parts for trucks must be equivalent to the original parts in terms of safety and the truck's configuration will not be altered;
- Keep open flames away from batteries and fuel tanks and disconnect the battery before making any electrical system repair;
- Any alteration, removal or addition of parts, or change in their configuration must be in accordance with manufacturer recommendations, and should generally not be undertaken;
- The truck manufacturer must approve additional counterweighting of fork trucks;
- Water mufflers shall be filled daily or as frequently as is necessary to prevent depletion of the supply of water below 75 percent of the filled capacity;
- Vehicles with mufflers having screens or other parts that may become clogged shall not be operated while such screens or parts are clogged;
- Personnel will immediately remove from service any vehicle that emits hazardous sparks or flames from the exhaust system until appropriate service and repair eliminates the cause for the emission of sparks or flames;
- Personnel will remove a truck from service when the temperature of any part exceeds normal operating temperature until appropriate service and repair eliminates the cause for overheating;
- Employees must keep trucks in a clean condition, free of lint, excess oil, and grease. Employees will use only noncombustible agents to clean trucks; and

- Industrial trucks approved for gasoline may be converted to use liquefied petroleum gas fuel provided the complete conversion results in a truck that embodies the features specified for LP or LPS designated trucks.

20.4.4 Truck Operations

OSHA requires operators of PITs to adhere to the following rules to ensure safe operation.

20.4.4.1 General Safe Operations

- Do not drive trucks up to anyone standing in front of a bench or other fixed object;
- Do not stand or pass under the elevated portion of any truck, whether loaded or empty;
- Do not permit unauthorized personnel to ride on PITs. Regulations only permit passengers when they have a safe place to ride;
- Keep arms and legs away from between the uprights of the mast or outside the running lines of the truck;
- Maintain a safe distance from the edge of ramps or platforms while on any elevated dock, or platform or freight car. Do not use trucks to open or close freight doors;
- There shall be sufficient headroom under overhead installations, lights, pipes, sprinkler system, etc; and
- Keep fire aisles, access to stairways, and fire equipment clear.

20.4.4.2 Maneuvering and Traveling

- Operators will observe all traffic regulations, including speed limits, and will maintain a safe distance (approximately three truck lengths) from the truck ahead. Keep the truck under control at all times.
- Operators must yield right of way to ambulances, fire trucks, or other vehicles in emergencies.
- Do not pass other vehicles traveling in the same direction at intersections, blind spots, or other dangerous locations.
- The driver will slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load obstructs forward view, the driver must travel with the load trailing.
- Cross railroad tracks diagonally wherever possible. Park no 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.

SLOW YOUR ROLL!

Powered industrial truck operators must slow down in the following situations:

- When approaching within three truck lengths of another truck.
- At cross aisles and anywhere vision is obstructed.
- On grades.
- When going too fast to come to a safe stop.
- On wet or slippery floors.
- On dockboards or bridgeplates.
- Approaching elevators.
- Negotiating turns.

Powered Industrial Trucks (Forklifts)

- Ascend or descend grades slowly.
- When ascending or descending grades in excess of 10 percent, drive loaded trucks with the load up grade.
- On grades, tilt back load engaging means and raise the load to clear the road surface.
- Under all travel conditions, operate the truck at a speed that will permit it to be brought to a stop in a safe manner.
- No stunt driving or horseplay.
- The driver must slow down for wet and slippery floors.
- Drive over dockboard or bridgeplates carefully and slowly, never exceed rated capacity.
- Approach elevators slowly, entering them squarely only after the elevator car is properly leveled. Once on the elevator, neutralize controls, shut off power, and set brakes.
- Motorized hand trucks must enter confined areas with load end forward.
- Avoid running over loose objects on the roadway surface.
- While negotiating turns, reduce speed to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, turn the hand steering wheel only at a moderate, even rate.

20.4.4.3 Load Handling

- Handle only stable or safely arranged loads. Exercise caution when handling off-center loads which cannot be centered.
- All loads will be within the rated capacity of the truck.
- The long or high loads which may affect capacity shall be adjusted.
- Operate trucks with attachments as partially loaded trucks when not handling a load.
- Place the 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 high tiering. Do not tilt load engaging means forward while elevated except to pick up a load. Do not tip an elevated load forward unless the load is in a deposit position over a rack or stack. When stacking or tiering, use only enough backward tilt to stabilize the load.

Parking

A PIT operator will adhere to the following procedures (see Figure 1) to dismount the truck:

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

- When the operator of an industrial truck is dismounted and within 25 ft. of the truck still in his view, the load engaging means shall be fully lowered, controls neutralized, and the brakes set to prevent movement.

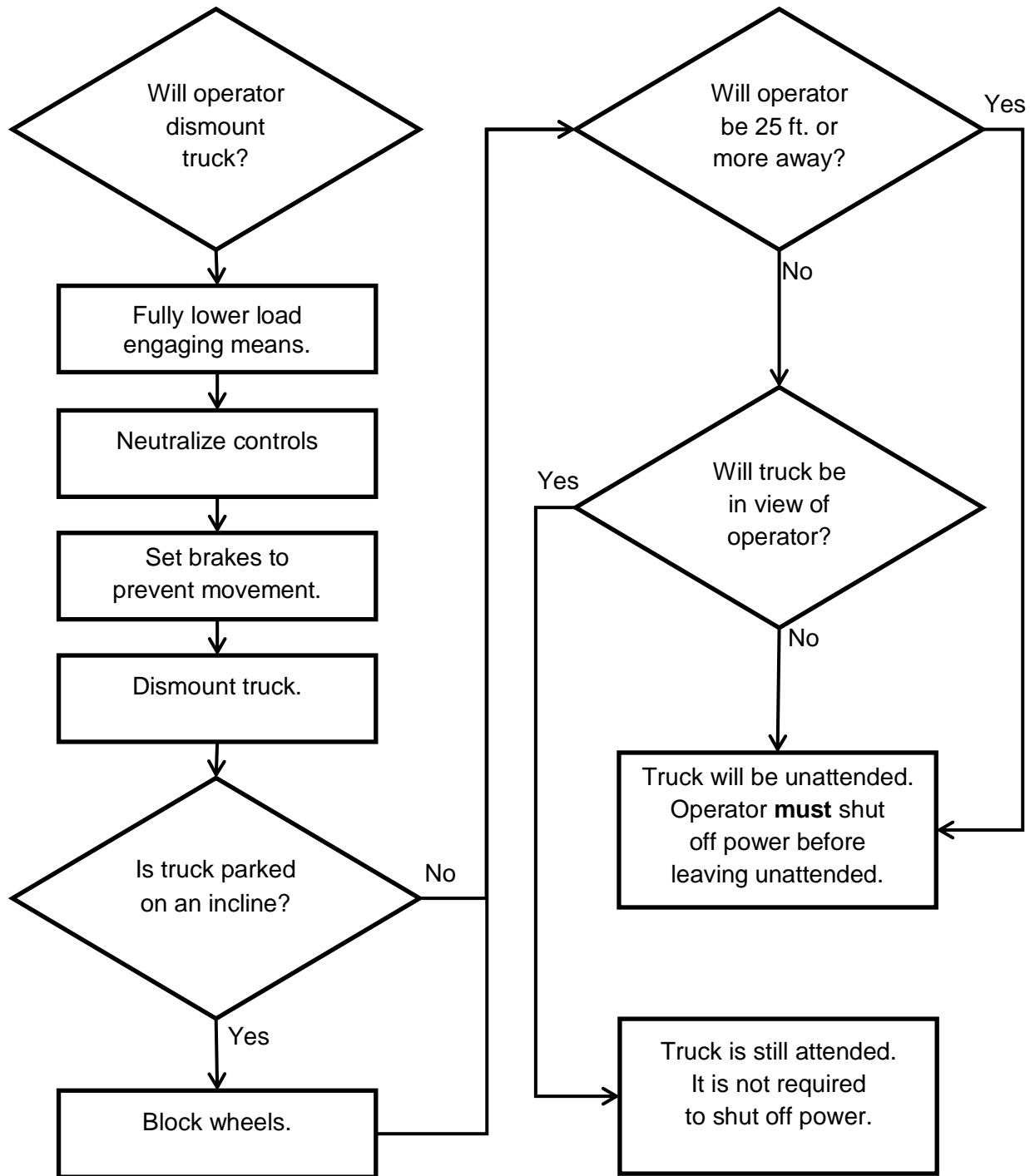


Figure 1 — Parking your PIT

20.5 *Forms & Attachments*

On the following pages, please find the following document(s):

- Performance Evaluation for Forklift Operators
- Powered Industrial Trucks Training Record Sheet

Daily Inspection Checklist for Powered Industrial Trucks

KEY OFF Procedures

- Overhead guard
- Hydraulic cylinders
- Mast assembly
- Lift chains and rollers
- Forks
- Tires
- Gas gauge
- Check the engine oil level
- Examine the battery
- Inspect the hydraulic fluid level
- Check the engine coolant level

KEY ON Procedures

- Front, tail, and brake lights
- Fuel gauge (if diesel)
- Windshield wiper
- Heater

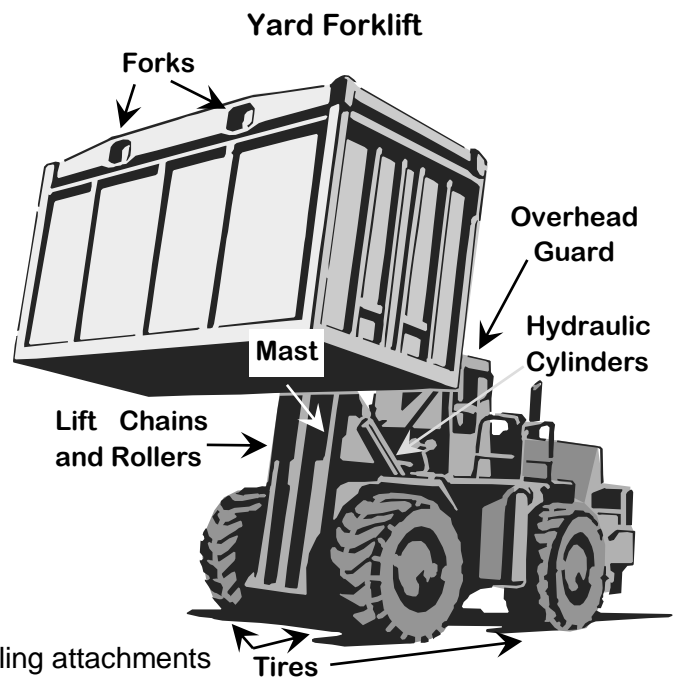
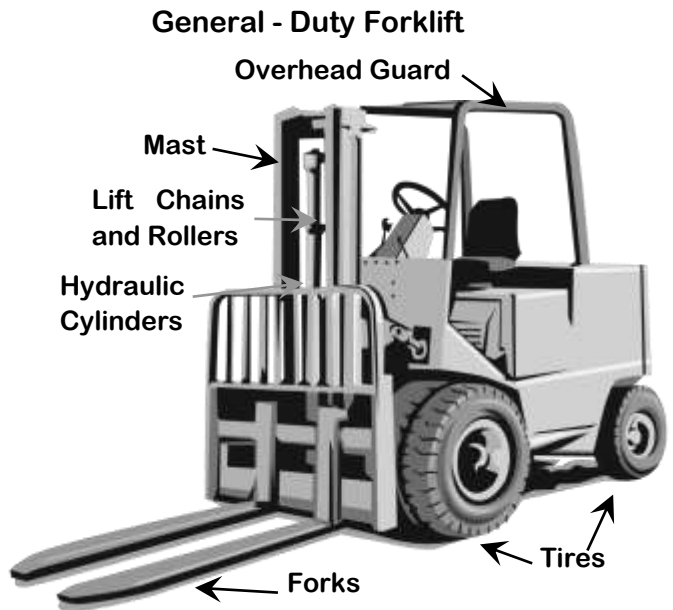
ENGINE RUNNING Procedures

Gauges

- Oil pressure indicator lamp
- Ammeter indicator lamp
- Ammeter
- Hour Meter
- Water Temperature Gauge

Standard Equipment

- Steering
- Brakes
- Horn
- Safety seat (if equipped)
- Check the operation of load-handling attachments
- Check the transmission fluid level



21 Welding, Cutting & Brazing (Hotwork)

21.1 Policy Statement

Pyro Combustion & Controls Inc. is committed to preserving the safety of employees and maintaining a place of employment free from recognized hazards.

