

Sheet Metal

Working with sheet metal requires attention to many safety and health issues. This chapter will address material handling of sheet metal, welding and cutting, and mechanical power presses. Additionally, it will reference other relevant chapters, including electrical safety, lockout/tagout, material handling, back-injury prevention, and power and pneumatic tools.

Material Handling of Sheet Metal

Safe methods of handling sheet metal are not included in the material-handling regulations, which focus on material storage and safe use of slings, wire ropes, and cables on cranes and hoists. The safe handling of sheet metal as discussed here is directly related to the use of personal protective equipment (PPE) and back-injury prevention.

Sheet metal is heavy, and the edges and corners can be extremely sharp. Furthermore, metal is an excellent conductor of electricity and heat and will become hot quickly if exposed to the sun or other heat sources. Likewise, sheet metal exposed to the elements of a winter's day may be cold, icy or wet. For these reasons, it is essential that all employees working with sheet metal wear gloves that are made of leather or synthetic puncture-resistant material like Kevlar.® Puncture-resistant sleeves that protect the forearm also are available. Appropriate eye protection is warranted in most instances where sheet-metal fabrication or installation take place.

Back-injury prevention also is extremely important. Sheet metal is awkward to carry—it is difficult to grip, the sheets are substantial and it generally is cumbersome to carry or move. Whenever possible, sheet metal should be moved mechanically. If it must be moved manually, employees should practice proper lifting procedures and get assistance when needed. Sheet metal should be stored on storage tables to minimize the amount of bending and lifting employees must do.

Welding and Cutting

Gas Welding and Cutting

Gas welding or cutting involve the use of compressed gases to produce a high-temperature flame. Usually, a mixture of oxygen gas and some type of compressed gas as fuel—acetylene is the most common—combine to produce a very hot flame (over 4,000 F in many cases) that can weld metals together or cut metals.

Gas Cylinders

Gas cylinders contain gas that has been compressed under extreme pressure to fit into a relatively small space. Any damage to the container can turn the cylinder into the equivalent of a bomb because the contents are volatile and under pressure. When handling compressed gas, employees must avoid bumping or otherwise disturbing the cylinders to prevent them from cracking or weakening. Hammers or pry bars never should be used to loosen valves or valve caps.

Moving Cylinders

Gas cylinders must remain upright when being stored, transported or used. Valve protection caps should be placed on all cylinders before they are moved unless the cylinders are transported in specifically designed carriers. The only time a cylinder is permitted to be in the other-than-vertical position is when it is being moved in the shop or on the work site or being hoisted to a different working level.

When moving a cylinder within the shop or on the work site, it should be tipped and rolled on its bottom edge. When it is being hoisted, the cylinder must be on a pallet, slingboard or cradle; it should never be lifted with a magnet nor should slings or chains be placed around valve assemblies or collars. When cylinders are in use, cylinder trucks, chains or other steadying devices must be used to keep the cylinders from falling over or knocking together.

Storage

Cylinders must be stored with care. Fuel-gas cylinders should always be separated from oxygen cylinders by at least 20 feet or by a noncombustible barrier. They must be stored in a dry and well-ventilated area, away from combustible materials, elevators, stairs and gangways, in a location where they cannot be bumped or damaged.

Use

When in use, cylinders must be kept a safe distance from sparks, hot slag or flames, and electrical circuits. A cylinder containing fuel gas, like acetylene, or oxygen must never be taken into a confined space (with the exception of self-contained breathing apparatus gear).

Cracking

It is the employer's responsibility to teach employees how to fuel gas safely. One of the first things employees should learn how to do is "crack" a cylinder. Cracking is done to remove dust and dirt from a cylinder's valve and should be done before the regulator is attached. The proper method is

to stand to one side and open the valve slightly, then close it immediately. The small amount of escaping gas will clear dust and debris from the valve so that it does not contaminate regulators or torch assemblies. Cylinders must never be cracked near any possible source of ignition.

Opening

Cylinders must be opened slowly to prevent damage to the regulator. To close the cylinder quickly, if need be, the regulator should be opened only about 1¹/₂ turns. If a wrench is needed to open a cylinder, it must be left on top of the cylinder so it can be closed quickly. Nothing that can damage the regulator or prevent it from being turned off quickly should be set on top of the cylinder. When the time comes to remove the regulator, the cylinder valve first must be closed and the regulator bled of excess gas. If any leaks cannot be stopped by tightening the gland nut (the nut that is attached to the valve stem) or applying the regulator, then the cylinder must be tagged and removed from the working area immediately.

