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9.3.1 Confined Space

Entry Into Confined Space

1. Maintenance Supervisor issues/OH&S officer approves:
 - a) hazard assessment
 - b) classification
 - c) procedures as per level
2. A space which is enclosed or partially enclosed and is not intended for human occupancy. An area with restricted entry or exit and may be hazardous because of design, construction, location, atmosphere or the materials or substances in it other conditions.
3. All employees permitted to work in confined spaces shall be trained on the requirements of entry. Retraining programs will be offered to ensure personnel remain versed in procedures with confined spaces.
4. All operation carried out within confined spaces: shall be under the supervision of a person in charge, shall be attended by and in communication with another worker stationed outside at or near the entrance.
5. Atmosphere inside a confined space shall be remotely monitored for hazards prior to each entry and throughout the operation.

Hazardous Assessment

1. Hazardous Atmosphere:
 - d) An atmosphere that may expose employees to risk or death.
 - e) Concentrations of chemicals.
 - f) Airborne combustibles, flammable gas or mist.
 - g) An atmosphere which will incapacitate, impair ability to self rescue, will injure or harm.
 2. Hazardous atmosphere will be force ventilated to reduce to acceptable levels or eliminate the hazard. If ventilation is ineffective, the appropriate level of personal protective equipment required to perform the task shall be provided.
 3. Approved self-contained breathing apparatus or airline respirators equipped with
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a five (5) minute emergency air supply shall be used in hazardous atmosphere or dangerous conditions.

4. Hazard Isolation

a) Actions to isolate confined space hazards shall be performed prior to entry. These include but are not limited to blanking or gliding, double block and bleed or log out and tag.

5. If a confined space requires respiratory protective equipment or where rescue may be difficult, body harnesses and life lines shall be used. The attendant shall be provided with the same equipment as those working within the confined space.

6. All equipment provided for permit space entry shall be adequately maintained and calibrated in accordance with manufacturers specifications. All employees using equipment shall be trained in their use.

7. All sources of ignition must be removed prior to entry, hand tools will be in good condition, explosion proof and spark proof, hand held lights and other illumination equipped with guards and be explosion proof.

8. Compressed gas cylinders shall not be taken into confined spaces, except cylinders used for self-contained breathing apparatus.

9. Contractors shall be provided with all available information, regulations and safety procedures for entry into confined space. Procedures for each employer shall be implemented when one or more employer has employees in a permit space.

9. Rescue teams trained in confined space responses will be available to assist the confined space attendant in emergency situations. Rescue teams shall be informed of the hazards associated with the confined space prior to commencement. Retrieval system allowing attendant to extricate entrant without entering confined space may be used, tripods or other properly secured retrieval system.

Definitions

1. **Hot Work Permits**

After a hazard assessment, a Hot Work Permits are for work where the heat used or generated is of sufficient intensity to cause ignition of any explosive or flammable concentrations of vapors, or gases.

Aim Model 510

1. Follow manufacturer's instruction for care and maintenance of Aim Model 510 monitor.
2. Test calibration every 24 hours.
3. Turn on meter, press ON switch. Meter will do a self diagnostic test.
4. Turn lights on if required. Select from menu.
5. Start meter in clean air environment.
Reading: Low Level

	<u>Low</u>	<u>High</u>
Carbon Monoxide	0 ppm	25 ppm
Explosive Level	0%	10%
Oxygen	20.9%	23%
Methane	0 ppm	25 ppm

6. "Bump Test" High Level Using Ca Gras:
 - a) Mute silence for 5 minutes using menu.
 - b) After test completed turn pump on to purge.
7. Pump On: install probe/tube for sampling, attach wind cuff. Remote sampling should pump stall, increase the pump function to high using menu.
8. Test confined space before entering.
9. Take appropriate action based on meter reading purge. Ventilated space until desired results are obtained.
10. Re-test for conditions after ventilation or purging is completed.
10. All conditions are acceptable. Complete Entry Permit.
12. If using a new session on menu turn meter off and on. Is continuous monitoring going to be conducted or re-testing necessary.