Accordingly, only properly trained employees, authorized to perform such operations with a written hot work permit may perform welding, cutting, brazing, grinding and other hotwork. If it is impossible to eliminate fire hazards from such work, appropriate control steps will be taken to ensure the safety of workers, including engineering and administrative controls and personal protective equipment.

This welding, cutting, and brazing program — designed to protect life and property from fire, atmospheric contaminants, and other associated hazards during these operations — will be enforced rigorously.

21.2 Responsibilities

Protecting workers and the work environment from fire and atmospheric contaminants during hot work is a cooperative effort between *Pyro Combustion & Controls Inc.* and its employees.

21.2.1 Employer Responsibilities

It is the responsibility of *Pyro Combustion & Controls Inc.* to:

- Ensure the safe use of cutting and welding equipment on site;
- Establish areas for cutting and welding and establish procedures based on the fire potentials of facilities;
- Designate a person to authorize cutting and welding operations if they are done outside of designated areas;
- Ensure that cutters, welders and their supervisors are trained to operate their equipment according to safe processes; and
- Inform contractors of fire hazards.

21.2.2 Safety Committee Responsibilities

It is the responsibility of the *Pyro Combustion & Controls Inc.* safety committee to:

- Assist in identifying hazards associated with hotwork;
- Assist in training employees regarding hotwork procedures;
- Participate in regular review of hotwork safety program as necessary;
- Offer to management recommendations from employees about the program; and
- Assist in hotwork operations safety activities as required.

21.2.3 Employee Responsibilities

Pyro Combustion & Controls Inc. employees who, as part of their work responsibilities engage in welding, brazing, cutting, grinding or any other activity that can produce spark, heat or atmospheric toxicants are expected to:

- Refrain from welding or other hot work without appropriate authorization;
- Only perform such activities in designated, appropriately ventilated areas unless authorized otherwise; and
- Follow all other safe work practices as outlined in this policy.

Supervisors of employees who must perform welding are expected to:

- Be responsible for the safe handling and use of equipment to cut or weld;
- Determine fire hazards and combustibles that are or may arise at the work location;
- Prevent ignition of combustibles by the following:
 - Ensuring work gets moved away from combustibles;
 - Moving combustibles from the work or emplacing guards to prevent;
 - Ensuring cutting or welding work is done at a time when nearby operations will not expose combustibles to ignition from such work;
 - Secure authorization from management before any cutting or welding is begun;
 - Ensure the cutter or welder does not go ahead without approval of safe conditions;
 - Determine that fire protection and extinguishing equipment are located at the site; and
 - Ensure the availability of a fire watch as required.

21.3 Training

Pyro Combustion & Controls Inc. will ensure every employee is provided training on hotwork. This training will be provided at no cost to the employee during working hours.

Pyro Combustion & Controls Inc. will use only training material that is appropriate in content and vocabulary to the educational level, literacy, and language of employees.

21.3.1 Training Components

Gary Pfizenmayer will ensure that every employee will be trained in the following minimum elements:

- Compressed gas hazards and cylinder safety and storage;
- Fire hazards in the workplace;
- The roles and responsibilities for a fire watch while welding;
- Location and use of fire extinguishers;
- Housekeeping efforts around welding;
- Personal protective equipment selection, fitting and use;
- Welding in confined spaces;
- Basic rules for any welding technique used at work;
- Protective devices like valves, backflow preventers, etc;
- Hazards associated with chemicals used in welding; and
- Hazards associated with light and non-visible spectrum radiation in welding.

21.3.2 Training Records

Training records will include the following information:

- The dates of the training sessions;
- The contents or a summary of the training sessions;
- The names and qualifications of persons conducting the training; and
- The names and job titles of all persons attending the training sessions.

Employee training records will be maintained for 3 years from the date on which the training occurred.

21.4 Policy

21.4.1 General Requirements

21.4.1.1 Fire Prevention and Protection

Cutting or welding may only occur in fire-safe areas.

If the object to be welded or cut cannot be moved, movable fire hazards need to be moved at least 35 feet away. If it is impossible to move them, safeguards to confine heat, sparks, and slag must protect the immovable fire hazards.

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

Where combustible materials are on the floor, employees must sweep the floor clean for a radius of 35 feet. Combustible floors shall be kept wet (protect welder from shock if arc welding), covered with damp sand, or protected by fire-resistant shields.

Welding, Cutting & Brazing (Hotwork)

Floor openings or cracks in the floor that cannot be closed, as well as holes in walls, open doorways and open or broken windows must be guarded to prevent sparks from reaching readily combustible material. Employees must shutdown ducts that could carry sparks to combustibles, or emplace appropriate safeguards before hotwork.

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

Fire extinguishing equipment appropriate to the present hazard will be ready for instant use during hot work.

An inspector will inspect the worksite and designate precautions before granting authorization to proceed with cutting or welding in the form of a **written permit**.

Fire Watch

Fire watchers must be present for welding or cutting in locations where an unplanned flame might develop or when any of the following is true:

- Appreciable combustible material is within 35 feet to the point of operation.
- Sparks may easily ignite appreciable combustibles more than 35 feet away.
- Wall or floor openings within a 35-foot radius expose combustible material in adjacent areas (including concealed spaces in walls or floors).
- Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.

Fire watchers must have fire extinguishing equipment readily available and training in its use. They shall be familiar with facilities for sounding an alarm in the event of a fire and will watch for fires in all exposed areas. Fire watchers must try to extinguish flames only when within the capacity of the equipment available. Otherwise, they must sound the alarm.

The fire watch will continue for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires.

Prohibited Areas

Cutting or welding is prohibited in the following situations:

- in areas not authorized by management;
- in sprinklered buildings where the sprinkler's ability to stop fire have been impaired;
- in explosive atmospheres, including those that may develop inside uncleaned or improperly prepared spaces that contained explosive materials, or where there is an accumulation of combustible dusts;
- in areas near the storage of large quantities of exposed, readily ignitable materials such as bulk sulfur, baled paper, or cotton;
- on a metal partition, wall, ceiling or roof that has a combustible covering or walls of sandwich-type construction; and

- on pipes or other metal in close enough contact with combustible walls, partitions, ceilings or roofs to ignite them by conduction.

Containers

Welding, cutting, or other hot work is forbidden on used drums, barrels, tanks or other containers until they are clean of flammable materials or substances that produce flammable or toxic vapors.

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

Disconnect or blank any pipelines or connections to the drum or vessel, and vent all hollow spaces or containers (purge with inert gas if appropriate).

Confined Spaces

Ventilation is required to work in any confined space.

Leave gas cylinders and welding machines outside of confined spaces. Before starting operations, block the wheels of heavy portable equipment to prevent movement.

A welder will only enter a confined space with company-provided means to be removed in case of emergency. When using safety belts and lifelines for this purpose, they need to be attached to the welder's body so that his body cannot be jammed in a small exit opening.

As with any work done in a hazardous confined space, the worker will have an attendant stationed outside with a preplanned rescue procedure who can observe the welder at all times and put rescue plans promptly into effect.

In confined spaces, when suspending arc welding for any substantial period, such as during lunch or overnight, the worker will:

- remove electrodes from the holders;
- locate the holders carefully to prevent accidental contact;
- disconnect the machine from the power source; and
- close torch valves and gas supply outside the confined space.

The worker also must remove the torch and hose from the confined space.

21.4.1.2 Protection of Personnel

Employees will have every appropriate protection against identified hazards.

Effective safeguards will protect workers on platforms, scaffolds or other spaces that present a falling hazard. Welding cable and equipment will remain clear of passageways, ladders and stairways to ensure safe travel.

After welding operations are completed, the welder will mark the hot metal or provide some other means of warning other workers.

Eye Protection

Welders must use helmets and hand shields during arc welding or arc cutting operations, excluding submerged arc welding. The company also will provide helpers or attendants with proper eye protection.

Goggles or other suitable eye protection must be worn during all gas welding or oxygen cutting operations. Employees may use spectacles without side shields, with suitable filter lenses during gas welding operations on light work, for torch brazing or for inspection.

All operators and attendants of resistance welding or resistance brazing equipment shall use transparent face shields or goggles, depending on the particular job, to protect their faces or eyes, as required.

The company will provide eye protection in the form of suitable goggles where needed for brazing operations other than arc welding and brazing, or resistance welding or brazing.

The specifications for such protectors are as follows:

- Helmets and hand shields shall be made of material that insulates for heat and electricity;
- Helmets, shields and goggles shall be not readily flammable and shall be capable of withstanding sterilization;
- Helmets and hand shields shall be arranged to protect the face, neck and ears from direct radiant energy from the arc;
- Helmets shall be provided with filter plates and cover plates designed for easy removal;

Guide for the selection of the proper shade numbers

Welding Operation	Shade No.
Shielded metal-arc welding - $\frac{1}{16}$ -, $\frac{3}{32}$ -, $\frac{1}{8}$ -, $\frac{5}{32}$ -inch electrodes	10
Gas-shielded arc welding (nonferrous) - $\frac{1}{16}$ -, $\frac{3}{32}$ -, $\frac{1}{8}$ -, $\frac{5}{32}$ -inch electrodes	11
Gas-shielded arc welding (ferrous) - $\frac{1}{16}$ -, $\frac{3}{32}$ -, $\frac{1}{8}$ -, $\frac{5}{32}$ -inch electrodes	12
Shielded metal-arc welding:	
$\frac{3}{16}$ -, $\frac{7}{32}$ -, $\frac{1}{4}$ -inch electrodes	12
$\frac{5}{16}$ -, $\frac{3}{8}$ -inch electrodes	14
Atomic hydrogen welding	10-14
Carbon arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 inch to 6 inches	4 or 5
Heavy cutting, 6 inches and over	5 or 6
Gas welding (light) up to $\frac{1}{8}$ inch	4 or 5
Gas welding (medium) $\frac{1}{8}$ inch to $\frac{1}{2}$ inch	5 or 6
Gas welding (heavy) $\frac{1}{2}$ inch and over	6 or 8

NOTE: In gas welding or oxygen cutting where the torch produces a high yellow light, it is desirable to use a filter or lens that absorbs the yellow or sodium line in the visible light of the operation.