Manifolds

Certain precautions must be taken when using manifolds. Manifolds must be placed in safe, well-ventilated and accessible locations and must bear the name of the substance they contain in letters at least 1 inch high, either painted on or otherwise permanently attached. Hose connections for oxygen and fuel must not be interchangeable, and header connections must be capped when not in use.

Hoses

Hoses for acetylene or other fuel gas must be clearly distinguishable from those for oxygen, either by color or texture. If hoses are taped together, at least 8 inches out of every 12 inches must be free from tape covering so that the color and texture can easily be seen. All hoses conducting substances that could ignite or combust must be inspected at the beginning of each shift and removed if they are in poor condition. Hoses that look worn or damaged must be tested at twice their normal pressure, as long as the pressure is not less than 300 pounds per square inch (psi), to determine if they can still be used. Couplings for hoses must be the type that can only be disconnected with a rotary motion as opposed to a straight pull in order to prevent accidental disengagement or loose connections. Hose storage must be in well-ventilated areas, away from passageways, stairways and ladders.

Torches

At the beginning of each shift, torch valves, hose couplings and tip connections must be checked. Torches must be taken out of service if any

part is defective. Cleaning wires, drills or other devices may be used to unclog torch tips if specifically designed for that purpose.

Torches must never be lit with a match—only with a friction lighter or other approved device—and a burning torch must never be left unattended. See the chapter on fire prevention for more information on torch hazards.

Additional Hazards

Any part of equipment used in operations with oxygen must be kept away from oil and grease. This equipment includes fittings, caps, valves, couplings, regulators, hoses and any other apparatus. Because pure oxygen can cause fire when it comes into contact with grease or oil, it should never be directed at oily surfaces or greasy clothes or put in any storage tank or vessel of fuel oil. Other welding hazards and technical instructions are specified in the American National Standards Institute (ANSI) regulation on welding, ANSI Z49.1-2005.

Arc Welding and Cutting

Cables and Other Components

Only fully insulated components may be used for arc welding. This includes the portion of the holder held by the operator; the outer surfaces of the jaws of the holder and all cables. The manual electrode holders must be designed specifically to handle the maximum-rated current required by the electrodes.

Cables cannot be used if they need repair. They also cannot be used if they contain repairs or splices within 10 feet of the end of the cable to which the electrode is connected. There are exceptions, however. If the splices still have insulating quality as good as that of the original cable, the cable may be used. It also is useable if the cable has standard insulating connectors. If splices anywhere on the cable are affected by cable lugs, they must be fastened securely for good conductivity and the metal parts must be insulated.

Grounding

A grounded return cable must have a safe current-carrying capacity that is at least equal to the output capacity of the unit it serves. If it serves more than one unit, the capacity must be at least equal to the total maximum capacity of all units together. Unless it contains gases, flammable liquids or electrical circuits, a structure or pipeline may be used as a ground return circuit. The required electrical contact must exist at all joints, and the joints must be bonded and subject to periodic inspection if they are used continuously as a ground return circuit. The frames of all machines must be grounded through

a third wire in the cable. All ground connections must be inspected to make sure they are able to handle the current, mechanically and electrically.

Operation

Employers must train employees in the following arc-welding and cutting-safety procedures:

- *When electrode holders must be left unattended, the employee must remove the electrodes and place the holders in such a way that they cannot make electrical contact with people or objects.*
- *Hot electrode holders never should be placed in water because this may expose the operator to electric shock.*
- *The operator must open the power supply switch when he or she needs to leave the work or stop working for any significant amount of time.*
- *The operator must report faulty or defective equipment to a supervisor.*

Unless it is infeasible, all arc-welding and shielding operations must be shielded with a noncombustible or flame-proof screen to protect people in the vicinity.

Fire Prevention for Gas and Arc-welding Operations

Welding creates a number of fire hazards: heat, sparks, gases, slag and other emissions from the surface being welded or cut. Certain surfaces, such as those covered with heavy dust or flammable paints or compounds, may not be welded, cut or heated.

When a moveable object is being welded or cut, it should be moved to a safe place. If the object cannot be moved, potential hazards around it should be relocated. If it is not possible to move either the objects or the hazards, preventive means must be taken to ensure heat, sparks and slag are confined. When work is being done on a wall, ceiling or floor, precautions must be taken on the opposite side of the structure, as well as on the work side, so sparks and heat that penetrate the structure won't cause fires on the other side.