Note: Green warning lights will activate at ½ the high level setting on meter. Alarm will Activate and red light indicator will come on upon reaching high level setting.

1. Description of Work to be Undertaken

2. Names of Workers and Position

a) _____

b) _____

c) _____

d) _____

e) _____

3. List of Tools/Equipment and Product For This Project
 (Example: Lifting Devices; Lighting; Wrenches; Solvent; Gaskets)

4. Lock Out Procedure in Place

Name of Electrician and/or Plumber _____

Name of Employee(s) Entering Space _____

	Check (✓)	Not Applicable
Electrical Source Locked Out	0	0
Mechanical Source Locked Out	0	0
Lines Blanked or Isolated	0	0
Others (Please Specify) _____	0	0

5. Cleaning or Purging Method

How Long _____

By Whom _____

6. Ventilation Set Up and Operational

	Check (✓) & initial for testing	
	Yes	No
Force Air	0	0
Extraction	0	0

7.	Safety Equipment	Check (✓)	
		Yes	No
	Tripod	θ	θ
	Fall Arrest System	θ	θ
	Hard Hat	θ	θ
	Protective Footwear	θ	θ
	Safety Glasses	θ	θ
	Respirator (Type) _____	θ	θ
	Coveralls	θ	θ
8.	Testing Results	Check (✓)	
		Yes	No
	Carbon Monoxide Level More Than 35 ppm	θ	θ
	Methane Level More Than 10 ppm	θ	θ
	Explosive Limits Level More Than 10%	θ	θ
	Oxygen Less Than or More Than 19.5%-23%	θ	θ
9.	Emergency Plan	Check (✓)	
		Yes	No
	a) Communication Devices in Place and Tested	θ	θ
	b) Emergency Plan Posted	θ	θ
	c) Rescue Preparedness	θ	θ
10.	Entry Permit in Place	Check (✓)	
		Yes	No
		θ	θ
11.	Hazard Assessment and Work Procedure Reviewed With Workers	Check (✓)	
		Yes	No
		θ	θ

Signature of Person in Charge

Date

9.3.2 Demolition/Dismantling

General

1. Hazard assessment to be done before demolition.
2. Warning signs to be installed.
3. Seal off as much as possible, to contain dust, etc.
4. All electrical water and gas to be locked out before demolition.
5. Masonry walls shall be removed in reasonably level courses in any one storey. It shall not be permitted to fall in such a mass as to damage the structural stability of floor or supports.
6. Proper storage bins or trucks to be on job site for debris.
7. Anything over 3 meters a proper shoot to be used from work site to container, or carried out by hand.
8. Do not leave anything hanging or something that could fall.
9. All debris shall be disposed of as soon as possible.
10. No stacking or piling materials or debris on project to endanger workers.
11. No workman shall enter or be permitted in any area where his safety might be endangered by material or debris falling from demolition.

Barricades and Guardrails

1. Hazardous areas should be cordoned-off with barricades and danger tape.
 2. Guardrails consisting of a top rail, mid-rail and toeboard must be provided at all floor edges or roof openings where an employee may fall more than 2.5 meters (8 feet), unless protected by adequate coverings.
 3. Barricades may only be removed for work to proceed with permission of the supervisor. They must be replaced immediately after work is completed.
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9.3.3 Fire Protection Sprinklers

1. All sprinkler work shall be carried out by qualified personnel.
2. Notify personnel 24 hours before disconnection.
3. Prior to sprinkler shut down, the building contact person shall be notified. The type and duration of work will be disclosed.
4. Notices will be posted by building contact person prior to commencement of work, using attached form. Form will be posted on all affected pull stations. Electrician to notify monitoring company.
5. Monitoring station is notified before and after.
6. End of day electrician will notify proper authority if system or only part of the system can be re-energized.
7. Upon completion of work:
 - a) Ensure system is charged.
 - b) Main water supply is fully open.
 - c) Alarm panel is connected and checked for operation by electrician.
 - d) Monitoring service is notified system is back to normal.
 - e) Notify building contact person that work is complete and system is charged and back on line.
 - f) Signs are removed.