Table 1

- All parts shall be constructed of a material that will not readily corrode or discolor the skin;
- Goggles shall be ventilated to prevent fogging of the lenses as much as practicable;
- All glass for lenses shall be tempered, substantially free from striae, air bubbles, waves and other flaws. Except when a lens is ground to provide proper optical correction for defective vision, the front and rear surfaces of lenses and windows shall be smooth and parallel;
- Lenses shall bear some permanent distinctive marking by which to identify the source and shade;
- Filter lenses must meet the test for transmission of radiant energy prescribed by any of the following consensus standards:
 - ANSI Z87.1-2003, "American National Standard Practice for Occupational and Educational Eye and Face Protection;"
 - ANSI Z87.1-1989 (R-1998), "American National Standard Practice for Occupational and Educational Eye and Face Protection;" or
 - ANSI Z87.1-1989, "American National Standard Practice for Occupational and Educational Eye and Face Protection."
- Where work permits, enclose the welder in an individual booth painted with a finish of low reflectivity such as zinc oxide and lamp black, or enclose with noncombustible screens similarly painted. Booths and screens shall permit circulation of air at floor level; and
- Protect workers or other persons adjacent to the welding areas from the rays by noncombustible or flameproof screens or shields or shall be required to wear appropriate goggles.

Protective Clothing

Protect employees exposed to the hazards created by welding, cutting, or brazing operations with personal protective equipment as required to ensure safety and meet regulatory requirements. Appropriate protective clothing required for any welding operation will vary with the size, nature and location of the work.

21.4.1.3 Health Protection and Ventilation

The factors that govern the amount of contamination to which welders may be exposed are the dimensions of the workspace, the number of welders working, and the evolution of hazardous fumes, gases or dust.

When the welding area is screened on all sides, the screens need to be arranged to allow sufficient ventilation — mounted about 2 feet from the floor, unless the work being done is near enough to the ground to require them to be lower to prevent harm to nearby workers.

Ventilating systems must ensure toxic fumes, gases, or dust remain under permissible levels for all workers.

Welding, Cutting & Brazing (Hotwork)

First-aid equipment remains available according to the emergency action plan. Report all injuries immediately. Trained personnel will provide first aid until professional medical attention is available.

Precautionary Labels

Fluxes, coatings, coverings, and filler metals used in welding and cutting may employ potentially hazardous materials, including, but not limited to the following:

- Flourine Compounds;
- Zinc;
- Lead;
- Cleaning compounds;
- Beryllium;
- Cadmium;
- Mercury; and
- Chlorinated hydrocarbons.

Appropriate ventilation or respirator equipment must control hazards presented by these chemicals and oxygen cutting stainless steel. Find more detail on controlling hazards these chemicals present in CFR 1910.252 (c) (5-12).

Welding material suppliers are responsible for determining hazards associated with a given material used for welding or cutting. Materials used in hot work must be labeled with safety warnings according to the hazards the materials present and all workers must understand what the warnings mean.

Ventilation for General Welding and Cutting

Mechanical ventilation shall consist of either general mechanical ventilation systems or local exhaust systems and must be in place for welding or cutting on metals other than those listed above when any of the following is true:

- The space is less than 10,000 cubic feet per welder;
- The room has a ceiling height less than 16 feet;
- The space is confined; or
- The welding space has structural barriers that significantly obstruct cross ventilation.

Welding Zone	Minimum air flow cubic feet / minutes	Duct Diameter, inches
4 to 6 inches from arc or torch	150	3
6 to 8 inches from arc or torch	275	3 ½
8 to 10 inches from arc or torch	425	4 ½
10 to 12 inches from arc or torch	600	5 ½

Table 2

Natural ventilation is sufficient for welding or cutting operations where these restrictions are not present.

Ventilation will be at least 2,000 cubic feet per minute per welder, except where workers have local exhaust hoods and booths or have airline respirators approved for such purposes.

Mechanical local exhaust ventilation may be by means of either of the following:

- Freely movable hoods near the work provided with a rate of air flow in the direction of the hood of 100 linear feet per minute in the zone of welding when the hood is at its most remote distance from the point of welding. The rates of ventilation required to accomplish this velocity using a 3-inch wide flanged suction opening are shown in table 2; or

- A fixed enclosure with a top and at least two sides that surround the welding or cutting operations with a rate of airflow sufficient to maintain a velocity away from the welder of not less than 100 linear feet per minute.

Contaminated air exhausted from a working space shall be discharged clear of the source of intake air.

All air replacing that withdrawn shall be clean and respirable.

Oxygen shall not be used for ventilation purposes, comfort cooling, blowing dust from clothing, or for cleaning the work area.

Confined Spaces Ventilation

Adequate ventilation for all welding and cutting operations in confined spaces must prevent the accumulation of toxic materials or oxygen deficiency. This applies not only to the welder but also to helpers and other personnel in the immediate vicinity. All air replacing that withdrawn for ventilation must be clean and respirable.

If this company cannot provide such ventilation, it will provide approved (by the National Institute for Occupational Safety and Health — NIOSH) airline respirators or hose masks for this purpose.

An employee on the outside of the confined space shall be assigned to maintain communication with those working within it and to aid them in an emergency.

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

Areas immediately hazardous to life require a full-facepiece, pressure-demand, self-contained breathing apparatus or a combination full-facepiece, pressure-demand supplied-air respirator with an auxiliary, self-contained air supply approved by NIOSH.

Where welding operations occur in confined spaces require hose masks, hose masks with blowers or self-contained breathing equipment, a worker stationed on the outside of such confined spaces will ensure the safety of those working within.

Never use oxygen for ventilation.

21.4.1.4 Surfaces Covered by a Preservative Coating

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

When coatings are determined to be highly flammable, they shall be stripped from the area to be heated to prevent ignition.

Protection against toxic preservative coatings:

- In enclosed spaces, all surfaces covered with toxic preservatives shall be stripped of all toxic coatings for a distance of at least 4 inches from the area of heat application, or the employees shall be protected by approved airline respirators.
- In the open air, employees shall be protected by a respirator, in accordance with safety requirements.

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

21.4.1.5 Industrial Applications

Observe OSHA requirements where field shop operations are involved for fabrication of fittings, river crossings, road crossings, and pumping and compressor stations.

Special protection against electric shock for arc welding will be provided in wet conditions, or under conditions of high humidity.

In pressure testing of pipelines, protect workers and the public against injury by blowing out closures or other pressure restraining devices. Ensure protection against expulsion of loose dirt trapped in the pipe.

Employees will follow the appropriate standard for the following welding applications:

- Conduct the welded construction of transmission pipelines in accordance with the Standard for Welding Pipe Lines and Related Facilities, API Std. 1104-1968.
- The connection, by welding, of branches to pipelines carrying flammable substances shall be performed in accordance with Welding or Hot Tapping on Equipment Containing Flammables, API Std. PSD No. 2201-1963.
- The use of X-rays and radioactive isotopes for the inspection of welded pipeline joints shall be carried out in conformance with the American National Standard Safety Standard for Non-Medical X-ray and Sealed Gamma-Ray Sources, ANSI Z54.1-1963.

21.4.2 Oxygen-fuel Gas Welding and Cutting

Mixtures of fuel gases and air or oxygen may be explosive and require appropriate guards.

21.4.2.1 General Requirements

- Mixing air or oxygen with flammable gases will occur only at the burner or in a standard torch. Unapproved attachments or devices to mix air and fuel gasses are forbidden.
- Acetylene may not be generated, piped (except in approved cylinder manifolds) or utilized at a pressure in excess of 15 psig or 30 psia.
- Liquid acetylene is also forbidden.
- Only approved apparatus such as torches, regulators or pressure-reducing valves, acetylene generators, and manifolds shall be used.
- Anyone in charge of the oxygen or fuel-gas supply equipment, and oxygen or fuel-gas distribution piping systems shall be instructed and judged competent by their employers before being left in charge.
- Rules and instructions covering the operation and maintenance of oxygen or fuel-gas supply equipment including generators, and oxygen or fuel-gas distribution piping systems shall be readily available.
- Clogged torch tip openings shall be cleaned with suitable cleaning wires, drills, or other devices designed for such purpose.
- Torches in use shall be inspected at the beginning of each working shift for leaking shutoff valves, hose couplings, and tip connections. Defective torches shall not be used.
- Torches shall be lighted by friction lighters or other approved devices, and not by matches or from hot work.

21.4.2.2 Cylinders and Containers

Marking

All portable cylinders used for the storage and shipment of compressed gases shall be constructed and maintained in accordance with the regulations of the U.S. Department of Transportation, 49 CFR Parts 171-179. No damaged or defective cylinder may be used.

Compressed gas cylinders shall be legibly marked, with either the chemical or the trade name of contents. Such marking (by means of stenciling, stamping, or labeling) shall not be readily removable. Whenever practical, the marking shall be located on the shoulder of the cylinder.

Compressed gas cylinders must be equipped with connections complying with the American National Standard Compressed Gas Cylinder Valve Outlet and Inlet Connections, ANSI B57.1-1965.

All cylinders with a water weight capacity of over 30 pounds shall be equipped with means of connecting a valve protection cap or with a collar or recess to protect the valve.

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Storage

Keep cylinders away from radiators and other sources of heat.

Inside of buildings, cylinders shall be stored in a well-protected, well-ventilated, dry location, at least 20 feet from highly combustible materials. Cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage spaces shall be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons. Keep cylinders out of unventilated enclosures such as lockers and cupboards.

Empty cylinders shall have their valves closed.

Valve protection caps, where cylinder accepts a cap, shall always be in place, hand-tight, except when cylinders are in use or connected for use.

Handling Procedures

- Cylinders, cylinder valves, couplings, regulators, hose, and apparatus shall be kept free from oily or greasy substances. Oxygen cylinders or apparatus shall not be handled with oily hands or gloves. A jet of oxygen must never be permitted to strike an oily surface, greasy clothes, or enter a fuel oil or other storage tank.
- When transporting cylinders by a crane or derrick, a cradle, boat, or suitable platform shall be used. Slings or electric magnets shall not be used for this purpose.
- Valve-protection caps, where cylinder is designed to accept a cap, shall always be in place.
- When cylinders are transported by powered vehicles, they shall be secured in a vertical position.
- Cylinders shall not be dropped or struck or permitted to strike each other violently.
- Valve-protection caps shall not be used for lifting cylinders from one vertical position to another. Bars shall not be used under valves or valve-protection caps to pry cylinders loose when frozen to the ground or otherwise fixed; the use of warm (not boiling) water is recommended. Valve-protection caps are designed to protect cylinder valves from damage.
- Unless cylinders are secured on a special truck, regulators shall be removed and valve-protection caps, when provided for, shall be put in place before cylinders are moved.
- A suitable cylinder truck, chain, or other steadying device shall be used to keep cylinders from being knocked over while in use.
- Cylinders not having fixed hand wheels shall have keys, handles, or nonadjustable wrenches on valve stems while these cylinders are in service. In multiple cylinder installations only one key or handle is required for each manifold.
- Cylinder valves shall be closed before moving cylinders.
- Cylinder valves shall be closed when work is finished.
- Valves of empty cylinders shall be closed.