Fire-extinguishing equipment must always be readily available and in working order. If the hazards associated with a cutting or welding operation are too significant for simple fire-prevention techniques, trained personnel must be available to guard against fire during these operations.

Shutting off the gas supply to the torch whenever it is not in use will reduce the chance of fire. Except when the contents are being transferred or removed, drums, pails and other containers with flammable contents must have their lids securely closed. Empty containers should be removed altogether. If an employee needs to cut, heat or weld a container that has held flammable materials, the container must be filled with water and thoroughly cleaned and ventilated first. Any hollow container used in welding operations must have an opening or vent to allow pressure to be released.

Ventilation and Respiration

Welding generally requires adequate ventilation or respiratory protective equipment if employee exposure to airborne contaminants exceeds the permissible exposure limit (PEL). However, when welding involves confined spaces, significantly toxic metals (e.g., zinc-bearing materials, lead-base metals, cadmium-bearing filler or cadmium-coated base metals, mercury-bearing materials, or beryllium-containing base or filler metals), or inert-gas metal-arc welding, providing adequate ventilation can be a challenge and respiratory protection in the form of a supplied-air respirator may be needed. Because almost every welding operation creates gases, fumes and dust to some extent, the material safety data sheets (MSDSs) should be the prime guide regarding the need for appropriate respiratory protection. (See the chapter Confined Spaces for ventilation requirements and the chapter Hazard Communication for information about MSDSs). It is important to realize that confined spaces are not limited to small rooms or inside locations. Any time there is restricted natural air flow, some kind of ventilation should be used.

Specific Metals

Stainless steel that is welded may expose a worker to hexavalent chromium, a known carcinogen. The high temperatures welding produces may cause the chromium in the stainless steel to oxidize, forming hexavalent chromium, often written as CrVI. The Occupational Safety and Health Administration (OSHA) suggests workers who breathe hexavalent chromium compounds for extended periods may be at increased risk of developing lung cancer. In addition, breathing high levels of hexavalent chromium can irritate or damage the nose, throat and lungs. If a worker's eyes or skin receive prolonged exposure to hexavalent chromium, irritation or damage can result that may be permanent. Precautions need to be taken to reduce or eliminate any worker exposure to hexavalent chromium.

Eye protection

The following chart will help employers select appropriate eye protection for employees. Also, the chapter, Personal Protective Equipment (PPE), can be

referred to for a similar chart and full description of the array of eye and face safety protection available.

Protective Clothing

The most suitable protective clothing to wear in a welding, cutting or heating operation is clothing that is relatively flame-retardant. Work clothing of cotton or wool fibers and an apron made of leather or other heavy material offer the best protection for the body. Leather gloves and arm protection will protect the hands and arms, and leather or other firm material for work boots will offer adequate foot protection.

Mechanical Power Presses

Note: This section does not include press brakes, hydraulic and pneumatic power presses, bulldozers, hot bending or hot metal presses, hammers, riveting machines or similar types of fastener applicators.

General Guarding and Construction of Mechanical Power Presses

- *Broken or falling machine components—Components must be designed, secured and/or covered so they do not break, fall or release mechanical energy unexpectedly through broken springs or other machine parts.*
- *Brakes—Friction brakes must be self-engaging so that only an external source can cause them to disengage. The brakes must be strong enough to stop and hold the slide at any point of its travel.*
- *Full-revolution positive clutches—Machines that use full-revolution positive clutches must have a single-stroke mechanism. If the mechanism is based on springs, the springs have to be compression types that operate on rods or are guided within a hole or tube. That way, the springs cannot get snarled and tangled within the clutch if they break.*
- *Foot pedals (treadle)—Pedals, covered with nonslip pads, must be protected so that falling objects or similar accidents will not be able to activate machines. The pedal return spring must follow the guidelines for the full-revolution clutches (above). If there are counterweights provided, the path of the weights must be enclosed.*
- *Hand-operated levers—Spring latches on operating levers will prevent premature or accidental tripping. Also, if there is more than one operating station, the levers must be interlocked so the machine is tripped only when all levers are used together.*
- *Two-hand trip—Hand controls must be protected to prevent accidental start-up of the machine and constructed so that both of the operator's hands are required to trip the press and operate the*

machine. If the press is a multioperator machine, each operator must have a separate set of controls. Also, on a full-revolution clutch machine, there must be an anti-repeat feature.