IN CASE OF FIRE

CALL 911

Authorized by: _____

9.3.4 Electric Welding – Setup Checklist

Do

1. Locate welding leads away from main power leads to prevent accidental contact with high voltage.
2. Cover the lug terminals to prevent shorting out by a metal object.
3. Locate equipment so that it will not be tampered with by unauthorized personnel.
4. Minimize welding machine exposure to corrosive fumes, welding sparks or excessive dust.
5. Locate power switches where they can be quickly disconnected in an emergency.
6. Clear combustible materials from work area. Cover combustible objects with a fire-resistant blanket if you cannot move them.
7. Use only a proper earthing clamp or bolted terminal.
8. Have a fire extinguisher nearby.
9. Ensure welding machine is grounded.

Do Not

1. Do not block walkways. Welding leads should run above head level or be covered so that they are not a tripping hazard. Locate leads and cables so they do not obstruct passageways, ladders and stairways.
2. Do not locate welding equipment near overhead cranes or work aisles.
3. Do not ground welding equipment to chains, hoists, or elevator cables.
4. Do not locate equipment with machine base in water. Thoroughly dry and test machine before using.
5. Do not overload machine or force cables to carry currents beyond their rated capacity.
6. Do not ground to pipelines carrying gas or flammable liquids, or to conduits

7. carrying electric wires.
Do not coil or loop cables around your body.
8. Do not allow leaks and condensation to run back in the machine. Use cooling water line drip loops.

9.3.5 Electric Welding - Installation

Engine Driven Equipment

1. Locate on a level base protected from weather. Block wheels to prevent movement. Equipment used outside may require temporary shelter.
2. Ensure fuel tank has no leaks and cooling fan is guarded.
3. Conduct engine exhaust outside when used inside.

Grounding

1. Ground according to manufacturers' instructions.
2. Check that the welding machine frame is grounded with special attention to ground connectors.
3. Do not ground to pipelines carrying gases, flammable liquids or electrical conductors.
4. Keep plugs and sockets connecting welding machines to power clean and free of moisture.
5. De-energize electric power when connecting power plug to the power socket.
6. Stand well away from plug and socket when power is turned on.
7. Wear eye protection.
8. Install caps on plugs and sockets when not in use.

Connections and Cables

1. Locate main switch near equipment so power can be shut off easily.
2. Locate main power lines overhead and connect them to each machine location.
3. Spread out welding cable prior to use. Check weld lead cables for damaged

insulation and lead cables for exposed conductors. Check welding cables for full insulation along their length.

4. Ensure welding cable is large enough to carry the current required. As the total length of cable in the welding circuit increases, the current carrying capacity of that cable decreases. Therefore, for a given application, it may be necessary to increase the cable size.
5. Replace weld lead spliced with 3 m (10 ft.) of the electrode holder.
6. Check for leaks in gas hoses if metal inert gas (MIG) or tungsten inert gas (TIG) welding.
7. Inspect equipment periodically for loose or corroded connections, cable damage, dirty or ineffective jaws of electrode holders, and ground clamps.
8. Connect to the transformer or generator with the proper plugs or lugs.
9. Do not use bolts for clamping stranded or plaided conductors. They usually work loose.
10. Use proper cable couplings to extend leads.

9.3.6 Ballast

Ballasts Removal and Identification

1. Identify the ballast by looking at the markings on it. These markings identify manufacturer, type, year produced, PCB or non PCB.
2. Ballast changed/removed by qualified electrician.
3. If you can not get the information you need contact the manufacturer of the ballast.
4. Once confirmed PCB's are present before removing, place something on the floor in case the PCB's drip. Wear proper gloves and eye protection.
5. After removal place ballast in plastic bag and dispose of in a PCB barrel on site.
6. If no PCB barrel is on site you can transport up to 3 ballasts in plastic bags to a site with a barrel.
7. Ballasts manufactured after 1979 do not contain PCB.
8. Only ballasts from board owned buildings to go in the barrels, no ballasts to be excepted from outside contractors.
9. Ballasts that do not contain PCB's can be disposed of in the regular garbage.