- Cylinders shall be kept far enough away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them, or fire-resistant shields shall be provided.
- Cylinders shall not be placed where they might become part of an electric circuit. Contacts with third rails, trolley wires, etc., shall be avoided. Cylinders shall be kept away from radiators, piping systems, layout tables, etc., that may be used for grounding electric circuits such as for arc welding machines. Any practice such as the tapping of an electrode against a cylinder to strike an arc shall be prohibited.
- Cylinders shall never be used as rollers or supports, whether full or empty.
- The numbers and markings stamped into cylinders shall not be tampered with.
- No person, other than the gas supplier, shall attempt to mix gases in a cylinder. No one, except the owner of the cylinder or person authorized by him, shall refill a cylinder.
- No one shall tamper with safety devices in cylinders or valves.
- Cylinders shall not be dropped or otherwise roughly handled.
- Unless connected to a manifold, oxygen from a cylinder shall not be used without first attaching an oxygen regulator to the cylinder valve. Before connecting the regulator to the cylinder valve, the valve shall be opened slightly for an instant and then closed. Always stand to one side of the outlet when opening the cylinder valve.
- A hammer or wrench shall not be used to open cylinder valves. If valves cannot be opened by hand, notify the supplier.
- Do not tamper with cylinder valves and do not attempt to repair them. If trouble is experienced, the supplier should be sent a report promptly indicating the character of the trouble and the cylinder's serial number. Follow the supplier's instructions.
- Complete removal of the stem from a diaphragm-type cylinder valve shall be avoided.
- Fuel-gas cylinders shall be placed with valve end up whenever they are in use. Liquefied gases shall be stored and shipped with the valve end up.
- Cylinders shall be handled carefully. Rough handling, knocks, or falls are liable to damage the cylinder, valve or safety devices and cause leakage.
- Before connecting a regulator to a cylinder valve, the valve shall be opened slightly and closed immediately. The valve shall be opened while standing to one side of the outlet; never in front of it. Never crack a fuel-gas cylinder valve near other welding work or near sparks, flame, or other possible sources of ignition.
- Before a regulator is removed from a cylinder valve, the cylinder valve shall be closed and the gas released from the regulator.
- Nothing shall be placed on top of an acetylene cylinder when in use which may damage the safety device or interfere with the quick closing of the valve.
- If cylinders are found to have leaky valves or fittings which cannot be stopped by closing of the valve, the cylinders shall be taken outdoors away from sources of ignition and slowly emptied.

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- A warning should be placed near cylinders having leaking fuse plugs or other leaking safety devices not to approach them with a lighted cigarette or other source of ignition. Such cylinders should be plainly tagged; the supplier should be promptly notified and his instructions followed as to their return.
- Safety devices shall not be tampered with.
- Fuel-gas shall never be used from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.
- The cylinder valve shall always be opened slowly.
- An acetylene cylinder valve shall not be opened more than one and one-half turns of the spindle, and preferably no more than three-fourths of a turn.
- Where a special wrench is required it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel-gas flow can be quickly turned off in case of emergency. In the case of manifolded or coupled cylinders at least one such wrench shall always be available for immediate use.

Fuel-Gas Cylinder Storage

Inside a building, cylinders, except those in actual use or attached ready for use, shall be limited to a total gas capacity of 2,000 cubic feet or 300 pounds of liquefied petroleum gas.

For storage in excess of 2,000 cubic feet total gas capacity of cylinders or 300 pounds of liquefied petroleum gas, a separate room or compartment must be used with the following specifications:

- Noncombustible construction having a fire resistance rating of at least one hour;
- Walls or partitions continuous from floor to ceiling and securely anchored; and
- At least one wall an exterior wall.

Alternatively, cylinders will be stored outside in a special building. Special buildings, rooms or compartments shall have no open flame for heating or lighting and shall be well ventilated. They may also be used for storage of calcium carbide in quantities not to exceed 600 pounds, when contained in metal containers with the following specifications:

- Of sufficient strength to prevent rupture;
- With a screw top or equivalent;
- Water- and air-tight; and
- No solder used in a manner that the package would fail in a fire.

Acetylene cylinders shall be stored valve end up.

Oxygen Storage

Oxygen cylinders shall not be stored near highly combustible material, especially oil and grease; or near reserve stocks of carbide and acetylene or other fuel-gas cylinders, or near any other substance likely to cause or accelerate fire; or in an acetylene generator compartment.

Oxygen cylinders stored in outside generator houses shall be separated from the generator or carbide storage rooms by a noncombustible partition having a fire-resistance rating of at least 1 hour. This partition shall be without openings and shall be gastight.

Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour.

Where a liquid oxygen system is to be used to supply gaseous oxygen for welding or cutting and the system has a storage capacity of more than 13,000 cubic feet of oxygen (measured at 14.7 psia and 70°F), connected in service or ready for service, or more than 25,000 cubic feet of oxygen (measured at 14.7 psia and 70°F), including unconnected reserves on hand at the site, it shall comply with the provisions of the Standard for Bulk Oxygen Systems at Consumer Sites, NFPA No. 566-1965.

21.4.2.3 Manifolding of Cylinders

Fuel gas and oxygen manifolds shall bear the name of the substance they contain in letters at least 1-inch high which shall be either painted on the manifold or on a sign permanently attached to it. These manifolds shall be placed in safe, well ventilated, and accessible locations and not be located within enclosed spaces.

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

When not in use, manifold and header hose connections shall be capped.

Nothing shall be placed on top of a manifold, when in use, which will damage the manifold or interfere with the quick closing of the valves.

Fuel-Gas Manifold

Manifolds shall be approved either separately for each component part or as an assembled unit.

Except as provided below, fuel-gas cylinders connected to one manifold inside a building shall be limited to a total capacity not exceeding 300 pounds of liquefied petroleum gas or 3,000 cubic feet of other fuel-gas. More than one such manifold with connected cylinders may be located in the same room provided the manifolds are at least 50 feet apart or separated by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour.

Fuel-gas cylinders connected to one manifold having an aggregate capacity exceeding 300 pounds of liquefied petroleum gas or 3,000 cubic feet of other fuel-gas shall be located outdoors, or in a separate building or room constructed in accordance with the following:

- The walls, partitions, floors, and ceilings of inside generator rooms shall be of noncombustible construction having a fire-resistance rating of at least 1 hour;

Welding, Cutting & Brazing (Hotwork)

- The walls or partitions shall be continuous from floor to ceiling and shall be securely anchored;
- At least one wall of the room shall be an exterior wall;
- Openings from an inside generator room to other parts of the building shall be protected by a swinging type, self-closing fire door for a Class B opening and having a rating of at least 1 hour;
- Windows in partitions shall be wired glass and approved metal frames with fixed sash; and
- Installation shall be in accordance with the Standard for the Installation of Fire Doors and Windows, NFPA 80-1970, which is incorporated by reference as specified in Sec. 1910.6.

Separate manifold buildings or rooms may also be used for the storage of drums of calcium carbide and cylinders containing fuel gases as permitted. Such buildings or rooms shall have no open flames for heating or lighting and shall be well-ventilated.

High-pressure fuel-gas manifolds shall be provided with approved pressure regulating devices.

High-Pressure Fuel-Gas Manifolds

Manifolds shall be approved either separately for each component part or as an assembled unit.

Oxygen manifolds shall not be located in an acetylene generator room. Oxygen manifolds shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour.

Except as provided below, oxygen cylinders connected to one manifold shall be limited to a total gas capacity of 6,000 cubic feet. More than one such manifold with connected cylinders may be located in the same room provided the manifolds are at least 50 feet apart or separated by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour.

An oxygen manifold, to which cylinders having an aggregate capacity of more than 6,000 cubic feet of oxygen are connected, should be located outdoors or in a separate noncombustible building. Such a manifold, if located inside a building having other occupancy, shall be located in a separate room of noncombustible construction having a fire-resistance rating of at least one-half hour or in an area with no combustible material within 20 feet of the manifold.

An oxygen manifold or oxygen bulk supply system which has storage capacity of more than 13,000 cubic feet of oxygen (measured at 14.7 psia and 70°F), connected in service or ready for service, or more than 25,000 cubic feet of oxygen (measured at 14.7 psia and 70°F), including unconnected reserves on hand at the site, shall comply with the provisions of the Standard for Bulk Oxygen Systems at Consumer Sites, NFPA No. 566-1965.

High-pressure oxygen manifolds shall be provided with approved pressure-regulating devices.

Low-Pressure Oxygen Manifolds

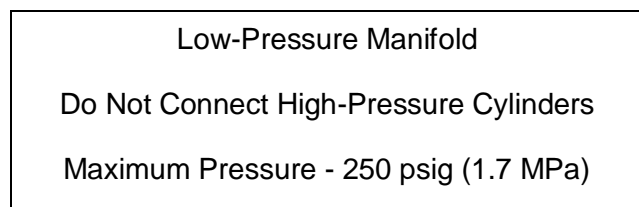
Manifolds shall be of substantial construction suitable for use with oxygen at a pressure of 250 psig. They shall have a minimum bursting pressure of 1,000 psig and shall be protected by a safety relief device which will relieve at a maximum pressure of 500 psig. DOT-4L200 cylinders have safety devices which relieve at a maximum pressure of 250 psig (or 235 psig if vacuum insulation is used).

Hose and hose connections subject to cylinder pressure shall comply with manifold operating procedures. Hose shall have a minimum bursting pressure of 1,000 psig.

The assembled manifold including leads shall be tested and proven gas-tight at a pressure of 300 psig. The fluid used for testing oxygen manifolds shall be oil-free and not combustible.

The location of manifolds shall comply with the requirements for high-pressure oxygen manifolds.

The following sign shall be conspicuously posted at each manifold:



Portable Outlet Headers

Portable outlet headers shall not be used indoors except for temporary service where the conditions preclude a direct supply from outlets located on the service piping system.

Each outlet on the service piping from which oxygen or fuel-gas is withdrawn to supply a portable outlet header shall be equipped with a readily accessible shutoff valve.

Hose and hose connections used for connecting the portable outlet header to the service piping shall comply with the requirements of the section headed "Hose and Hose Connections".

Master shutoff valves for both oxygen and fuel-gas shall be provided at the entry end of the portable outlet header.

Portable outlet headers for fuel-gas service shall be provided with an approved hydraulic back-pressure valve installed at the inlet and preceding the service outlets, unless an approved pressure-reducing regulator, an approved back-flow check valve, or an approved hydraulic back-pressure valve is installed at each outlet. Outlets provided on headers for oxygen service may be fitted for use with pressure-reducing regulators or for direct hose connection.

Each service outlet on portable outlet headers shall be provided with a valve assembly that includes a detachable outlet seal cap, chained or otherwise attached to the body of the valve.

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Materials and fabrication procedures for portable outlet headers shall comply with the requirements for service piping systems section later in this chapter.

Portable outlet headers shall be provided with frames which will support the equipment securely in the correct operating position and protect them from damage during handling and operation.

Manifold Operating Procedures

- Cylinder manifolds shall be installed under the supervision of someone familiar with the proper practices with reference to their construction and use.
- All manifolds and parts used in methods of manifolding shall be used only for the gas or gases for which they are approved.
- When acetylene cylinders are coupled, approved flash arresters shall be installed between each cylinder and the coupler block. For outdoor use only, and when the number of cylinders coupled does not exceed three, one flash arrester installed between the coupler block and regulator is acceptable.
- The aggregate capacity of fuel-gas cylinders connected to a portable manifold inside a building shall not exceed 3,000 cubic feet of gas.
- Acetylene and liquefied fuel-gas cylinders shall be manifolded in a vertical position.
- The pressure in the gas cylinders connected to and discharged simultaneously through a common manifold shall be approximately equal.

21.4.2.4 Service Piping Systems

Materials and Design

Piping and fittings shall comply with section 2, Industrial Gas and Air Piping Systems, of the American National Standard Code for Pressure Piping ANSI B31.1-1967, insofar as it does not conflict with the following:

- Pipe shall be at least Schedule 40 and fittings shall be at least standard weight in sizes up to and including 6-inch nominal; and
- Copper tubing shall be Types K or L in accordance with the Standard Specification for Seamless Copper Water Tube, ASTM B88-66a.