- *For machines using part-revolution clutches—*
 - *When the external clutch engaging means is deactivated, the clutch will release and the brake will be applied.*
 - *A red stop control must be provided with the clutch/brake control. The stop control will override any other control, and the clutch must be tripped by some selected method.*
 - *There must be a way to select a type of operation (off, inch, single stroke or continuous) with the clutch/brake control by means capable of supervision by the employer.*
 - *The “inch” function must be designed to prevent exposure to the worker’s hands by one of two methods: Either both hands should be required to actuate the clutch, or the single-hand control should be located far enough from the point of operation that the operator cannot have his or her hands in both places at once.*
 - *Two-hand control for single-stroke mechanisms (manufactured and/or installed after Aug. 31, 1971) must have the following features: controls that require use of both hands at once to trip the press, controls that require the use of both hands at once during the die closing, an anti-repeat feature, and a control system that requires the operators to release all hands from the controls before an interrupted stroke can be resumed.*
 - *The clutch/brake control system must be designed not to start unless both of the operator’s hands, at all stations, are being used.*
 - *Control systems that contain both single and continuous functions must be designed so that in order to have a continuous run, the operator has to take a specific action in addition to selecting the continuous function. Continuous circuits should be supervised by the employer.*
 - *If there is an available foot control, the selection method, which should be supervised by the employer, must be separate from the stroking selector.*
 - *Foot-operated tripping controls must be protected from accidental activation.*
 - *Air-clutch machines must be designed so that a failure within the operating mechanism doesn’t result in a significant increase in stopping time. They also cannot allow further operation in the case of a failure. (This applies only to machines manufactured and installed after Aug. 31, 1971, and not to machines intended only for continuous automatic-feeding applications.)*

- *Unless the press-drive motor is energized and in the forward direction, the clutch/brake control must not allow the single-stroke or continuous functions to activate.*
- *In the event of a power- or pressure-supply failure, the clutch/brake control must automatically deactivate. The normal power and pressure supplies and the tripping mechanism must be used together to reactivate it.*
- *If there is a failure of the counterbalance air supply, the clutch/brake must deactivate. Normal air supply must be restored, and the tripping mechanism must be required to reactivate it.*
- *The bar operation may be selected by means of employer supervision. A separate push-button will activate the clutch, but only if the driver motor is de-energized.*
- *Electrical—Every power-press control system must have a main on/off power switch that can be locked in the off position. There also must be a motor start button that is protected from being accidentally turned off or on. In the event of control-voltage or power-source failure, all operation controls must disconnect the drive motor from the power source. A motor start button is required to restart the motor. Normal power supply must be limited to 120-volt AC and 240-volt DC; higher voltages must be isolated from the operator's control mechanisms except when motor starters have integral start-stop buttons. Clutch/brake controls must be protected against false press operation that can result from an accidental ground. Controls also must incorporate features that will not allow an unintended stroke to control component malfunctions.*
- *Slide-counterbalance system—Spring-counterbalance and air-counterbalance cylinders must be able to retain all parts (springs or rods and pistons) if they break. The cylinders also must be able to hold the slides and attachments in midstroke without the brakes applied. The air-counterbalance cylinders should be able to prevent a sudden loss of pressure in the event of an air-supply failure.*
- *Air-controlling equipment—The system must be protected against foreign matter and water entering the pneumatic system. Air lubrication must be provided when needed.*
- *Hydraulic equipment—The maximum working pressure must be lower than the safe pressure rating of any one part of the system.*
- *Pressure vessels—All pressure vessels must conform to the American Society of Mechanical Engineers Code for Pressure Vessels, 1968 Edition.*
- *Control reliability—The control system must be designed so that a failure within the system affecting point-of-operation injuries doesn't prevent normal stopping actions. It should not allow the initiation of a stroke until the failure is corrected.*

- *Brake system monitoring—The brake monitor must be installed so that it meets several requirements. It must prevent activation if the stopping time or breaking distance deteriorates too much. It must indicate when the performance has deteriorated and monitor the system on each stroke.*

Safeguarding the Point of Operation

It is the employer's responsibility to provide and ensure the use of point-of-operation guards that conform with Table O-10, which can be found in OSHA's regulation