Piping shall be steel, wrought iron, brass or copper pipe, or seamless copper, brass or stainless steel tubing, except as provided below.

Oxygen piping and fittings at pressures in excess of 700 psi, shall be stainless steel or copper alloys.

Approved hose connections and hose may be used to connect the outlet of a manifold pressure regulator to piping providing the working pressure of the piping is 250 psi or less and the length of the hose does not exceed 5 feet. Hose shall have a minimum bursting pressure of 1,000 psig.

When oxygen is supplied to a service piping system from a low-pressure oxygen manifold without an intervening pressure regulating device, the piping system shall have a minimum design pressure of 250 psig. A pressure regulating device shall be used at each station outlet when the connected equipment is for use at pressures less than 250 psig.

Piping for acetylene or acetylenic compounds shall be steel or wrought iron.

Unalloyed copper shall not be used for acetylene or acetylenic compounds except in listed equipment.

Piping Joints

Joints in steel or wrought iron piping shall be welded, threaded or flanged. Fittings, such as ells, tees, couplings, and unions, may be rolled, forged or cast steel, malleable iron or nodular iron. Gray or white cast iron fittings are prohibited.

Joints in brass or copper pipe shall be welded, brazed, threaded, or flanged. If of the socket type, they shall be brazed with silver-brazing alloy or similar high melting point (not less than 800°F) filler metal.

Joints in seamless copper, brass, or stainless steel tubing shall be approved gas tubing fittings or the joints shall be brazed. If of the socket type, they shall be brazed with silver-brazing alloy or similar high melting point (not less than 800°F) filler metal.

Installation

Distribution lines shall be installed and maintained in a safe operating condition.

All piping shall be run as directly as practicable, protected against physical damage, proper allowance being made for expansion and contraction, jarring and vibration. Pipe laid underground in earth shall be located below the frost line and protected against corrosion. After assembly, piping shall be thoroughly blown out with air, nitrogen, or carbon dioxide to remove foreign materials. For oxygen piping, only oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used.

Only piping which has been welded or brazed shall be installed in tunnels, trenches or ducts. Shutoff valves shall be located outside such conduits. Oxygen piping may be placed in the same tunnel, trench or duct with fuel-gas pipelines, provided there is good natural or forced ventilation.

Low points in piping carrying moist gas shall be drained into drip pots constructed so as to permit pumping or draining out the condensate at necessary intervals. Drain valves shall be installed for this purpose having outlets normally closed with screw caps or plugs. No open end valves or petcocks shall be used, except that in drips located out of doors, underground, and not readily accessible, valves may be used at such points if they are equipped with means to secure them in the closed position. Pipes leading to the surface of the ground shall be cased or jacketed where necessary to prevent loosening or breaking.

Gas cocks or valves shall be provided for all buildings at points where they will be readily accessible for shutting off the gas supply to these buildings in any emergency. There shall also be provided a shutoff valve in the discharge line from the generator, gas holder, manifold or other source of supply.

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Shutoff valves shall not be installed in safety relief lines in such a manner that the safety relief device can be rendered ineffective.

Fittings and lengths of pipe shall be examined internally before assembly and, if necessary freed from scale or dirt. Oxygen piping and fittings shall be washed out with a suitable solution which will effectively remove grease and dirt but will not react with oxygen. Hot water solutions of caustic soda or trisodium phosphate are effective cleaning agents for this purpose.

Piping shall be thoroughly blown out after assembly to remove foreign materials. For oxygen piping, oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used. For other piping, air or inert gas may be used.

When flammable gas lines or other parts of equipment are being purged of air or gas, open lights or other sources of ignition shall not be permitted near uncapped openings.

No welding or cutting shall be performed on an acetylene or oxygen pipeline, including the attachment of hangers or supports, until the line has been purged. Only oil-free air, oil-free nitrogen, or oil-free carbon dioxide shall be used to purge oxygen lines.

Painting and Signs

Underground pipe and tubing and outdoor ferrous pipe and tubing shall be covered or painted with a suitable material for protection against corrosion.

Aboveground piping systems shall be marked in accordance with the American National Standard Scheme for the Identification of Piping Systems, ANSI A13.1-1956.

Station outlets shall be marked to indicate the name of the gas.

Testing

Piping systems shall be tested and proved gastight at 1½ times the maximum operating pressure, and shall be thoroughly purged of air before being placed in service. The material used for testing oxygen lines shall be oil free and noncombustible. Flames shall not be used to detect leaks.

When flammable gas lines or other parts of equipment are being purged of air or gas, sources of ignition shall not be permitted near uncapped openings.

21.4.2.5 Protective equipment, Hose and Regulators

Equipment shall be installed and used only in the service for which it is approved and as recommended by the manufacturer.

Service piping systems shall be protected by pressure relief devices set to function at not more than the design pressure of the systems and discharging upwards to a safe location.

Piping Protective Equipment

The fuel-gas and oxygen piping systems, including portable outlet headers shall incorporate the protective equipment shown here:

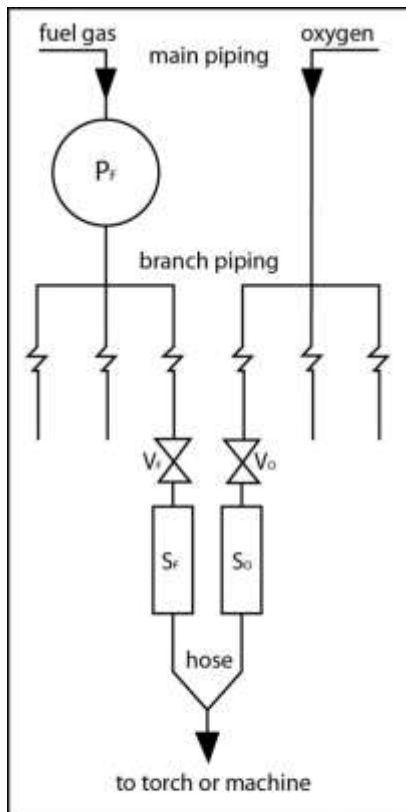


fig. Q-1

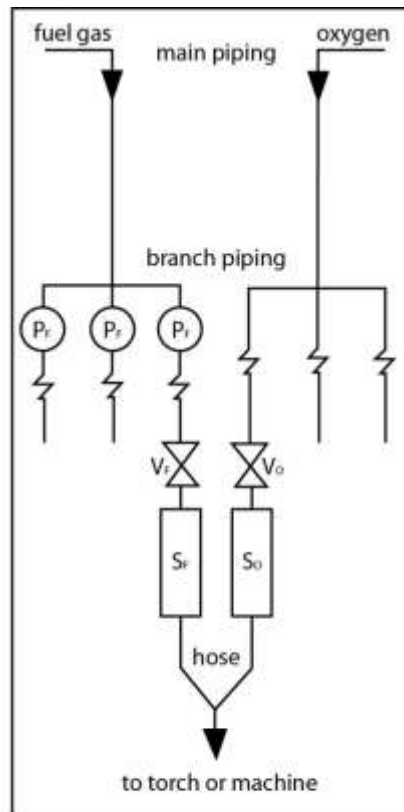


fig. Q-2

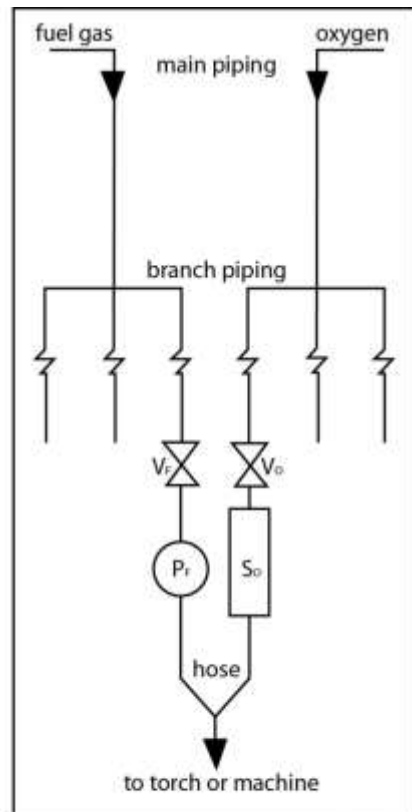


fig. Q-3

P_f – Protective equipment in fuel gas piping
 V_f – Fuel gas station outlet valve
 V_o – Oxygen station outlet valve

S_f – Backflow prevention device(s) at fuel gas station outlet
 S_o – Backflow prevention device(s) at oxygen station outlet

When only a portion of a fuel-gas system is to be used with oxygen only that portion need comply.

Approved protective equipment (designated P(F) in Figs. Q-1, Q-2, and Q-3) shall be installed in fuel-gas piping to prevent:

- Backflow of oxygen into the fuel-gas supply system;
- Passage of a flash back into the fuel-gas supply system; and
- Excessive back pressure of oxygen in the fuel-gas supply system. The three functions of the protective equipment may be combined in one device or may be provided by separate devices.

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The protective equipment shall be located in the main supply line, as in Figure Q-1 or at the head of each branch line, as in Figure Q-2 or at each location where fuel-gas is withdrawn, as in Figure Q-3. Where branch lines are of 2-inch pipe size or larger or of substantial length, protective equipment shall be located as shown in either Q-2 or Q-3.

Backflow protection shall be provided by an approved device that will prevent oxygen from flowing into the fuel-gas system or fuel from flowing into the oxygen system.

Flash-back protection shall be provided by an approved device that will prevent flame from passing into the fuel-gas system.

Back-pressure protection shall be provided by an approved pressure-relief device set at a pressure not greater than the pressure rating of the backflow or the flashback protection device, whichever is lower. The pressure-relief device shall be located on the downstream side of the backflow and flashback protection devices. The vent from the pressure-relief device shall be at least as large as the relief device inlet and shall be installed without low points that may collect moisture. If low points are unavoidable, drip pots with drains closed with screw plugs or caps shall be installed at the low points. The vent terminus shall not endanger personnel or property through gas discharge; shall be located away from ignition sources; and shall terminate in a hood or bend.

If pipeline protective equipment incorporates a liquid, the liquid level shall be maintained, and suitable antifreeze may be used to prevent freezing.

Fuel gas for use with equipment not requiring oxygen shall be withdrawn upstream of the piping protective devices.

Station Outlet Protective Equipment

A check valve, pressure regulator, hydraulic seal, or combination of these devices shall be provided at each station outlet, including those on portable headers, to prevent backflow, as shown in Figures Q-1, Q-2, and Q-3 and designated as S(F) and S(O).

When approved pipeline protective equipment (designated P(F)) is located at the station outlet as in Figure Q-3, no additional check valve, pressure regulator, or hydraulic seal is required.

A shutoff valve (designated V(F) and V(O)) shall be installed at each station outlet and shall be located on the upstream side of other station outlet equipment.

If the station outlet is equipped with a detachable regulator, the outlet le regulator, the outlet shall terminate in a union connection that complies with the Regulator Connection Standards, 1958, Compressed Gas Association, which is incorporated by reference as specified in Sec. 1910.6.

If the station outlet is connected directly to a hose, the outlet shall terminate in a union connection complying with the Standard Hose Connection Specifications, 1957, Compressed Gas Association, which is incorporated by reference as specified in Sec. 1910.6.

Station outlets may terminate in pipe threads to which permanent connections are to be made, such as to a machine.