29 CFR 1910.217:

Table O-10

Distance of opening from point-of-operation hazard *Maximum width of opening*

<i>1/2" to 1 1/2"</i>	<i>1/4"</i>
<i>1 1/2" to 2 1/2"</i>	<i>3/8"</i>
<i>2 1/2" to 3 1/2"</i>	<i>1/2"</i>
<i>3 1/2" to 5 1/2"</i>	<i>5/8"</i>
<i>5 1/2" to 6 1/2"</i>	<i>3/4"</i>
<i>6 1/2" to 7 1/2"</i>	<i>7/8"</i>
<i>7 1/2" to 12 1/2"</i>	<i>1 1/4"</i>
<i>12 1/2" to 15 1/2"</i>	<i>1 1/2"</i>
<i>15 1/2" to 17 1/2"</i>	<i>1 7/8"</i>
<i>17 1/2" to 31 1/2"</i>	<i>2 1/8"</i>

Point-of-operation Guards

- *Every guard must:*
 - *Be able to prevent operators from reaching their hands or fingers through, over, around or under the guard*
 - *Conform to Table O-10*
 - *Be constructed and installed without pinch points*
 - *Use fasteners that are not readily removable*
 - *Make inspection easy*
 - *Offer full visibility of the point of operation*
- *A die-enclosure guard must be fixed to the die shoe or stripper.*
- *A fixed-barrier guard must be attached securely to the press frame or bolster plate.*

- *An interlocking press-barrier guard must be attached to the press frame or bolster and interlocked with the press clutch control so the clutch cannot be activated unless the guard conforms to Table O-10.*
- *The hinged or moveable sections of an interlocking press barrier guard cannot be used for manual feeding. The guard will prevent opening of the interlocking section and reaching into the point of operation before die closure or cessation of slide motion.*
- *The adjustable barrier guard must be securely attached to the press bed, bolster plate or die shoe. Adjustments are allowed to be made only by those whose qualifications include a knowledge of Table O-10.*
- *A point-of-operation enclosure that does not meet the requirements of Table O-10 can be used only in conjunction with point-of-operation devices (see next section).*

Point-of-Operation Devices

There are various ways in which point-of-operation devices can protect operators.

Hand Feeding Tools

Hand tools should be used to feed, or place, materials in and remove them from the press. They are not guards or protection devices and cannot be used in place of either guards or devices.

Additional requirements

The following are additional requirements in a case where the operator feeds or removes parts by placing one or both hands in the point of operation and then uses a two-hand control, a presence-sensing device of Type B gate or a moveable barrier on a part-revolution clutch:

- *The employer must use a control system and brake monitor.*
- *The exception for two-hand controls manufactured and installed before Aug. 31, 1971, is not applicable.*
- *The control of air clutch machines must be designed to prevent a significant increase in the normal stopping time due to a failure within the system and to inhibit further operation in the case of a failure. The exception regarding control manufactured and installed before Aug. 31, 1971, is not applicable in this situation.*

Design, Construction, Setting and Feeding of Dies

The employer must attempt to eliminate hazards by using the dies and operating methods that are designed for the power presses. The employer

also must enforce the use of hand tools for freeing and removing work or scrap stuck on the dies. Scrap from the roll feed or other sources must be handled carefully, as specified by the employer.

A guidepost separated from its bushings by more than 1/4 inch must be protected as a point-of-operation hazard. Unitized tooling must be guarded between the top of the punch holder and the face of the slide, or striking pad.

Stamps—All dies should be stamped with the following information (or the information must be recorded and readily available to the die setter): the tonnage and stroke requirements; the upper die weight for air counterbalance pressure adjustments; and complete die weight for when handling equipment may become overloaded. Upper and lower shoes must have provisions for securely mounting the dies to the bolster and slide. Dies requiring mechanical handling must have attach points.

Diesetting—Employer-established die-setting procedures must comply with all safeguarding requirements. Spring-loaded turnover bars must be provided by the employer for presses designed to accept them. Die stools or other means should be used when setting or removing the dies in order to prevent losing control of the dies. Safety blocks must be used whenever adjustments or repairs are made to the press. So that operators and die setters do not have to reach into the point of operation, the employer must provide brushes, swabs, lubricating rolls, and automatic or manual pressure guns.

Inspection, Maintenance and Modification of Presses

It is an employer's responsibility to establish and follow an inspection program for periodic and regular inspections. Inspections must take place at least once a week during which the clutch/brake, anti-repeat and single-stroke mechanisms are examined. Any necessary maintenance or repairs need to take place before presses are operated. Certification records must be available to document inspections, tests and maintenance work. The certifications must include the dates of the inspections, tests or maintenance; the signatures of those who performed the operations; and the serial numbers or other identifications of the machines.

If anyone modifies a press in any way, it is that person's responsibility to provide instructions for how to use and properly care for the machine after its alteration. It is the employer's responsibility to ensure the competence of the people caring for, inspecting and maintaining the power presses.

Operation of Power Presses

Before an operator starts any work on a power press, the employer must train and instruct the operator in safe work methods. The operator must be supervised to ensure he or she is operating the machine correctly. The employer is responsible for making sure the machines are used within the tonnage and attachment weight ratings specified by the manufacturer.

Clearance between machines must allow operators to work without interfering with the work of another operator. Enough space also must be provided so there is room to clean the machines, handle materials around them, and clean work pieces and scrap. Surrounding floors and other surfaces must be kept in good condition, free of obstructions, grease, oil and water.

Reports of Injuries

All point-of-operation injuries to operators or any other employees need to be reported by the employer within 30 days to the following address or the state agency that administers the approved state plan:

*Director of the Directorate of Safety Standards Programs
Occupational Safety and Health Administration
U.S. Department of Labor
Washington, D.C. 20210*

Reports need to include the following information:

- The employer's name, address and location of workplace (establishment)*
- The employee's name, injury sustained and task being performed at the time of injury (operation, setup, maintenance)*
- The type of clutch used on the press (full revolution, part revolution or direct drive)*
- The type of safeguards being used (two-hand control, two-hand trip, pull-outs, sweeps or other)*
- The cause of the accident (repeat press, safeguard failure, removing stuck part or scrap, no safeguard provided, no safeguard in use or other)*
- The type of feeding (manual with hands in dies or with hands out of dies, semiautomatic, automatic or other)*
- The means used to actuate press stroke (foot trip, foot control, hand trip, hand control or other)*
- The number of operators required for the operations and provided with controls and safeguards*

List of Safe Work Practices

Sheet Metal and Shop Safety Safe Work Practices

It is the policy of [company name] to provide a safe work environment for those working in its sheet metal shop. The following rules listed below will be observed at all times.

General Shop Safety

- *An adequate supply of ABC-rated fire extinguishers will be located throughout the shop. They will be mounted on walls for easy access, and signage or marking will be provided to ensure visibility of location. The ground around these locations will be kept free of debris. Fire extinguishers will not be stored on the ground. Each fire extinguisher will be inspected at least monthly, ensuring that the pressure gauge indicates adequate pressure and the ring and tie holding the ring in place are intact.*
- *All flammable and combustible liquids will be stored in approved metal containers. Each cabinet will be marked: FLAMMABLE—KEEP AWAY FROM FIRE.*
- *First-aid kits will be located in the shop area and properly supplied.*
- *Personnel will wear appropriate personal protective equipment (PPE) when operating equipment, including*
 - *Safety goggles or glasses*
 - *Gloves*
 - *Long-sleeved shirts*
 - *Long pants*
 - *Sturdy work shoes*
- *Loose-fitting clothes or jewelry will not be permitted when working around equipment.*
- *Hard hats will be worn when there are overhead dangers in the shop.*
- *The shop area will be kept free of scrap metal and trash.*

- *All sheet metal will be stacked in a way to prevent it from slipping or falling.*
- *Lockout/tagout procedures will be used when equipment needs to be serviced.*

Welding Safety

- *All compressed gas cylinders will be stored and secured in an upright position.*
- *Valve-protection caps will be in place at all times when the cylinders are not in use and when they are being transported.*
- *Valve protection caps and cylinder collars will not be used to lift a cylinder.*
- *When transporting cylinders, they must be transported using a dolly designed for transportation that will include chains or other similar securing device.*
- *When cylinders are not in use, the valves will be turned off.*
- *Cylinders will be stored away from ignition sources.*
- *Damaged or defective cylinders or valves will not be used at any time.*
- *Hoses will be inspected before use. A soap solution will be used on the hose and connections to determine if a gas is leaking. Matches or lighters will not be used to determine if gas is leaking.*
- *Gauges will be in good working order. Defective gauges will be removed from service.*