Station outlets shall be equipped with a detachable outlet seal cap secured in place. This cap shall be used to seal the outlet except when a hose, a regulator, or piping is attached.

Where station outlets are equipped with approved backflow and flashback protective devices, as many as four torches may be supplied from one station outlet through rigid piping, provided each outlet from such piping is equipped with a shutoff valve and provided the fuel-gas capacity of any one torch does not exceed 15 cubic feet (0.42 m³) per hour. This paragraph (e)(4)(viii) does not apply to machines.

Hose and Hose Connections

Hose for oxy-fuel gas service shall comply with the Specification for Rubber Welding Hose, 1958, Compressed Gas Association and Rubber Manufacturers Association, which is incorporated by reference as specified in Sec. 1910.6.

When parallel lengths of oxygen and acetylene hose are taped together for convenience and to prevent tangling, not more than 4 inches out of 12 inches shall be covered by tape.

Hose connections shall comply with the Standard Hose Connection Specifications, 1957, Compressed Gas Association.

Hose connections shall be clamped or otherwise securely fastened in a manner that will withstand, without leakage, twice the pressure to which they are normally subjected in service, but in no case less than a pressure of 300 psi. Oil-free air or an oil-free inert gas shall be used for the test.

Hose showing leaks, burns, worn places, or other defects rendering it unfit for service shall be repaired or replaced.

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

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

Hose couplings shall be of the type that cannot be unlocked or disconnected by means of a straight pull without rotary motion.

Boxes used for the storage of gas hose shall be ventilated.

Hoses, cables, and other equipment shall be kept clear of passageways, ladders, and stairs.

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Pressure Reducing Regulators

Pressure-reducing regulators shall be used only for the gas and pressures for which they are intended. The regulator inlet connections shall comply with Regulator Connection Standards, 1958, Compressed Gas Association.

Oxygen and fuel gas pressure regulators, including their related gauges, shall be in proper working order while in use.

When regulators or parts of regulators, including gauges, need repair, the work shall be performed by skilled mechanics who have been properly instructed.

Gauges on oxygen regulators shall be marked "USE NO OIL."

Union nuts and connections on regulators shall be inspected before use to detect faulty seats which may cause leakage of gas when the regulators are attached to the cylinder valves.

21.4.3 Arc Welding and Cutting

21.4.3.1 General

Choose welding equipment for safe application of the work to be done.

Install welding equipment safely.

Workers designated to operate arc welding equipment shall have been properly instructed and qualified to operate such equipment.

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

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

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

21.4.3.2 Application of Arc Welding Equipment

Assurance of consideration of safety in design is obtainable by choosing apparatus complying with the Requirements for Electric Arc-Welding Apparatus, NEMA EW-1-1962, National Electrical Manufacturers Association or the Safety Standard for Transformer-Type Arc-Welding Machines, ANSI C33.2-1956, Underwriters' Laboratories.

Environmental conditions

Standard machines for arc welding service must carry their rated load with rated temperature rises where the temperature of the cooling air does not exceed 104°F and where the altitude does not exceed 3,300 feet. Arc welding machines shall be suitable for operation in atmospheres containing gases, dust, and light rays produced by the welding arc.

Unusual service conditions may exist, and in such circumstances machines shall be especially designed to safely meet the requirements of the service. Chief among these conditions are:

- Exposure to unusually corrosive fumes;
- Exposure to steam or excessive humidity;
- Exposure to excessive oil vapor;
- Exposure to flammable gases;
- Exposure to abnormal vibration or shock;
- Exposure to excessive dust;
- Exposure to weather; and
- Exposure to unusual seacoast or shipboard conditions.

Voltage

The following voltage limits shall not be exceeded:

- **Alternating-current machines;**
 - Manual arc welding and cutting - 80 volts.
 - Automatic (machine or mechanized) arc welding and cutting - 100 volts.
- **Direct-current machines**
 - Manual arc welding and cutting - 100 volts.
 - Automatic (machine or mechanized) arc welding and cutting - 100 volts.

When special welding and cutting processes require values of open circuit voltages higher than the above, means shall be provided to prevent the operator from making accidental contact with the high voltage by adequate insulation or other means.

For a.c. welding under wet conditions or warm surroundings where perspiration is a factor, the use of reliable automatic controls for reducing no load voltage is recommended to reduce the shock hazard.

Design

A controller integrally mounted in an electric motor driven welder shall have capacity for carrying rated motor current and be capable of making and interrupting stalled rotor current of the motor. It may serve as the running overcurrent device if provided with the number of overcurrent units as approved.

On all types of arc welding machines, control apparatus shall be enclosed except for the operating wheels, levers, or handles.

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Input power terminals, tap change devices and live metal parts connected to input circuits shall be completely enclosed and accessible only by means of tools.

Terminals for welding leads should be protected from accidental electrical contact by personnel or by metal objects i.e., vehicles, crane hooks, etc. Protection may be obtained by use of: Dead-front receptacles for plug connections; recessed openings with non-removable hinged covers; heavy insulating sleeving or taping or other equivalent electrical and mechanical protection. If a welding lead terminal which is intended to be used exclusively for connection to the work is connected to the grounded enclosure, it must be done by a conductor at least two AWG sizes smaller than the grounding conductor and the terminal shall be marked to indicate that it is grounded.

No connections for portable control devices such as push buttons to be carried by the operator shall be connected to an a.c. circuit of higher than 120 volts. Exposed metal parts of portable control devices operating on circuits above 50 volts shall be grounded by a grounding conductor in the control cable.

Auto transformers or a.c. reactors shall not be used to draw welding current directly from any a.c. power source having a voltage exceeding 80 volts.

21.4.3.3 Installation of Arc Welding Equipment

Installation including power supply shall be in accordance with the requirements of OSHA electrical regulations.

Grounding

The frame or case of the welding machine (except engine-driven machines) shall be grounded under the conditions and according to the methods prescribed in OSHA electrical regulations.

A ground return cable shall have a safe current-carrying capacity equal to or exceeding the specified maximum output capacity of the arc welding or cutting unit which it services. When a single ground return cable services more than one unit, its safe current-carrying shall exceed the total specified maximum output capacities of the all the units which it services.

Conduits containing electrical conductors shall not be used for completing a work-lead circuit. Pipelines shall not be used as a permanent part of a work-lead circuit, but may be used during construction, extension or repair providing current is not carried through threaded joints, flanged bolted joints, or caulked joints, and that special precautions are used to avoid sparking at connection of the work-lead cable.

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

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

Pipelines containing gases or flammable liquids, or conduits containing electrical circuits, shall not be used as a ground return.

Chains, wire ropes, cranes, hoists, and elevators shall not be used to carry welding current.

Where a structure, conveyor, or fixture is regularly employed as a welding current return circuit, joints shall be bonded or provided with adequate current collecting devices.

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

Supply Connections and Conductors

A disconnecting switch or controller shall be provided at or near each welding machine that is not equipped with such a switch or controller mounted as an integral part of the machine. The switch shall be in accordance with OSHA electrical regulations. Overcurrent protection shall be provided as specified in OSHA electrical regulations. A disconnect switch with overload protection or equivalent disconnect and protection means, permitted by OSHA electrical regulations, shall be provided for each outlet intended for connection to a portable welding machine.

For individual welding machines, the rated current-carrying capacity of the supply conductors shall be not less than the rated primary current of the welding machines.

For groups of welding machines, the rated current-carrying capacity of conductors may be less than the sum of the rated primary currents of the welding machines supplied. The conductor rating shall be determined in each case according to the machine loading based on the use to be made of each welding machine and the allowance permissible in the event that all the welding machines supplied by the conductors will not be in use at the same time.

In operations involving several welders on one structure, d.c. welding process requirements may require the use of both polarities; or supply circuit limitations for a.c. welding may require distribution of machines among the phases of the supply circuit. In such cases no load voltages between electrode holders will be 2 times normal in d.c. or 1, 1.41, 1.73, or 2 times normal on a.c. machines. Similar voltage differences will exist if both a.c. and d.c. welding are done on the same structure.

- All d.c. machines shall be connected with the same polarity.
- All a.c. machines shall be connected to the same phase of the supply circuit and with the same instantaneous polarity.

21.4.3.4 Operation and Maintenance

Workers assigned to operate or maintain arc welding equipment shall be acquainted with the requirements for safe arc welding and cutting.

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Before starting operations, all connections to the machine shall be checked to make certain they are properly made. The work lead shall be firmly attached to the work; magnetic work clamps shall be freed from adherent metal particles or spatter on contact surfaces. Coiled welding cable shall be spread out before use to avoid serious overheating and damage to insulation.

Grounding of the welding machine frame shall be checked. Special attention shall be given to safety ground connections of portable machines.

There shall be no leaks of cooling water, shielding gas or engine fuel.

It shall be determined that proper switching equipment for shutting down the machine is provided.

When the arc welder or cutter has occasion to leave his work or to stop work for any appreciable length of time, or when the arc welding or cutting machine is to be moved, the power supply switch to the equipment shall be opened.

Printed rules and instructions covering operation of equipment supplied by the manufacturers shall be strictly followed.

Electrode holders when not in use shall be so placed that they cannot make electrical contact with persons, conducting objects, fuel or compressed gas tanks.

Hot electrode holders shall not be dipped in water; to do so may expose the arc welder or cutter to electric shock.

Cables with splices within 10 feet of the holder shall not be used. The welder should not coil or loop welding electrode cable around parts of his body.

Any faulty or defective equipment shall be reported to the supervisor.

Maintenance

The operator should report any equipment defect or safety hazard to his supervisor and the use of the equipment shall be discontinued until its safety has been assured. Repairs shall be made only by qualified personnel.

Machines that have become wet shall be thoroughly dried and tested before being used.

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

Cables with damaged insulation or exposed bare conductors shall be replaced. Joining lengths of work and electrode cables shall be done by the use of connecting means specifically intended for the purpose. The connecting means shall have insulation adequate for the service conditions.

Inert-Gas Metal-Arc Welding

The inert-gas metal-arc welding process involves the production of ultra-violet radiation of intensities 5 to 30 times that produced during shielded metal-arc welding, the decomposition of chlorinated solvents by ultraviolet rays, and the liberation of toxic fumes and gases, employees shall not be permitted to engage in, or be exposed to the process until the following special precautions have been taken:

- The use of chlorinated solvents shall be kept at least 200 feet, unless shielded, from the exposed arc, and surfaces prepared with chlorinated solvents shall be thoroughly dry before welding is permitted on such surfaces.
- Employees in the area not protected from the arc by screening shall be protected by appropriately protective filter lenses. When two or more welders are exposed to each other's arc, filter lens goggles of a suitable type shall be worn under welding helmets. Hand shields to protect the welder against flashes and radiant energy shall be used when either the helmet is lifted or the shield is removed.
- Welders and other employees exposed to radiation shall be suitably protected so the skin is covered completely to prevent burns and other damage by ultraviolet rays. Welding helmets and hand shields shall be free of leaks and openings, and highly reflective surfaces.
- When inert-gas metal-arc welding is being performed on stainless steel, adequate local exhaust ventilation as described above or airline respirators shall be used to protect against dangerous concentrations of nitrogen dioxide.

21.4.4 Resistance Welding

21.4.4.1 General

All equipment shall be installed by a qualified electrician in conformance with regulatory requirements. There shall be a safety-type disconnecting switch or a circuit breaker or circuit interrupter to open each power circuit to the machine, conveniently located at or near the machine, so that the power can be shut off when the machine or its controls are to be serviced.

Ignition tubes used in resistance welding equipment shall be equipped with a thermal protection switch.

Workers designated to operate resistance welding equipment shall have been properly instructed and judged competent to operate such equipment.

Controls of all automatic or air and hydraulic clamps shall be arranged or guarded to prevent the operator from accidentally activating them.

21.4.4.2 Spot and Seam Welding Machines

All external weld initiating control circuits shall operate on low voltage, not over 120 volts, for the safety of the operators.

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Stored energy or capacitor discharge type of resistance welding equipment and control panels involving high voltage (over 550 volts) shall be suitably insulated and protected by complete enclosures, all doors of which shall be provided with suitable interlocks and contacts wired into the control circuit (similar to elevator interlocks). Such interlocks or contacts shall be so designed as to effectively interrupt power and short circuit all capacitors when the door or panel is open. A manually operated switch or suitable positive device shall be installed, in addition to the mechanical interlocks or contacts, as an added safety measure assuring absolute discharge of all capacitors.

All doors and access panels of all resistance welding machines and control panels shall be kept locked and interlocked to prevent access by unauthorized persons to live portions of the equipment.

All press welding machine operations, where there is a possibility of the operator's fingers being under the point of operation, shall be effectively guarded by the use of a device such as an electronic eye safety circuit, two hand controls. All chains, gears, operating bus linkage, and belts shall be protected by adequate guards.

The hazard of flying sparks shall be, wherever practical, eliminated by installing a shield guard of safety glass or suitable fire-resistant plastic at the point of operation. Additional shields or curtains shall be installed as necessary to protect passing persons from flying sparks.

All foot switches shall be guarded to prevent accidental operation of the machine.

Two or more safety emergency stop buttons shall be provided on all special multispot welding machines, including 2-post and 4-post weld presses.

On large machines, four safety pins with plugs and receptacles (one in each corner) shall be provided so that when safety pins are removed and inserted in the ram or platen, the press becomes inoperative.

Where technically practical, the secondary of all welding transformers used in multispot, projection and seam welding machines shall be grounded. This may be done by permanently grounding one side of the welding secondary current circuit. Where not technically practical, a center tapped grounding reactor connected across the secondary or the use of a safety disconnect switch in conjunction with the welding control are acceptable alternates. Safety disconnect shall be arranged to open both sides of the line when welding current is not present.

21.4.4.3 Portable Welding Machines

All portable welding guns shall have suitable counterbalanced devices for supporting the guns, including cables, unless the design of the gun or fixture makes counterbalancing impractical or unnecessary.

All portable welding guns, transformers and related equipment that is suspended from overhead structures, eye beams, trolleys, etc. shall be equipped with safety chains or cables. Safety chains or cables shall be capable of supporting the total shock load in the event of failure of any component of the supporting system.

Each clevis shall be capable of supporting the total shock load of the suspended equipment in the event of trolley failure.

All initiating switches, including retraction and dual schedule switches, located on the portable welding gun shall be equipped with suitable guards capable of preventing accidental initiation through contact with fixtures, operator's clothing, etc. Initiating switch voltage shall not exceed 24 volts.

The movable holder, where it enters the gun frame, shall have sufficient clearance to prevent the shearing of fingers carelessly placed on the operating movable holder.

The secondary and case of all portable welding transformers shall be grounded. Secondary grounding may be by center tapped secondary or by a center tapped grounding reactor connected across the secondary.

21.4.4.4 Flash Welding Equipment

Flash welding machines shall be equipped with a hood to control flying flash. In cases of high production, where materials may contain a film of oil and where toxic elements and metal fumes are given off, ventilation shall be provided.

For the protection of the operators of nearby equipment, fire-resistant curtains or suitable shields shall be set up around the machine and in such a manner that the operators movements are not hampered.

21.4.4.5 Maintenance

Periodic inspection shall be made by qualified maintenance personnel, and a certification record maintained. The certification record shall include the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, for the equipment inspected. The operator shall be instructed to report any equipment defects to his supervisor and the use of the equipment shall be discontinued until safety repairs have been completed.

21.5 Forms & Attachments

On the following pages, please find the following document(s):

- Welding, Cutting and Brazing Checklist;
- Ventilation Requirements for Welding and Cutting; and
- Welding, Cutting and Brazing Training Record Sheet.

These forms may be reproduced freely for the purposes of implementing and maintaining a safety and health program.

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Welding, Cutting And Brazing Checklist For General Industry

(A negative answer to any question indicates an area of safety or health concern.)

Company name: _____
 Physical address of worksite: _____
 Supervisor: _____
 Date/Time: _____
 Inspector: _____

Installation and Operation of Oxygen-Fuel Gas Systems for Welding and Cutting				
Y	N	N/A	Date Corrected	Question
				Is acetylene generated, piped, or utilized at a pressure of 30 p.s.i. absolute pressure or less?
				Have personnel in charge of the oxygen or fuel gas supply equipment been instructed and judged competent before being left in charge?
				Is the gas content of compressed gas cylinders marked with either the chemical or the trade name of the gas?
				Are cylinders stored away from radiators and other sources of heat?
				Are cylinders that are stored inside kept in a well-ventilated, dry location at least 20 feet from highly combustible material?
				Are cylinders stored in assigned places away from elevators, stairs, or gangways and where they will not be knocked over or damaged?
				Are the valves of empty cylinders kept closed?
				Are valve protection caps in place and hand-tight except when in use or connected for use?
				Are fuel gas cylinders except those in use or attached for use, which are stored inside a building, limited to a total gas capacity of 2,000 cubic feet or 300 pounds of liquefied petroleum gas?
				Are acetylene cylinders stored valve end up?
				If oxygen cylinders are stored in outside generator houses, are they separated from the generator or carbide storage rooms by a gastight, noncombustible partition having a fire-resistance rating of at least one hour?
				Are stored oxygen cylinders separated from fuel gas cylinders or combustible material by a minimum of 20 feet, or by a noncombustible barrier at least five feet high with a fire-resistance rating of at least one-half hour?
				Are cylinders, cylinder valves, couplings, regulators, hose and apparatus kept free from oily or greasy substances?
				Do you ensure that cylinders are not dropped, struck, or permitted to strike each other violently?
				Do you ensure that valve-protection caps are not used for lifting cylinders from one vertical position to another?
				Do you ensure that cylinders which do not have fixed hand wheels, have keys, handles, or nonadjustable wrenches on the valve stems while the cylinders are in service?
				Are cylinder valves closed before moving cylinder and when work is finished?
				Are cylinders kept away from sparks, hot slag, or flame produced by welding or cutting operations, or are fire-resistance shields provided?
				Are cylinders placed where they will not become part of an electric circuit?
				Do you insure that cylinders are not used as rollers or supports, and that only proper tools are used to open cylinder valves?
				Are fuel gas cylinders placed valve end up while in use?
				Are cylinders with leaky valves or fittings taken outdoors and slowly emptied?
				Are warning signs posted which prohibit open flame or other sources of ignition near cylinders with leaking fuse plugs or other leaking safety devices, and are the cylinders tagged?

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Manifold Systems				
Y	N	N/A	Date Corrected	Question
				Do you ensure that oxygen manifolds are not located in an acetylene generator room?
				Do you ensure that portable outlet headers are used indoors only for temporary service where conditions preclude a direct supply from outlets located on the service piping system?
				Is each outlet on the service piping which supplies a portable outlet header equipped with a readily accessible shutoff valve?
				Are master shutoff valves for both oxygen and fuel gas provided at the entry end of the portable outlet header?
				Are portable outlet headers provided with frames to support the equipment securely in the correct operating position?
				When acetylene cylinders are coupled in a manifold, are flash arresters installed between each cylinder and the coupler block?
				In service piping systems, are distribution lines installed and maintained in a safe operating condition?
				Are emergency gas cocks or valves provided for all buildings?
				Is underground pipe and tubing and outdoor ferrous pipe and tubing protected against corrosion?
General Requirements				
Y	N	N/A	Date Corrected	Question
				Is flashback protection provided by an approved device that will prevent flame from passing into the fuel gas systems?
				Are hoses showing defects repaired or replaced?
				Are pressure-reducing regulators used only for the gas and pressures for which they are intended?
				Is the repair of regulators performed by properly instructed, skilled mechanics?
				Are gauges on oxygen regulators marked "USE NO OIL"?
				Are union nuts and connections on regulators inspected before use to detect faulty seats?
Acetylene Generators (if applicable)				
Y	N	N/A	Date Corrected	Question
				Is ample space provided around the generator for operation and maintenance?
				Are generators placed where water will not freeze, and is the use of sodium chloride to prevent freezing prohibited?
				Are portable generators located at a safe distance from the welding position?
				Are the walls, floors, and roofs of outside generator houses constructed of noncombustible materials?
				Are exit doors readily accessible in case of emergency?
				Are generators installed inside buildings enclosed in a separate room?
				Are the walls, partitions, floors, and ceilings of inside generator rooms of noncombustible construction with a fire-resistance rating of at least one hour?
				Are generator rooms or buildings well ventilated with vents located at floor and ceiling levels?
				Do generator rooms or buildings have natural light during daylight hours or artificial light restricted to electric lamps installed in a fixed position?
				Are operating instructions posted in a conspicuous place near the generator or available for ready reference?
				Is the generator room electrically wired in accordance with 1910.307 (hazardous locations)?
				Do you ensure that the water-carbide residue mixture drained from the generator is not discharged into sewer pipes or stored in areas near open flames?
				Do you ensure that calcium carbide is kept in metal packages strong enough to prevent rupture?
				Are the packages marked "Calcium Carbide - Dangerous If Not Kept Dry"?
				Do you ensure that the calcium carbide stored indoors does not exceed 600 pounds and that the storage area is dry, waterproof, and well-ventilated?
				Are carbide containers that are stored outside periodically examined for conditions that could affect water or air tightness?

Welding, Cutting & Brazing (Hotwork)

Application, Installation and Operation of Arc welding and Cutting Equipment				
Y	N	N/A	Date Corrected	Question
				Have employees who are designated to operate arc welding equipment been properly instructed and qualified?
				Are open circuit (no load) voltages of arc welding and cutting machines as low as possible, consistent with satisfactory welding?
				When open circuit voltages must be higher, are means provided to prevent the operator from making accidental contact with the higher voltages?
				Is control apparatus enclosed on all types of arc welding machines?
				Are terminals for welding leads protected from accidental electrical contact by personnel or metal objects?
				Do you ensure that no connections for portable control devices, such as push buttons carried by the operator, are connected to an a.c. circuit of higher than 120 volts?
				Is the frame or case of the welding machine effectively grounded and the grounding checked?
				Is a separate disconnecting switch or controller provided at or near each welding machine?
				Are electrode holders placed so that they cannot make electrical contact with persons, conducting objects, fuel, or compressed gas tanks?
				Has the operator been instructed to report any equipment defect or safety hazard to his supervisor, and is use of the equipment discontinued until repaired by qualified personnel?
				Are work and electrode lead cables frequently inspected for wear and damage, and are cables with damaged insulation or exposed bare conductors replaced?
Installation and Operation of Resistance Welding Equipment				
Y	N	N/A	Date Corrected	Question
				Have personnel who are designated to operate resistance welding equipment been properly instructed and judged competent to operate such equipment?
				Are all doors and access panels of all resistance welding machines and control panels kept locked and interlocked?
				Has a shield guard of safety glass or suitable fire-resistant plastic been installed at the point of operation?
				Are foot switches guarded to prevent accidental operation of the machine?
				Are two or more safety emergency stop buttons provided on all special, multisport welding machines, including 2-post and 4-post weld presses?
				Are flash welding machines equipped with hoods to control flying flash?
				Are periodic inspections of the machines made by qualified maintenance personnel, and are records of the inspections maintained?
Fire Prevention and Protection				
Y	N	N/A	Date Corrected	Question
				Is suitable fire extinguishing equipment maintained in a state of readiness for instant use?
				Are fire watches on duty whenever welding or cutting is performed in locations where a major fire might develop?
				Before cutting or welding is permitted, is the area inspected by the individual responsible for authorized cutting and welding operations?
				Where practicable, are all combustibles relocated at least 35 feet from the work site?
				Does management recognize its responsibility for the safe usage of cutting and welding equipment on its property?
				Do supervisors recognize their responsibilities in the safe management of welding and cutting operations as defined in .252(a)(2)(xiv)(A)?

Welding, Cutting & Brazing (Hotwork)

Fire Prevention and Protection				
Y	N	N/A	Date Corrected	Question
				Are welders or helpers who are working on platforms, scaffolds, or runways protected against falling by railings, safety belts or lifelines?
				Is welding cable and other equipment kept clear of passageways, ladders, and stairways?
				Are helmets, hand shields and goggles worn during all arc welding or cutting operations?
				Has a hazard assessment been performed to determine if hazards are present or likely to be present?
				Are employees who are exposed to the hazards created by welding, cutting, or brazing operations protected by personal protective equipment as?
				When welding or cutting is being performed in any confined space, are gas cylinders and welding machines left outside?
				Before operations are started, is heavy, portable, wheel-mounted equipment securely blocked to prevent accidental movement?
Health Protection and Ventilation				
Y	N	N/A	Date Corrected	Question
				Where a welder must enter a confined space through a manhole or other small opening, have means been provided for his quick removal in case of emergency?
				Are ventilation or respiratory protective devices provided where necessary and do they meet OSHA requirements?
				Are employees trained to render first aid, and is first aid equipment available at all times?

Ventilation Requirements for Welding and Cutting

Metal Compound	Requirements Confined Space	Requirements Indoors	Requirements Outdoors
Flourine Compound	Air replacement or airline respirator or self-contained breathing apparatus needed	Air sample tests to determine if exhaust hood, booth, and airline respirator are required	Same as indoors
Lead Zinc (Galvanized Metals)	Air replacement or airline respirator or self-contained breathing apparatus	Exhaust hood or booth	Combination particulate and vapor and gas removing type respirator if tests indicate need
Beryllium	Exhaust hood or booth and airline respirator if air sample tests indicate need	Exhaust hood or booth and airline respirator if air sample tests indicate need	Exhaust hood or booth and airline respirator if air sample tests indicate need
Cadmium Mercury	Exhaust hood or booth and airline respirator if air sample tests indicate need	Exhaust hood or booth and airline respirator if air sample tests indicate need	Combination particulate and vapor and gas removing type respirator if tests indicate need

1. Airline or self-contained breathing apparatus are required in confined areas that are immediately hazardous to life.
2. Local exhaust hoods or booths must provide airflow of 100 linear feet per minute.
3. Mechanical ventilation at 2,000 cubic feet of air per minute per welder is required when welding or cutting on metals other than described above; when there is less than 10,000 cubic feet of space per welder; or where the ceiling height is less than 16 feet; or in confined spaces or where structural barriers (such as partitions or balconies) significantly obstruct cross ventilation. 1910.252(c)(2)(i)(A) through (C).

NOTE: Mechanical ventilation is necessary when an exhaust hood or fixed booth provide for a rate of airflow sufficient to maintain a velocity away from the welder or not less than 100 linear feet per minute.

Hot Work Permit

This permit is required for operations that involve open flames or that produce sparks or heat outside of designated areas, including, but not limited to brazing, cutting, welding and grinding.

	OK	PRECAUTION	N/A
Date: _____		Area is fire safe	
Location: _____		Moveable fire hazards moved	
Task: _____		Unmoveable fire hazards guarded	
Person Doing Hot Work: _____		Openings, cracks, doorways, windows guarded or closed	
<p>Precautions have been taken to prevent fire and to control hazards present in the above location for the job described, and hot work may commence.</p> <p>_____ Authorizing Individual (sign please)</p> <p>_____ Person Doing Hotwork (sign please)</p> <p>_____ Fire Watch (sign please)</p> <p>Start: _____ Date Time</p> <p>Finish: _____ Date Time</p> <p>FIRE WATCH SIGNOFF Work was fire safe through the entire watch period. The area was monitored for _____ minutes (at least 30) to ensure fire safety.</p> <p>_____ Fire Watch (sign please)</p>		Fire extinguisher available	
		Fire watch	
		Floors clean for 35' radius	
		Combustible floors wetted or otherwise shielded	
		In authorized area	
		Ducts and conveyer systems to flammables guarded	
		Worker trained appropriately	
		Contractors informed of hazards	
		Containers cleaned and ventilated	
		Pipelines to containers disconnected or blocked	
	PPE available and used		
	Hot metal warning sign		
	Ventilation provided		
	Confined spaces permit		
	Other:		

New Hire Orientation Checklist

- I have read or have had explained the Safety & Health Program Summary. I have no further questions regarding:
 - The Company's Safety Philosophy.
 - My safety responsibilities as an employee.
 - The disciplinary procedures.

_____ **Initial**

- I have read or have had explained the General Safety Rules as pertain to the Safety Program:
 - I am aware of all safety rules and general codes of safe practice.

_____ **Initial**

- I have read or have had explained the Safety Committee portion of the Safety Program:
 - I am aware of who is in charge of safety if I have questions.
 - I am aware of my ability to report my safety concerns to the Safety Coordinator.
 - I am aware that this Company is striving to provide a safe working environment and is committed to my safety and ability to inform the Company of unsafe working environments without fear of reprisal.

_____ **Initial**

- I have read or have had explained Job Hazard Analysis portion of the Safety Program:
 - I understand that I am to be familiar with the hazards that surround my workstation.
 - I understand that I am to report any hazard that may be present in my workstation.
 - I understand that it is my responsibility to assist in providing a safe working environment for myself and my co-workers.

_____ **Initial**

- I have read or have had explained the process for Accident Investigation:
 - I understand that I am to immediately report an accident to my supervisor.
 - I understand that I am to immediately stop working.
 - I understand that if I need medical attention I am to see the clinic or hospital that is affiliated with this Company.
 - I understand that if I go to a different doctor or medical facility the Company may have a right to deny or not pay my medical bill.
 - I understand that I will be cooperative in any accident investigation.
 - I understand that upon any accident I may be tested for drugs and alcohol.
 - I understand that if I am present at my place of employment under the influence of drugs and or alcohol that I automatically self-terminate my employment with or without notice of termination by the Company.

_____ **Initial**

New Hire Orientation Checklist (page 2)

- I have read or have had explained the Emergency Action Plan:
- I understand where my emergency evacuation routes are located.
 - I understand that we are to gather at a specific determined place in order to conduct a head count.
- _____ **Initial**
- I have read and or have had explained the Fire Prevention Plan:
- I understand that I am to report any potential fire hazards.
 - I am to keep all exits clear and free of obstacles.
 - I know where the nearest fire extinguisher is to my workstation.
- _____ **Initial**
- I am aware of the First Aid portion of the Safety Program:
- I am aware of where the first aid kits are located.
 - I am aware that I am to report to management if the first aid kit needs restocked.
 - I am aware of who is trained in First Aid and CPR
 - I am aware of where the nearest Eye Wash Station is located (if appropriate).
 - I am aware that I am to report all injuries immediately to my supervisor.
 - I am aware of where our clinic is located and will have someone drive me there in the event of an emergency (or by ambulance if appropriate).
- _____ **Initial**
- I have read or have had explained the Bloodborne Pathogens portion of the Safety Program:
- I understand that I am to wear personal protective equipment when dealing with blood or body fluids.
 - I understand that I am to properly dispose of any blood, body fluids, or material that has been touched by the blood or fluid.
 - I understand that in the event of dealing with a Bloodborne Pathogen situation it is my responsibility to receive post exposure care by the Company's clinic.
 - I am aware of where my hand-washing facilities and/or disinfectant are located.
- _____ **Initial**

New Hire Orientation Checklist (page 3)

- I have read or have had explained and understand the Workplace Violence & Harassment policy of the Safety Program:
- I understand The Company has ZERO TOLERANCE for workplace Violence & Harassment.
 - Workplace Violence & Harassment includes but is not limited to: intimidation, threats, physical attack, property damage, and includes acts of violence committed by employees, customers, relatives, acquaintances, or strangers against Company employees in the workplace.
 - Dangerous weapons are prohibited on Company property or in Company vehicles.
 - All employees are encouraged to report to a supervisor any possibility of workplace Violence & Harassment.

_____ ***Initial***

- I have read or have had explained the Electrical Safety portion and the Lockout/Tagout portion of the Company Safety Program:
- I understand that only authorized persons are allowed to deal with electrical repairs and or issues.
 - I understand that I am to not touch or in any way use any equipment that is locked out or tagged out.
 - I understand that it is my responsibility to report any electrical hazards to a supervisor immediately.

_____ ***Initial***

- I have read or have had explained the Hazard Communication portion of the Safety Program:
- I understand what a Safety Data Sheet is.
 - I have been given an orientation on how to read a SDS.
 - I understand that I am to report any Chemical or Hazardous Substance that does not have a label.
 - I understand that I can request further training on SDSs.

_____ ***Initial***

New Hire Orientation Checklist (page 4)

- I have read or have had explained the Personal Protective Equipment portion of the Safety Program:
- I understand that I am to wear my personal protective equipment as required by this Company.
 - I am aware of what I am required to wear for personal protective equipment at this Company.

_____ **Initial**

- I am aware of where my Company displays all of the required Employee Rights Postings.

_____ **Initial**

- I am aware of where my Company "Designated Medical Provider" is located.

_____ **Initial**

- I am aware that the Safety Program may contain additional written safety Programs in place which require additional training (i.e. Confined Spaces, Fall-Protection, Excavation, Ladders, Scaffolding, Lock-Out/Tag-Out, etc.):
- I understand that I may receive or request further training on any safety issues that may be appropriate for my particular job.
 - If I have not received adequate training or feel that I cannot conduct my job safely it is my responsibility to notify my supervisor.

_____ **Initial**

My signature certifies and verifies that I have received an orientation and have received or have read the material mentioned in the Company Safety Program. I understand completely the program and have no questions in regards to Company safety policy. I fully understand and am aware that if I have questions regarding the Company Safety Program or my personal safety, I may inquire of my supervisor for additional information and explanation.

New Hire Name

Signature

Date

New Hire Name

Signature

Date

DISCLAIMER

OSHA's Safety and Health Regulations are continuously being reinterpreted. Therefore, Safety Services Company is unable to completely guarantee the exactness of the information conveyed in this publication. Safety Services Company assumes no responsibility and shall be held harmless for any inaccuracies or omissions contained within this manual and shall not be held liable to any extent or form for any injury or loss resulting from the manner in which this information is interpreted and / or applied. Careful effort has been dedicated in order to provide a simplified, understandable explanation of OSHA regulations based on currently available information. This "Safety and Health Manual is distributed with the agreement that Safety Services Company is not employed in providing legal or other specialized business services. Should expert assistance be required, retain the services of a competent professional.

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