PCB Storage Barrels

1. Good quality 200 litre steel drum, 16 gauge or thicker.
 2. Properly labeled can be viewed from all-round top and bottom.
 3. Oil dry put on bottom before any ballast are put in.
 4. Leave ballast 3" from top of drum for air movement when full.
 5. Only ballasts from board buildings to be put in barrel.
 6. We do not accept outside contractors ballast.
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9.3.7 Asbestos Removal & Identification

General

1. Asbestos can be found in most pre 1973 construction in some form.
 2. Any employee that finds material on a job site that appears to resemble asbestos must notify their supervisor so that tests can be carried out, especially if renovating etc.
 3. Once the material has been identified the supervisor will make the decision as how it will be handled using safe work procedures, type and amount of material.
 4. If asbestos is found, managers will decide if our people are to carry out the work and time required, e.g. summer break.
 5. If work is carried out by our department only trained/qualified employees or contractors:
 1. Personal respirators with proper hepa filters will be provided.
 2. Protective clothing, full body disposable type coveralls (tyvek) provided.
 3. Drop sheets of 6 mil polyethylene and waste containers of 6 mil sealable polyethylene clear bags will be provided.
 6. Minor removal or disturbance of asbestos material during repair, renovation, maintenance or demolition (glove bag size or smaller).
 - a) Before beginning work, at each access to work areas, install warning signs.
 - b) Prevent the spread of dust from the work area using polyethylene drop sheets or enclosed work areas where walls and ceiling are being demolished.
 - c) Block off any duct work vents.
 - d) Wet materials containing asbestos to be cut ground, abraded, dulled or otherwise disturbed.
 - e) When work is completed:
 1. Place dust and waste containing asbestos in sealed dust-tight, Labeled waste bags.
 2. Drop sheets and disposable protective clothing shall be placed in Labeled waste bags.
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3. Each labeled waste bag will be cleaned with a damp cloth and placed in a second labeled waste bag before removed from work site.

Pipe Insulation Removal Using Glove Bag

1. Place tools necessary to remove insulation in tool pouch. Wrap the bag around the pipe and close zippers. Seal bag to pipe with cloth straps.
2. Arrange insulation in bag to obtain full capacity of bag.
3. Insert nozzle of spray pump into bag through valve and wash down pipe and interior of bag. Wet surface of insulation in lower section of bag.
4. If bag is to be removed along pipe, loosen straps, move bag, re-seal to pipe using double-pull zipper to pass hangers.
5. To remove bag after completion of stripping with top section and tools thoroughly. Pull waste container over glove bag before removing from pipe.
6. After removal of bag ensure that pipe is free of all residue. Remove residue with wet cloth.
7. Seal exposed surfaces of pipe and ends of insulation with plan-drying sealer to seal in any residue filers.
8. Glove bags must be double bagged for disposal in labeled waste bags and must be discarded when full.

9.3.8 Electric Welding – Equipment Use Checklist

Do

1. Have solid footing and support yourself against stable objects. Your sense of balance may be affected with your welding shield covering your face.
2. Hold the weight of the welding lead in one hand while welding with the other hand.
3. Store electrode holders where they cannot contact workers, fuels or compressed gas leaks.
4. Remove all electrodes from holders and disconnect the machine from power source when welding is stopped for any period of time. Retract or cut off wire electrodes in semi-automatic holders to prevent contact.
5. Burn electrodes to no less than 39 to 50 mm (1 ½ to 2 in.) in length. Burning them shorter damages the electrode holder insulators, and may result in accidental shorting out.
6. Keep electrode holders and electrodes dry. If exposed to water or steam, dry thoroughly before further use.
7. Place electrode stubs in a container to prevent welders from slipping or falling on them.
8. Position yourself where welding fumes do not rise directly into your face.
9. Shield other workers from your welding arch.
9. Wear protective clothing, including eye and foot protection.
10. Use chalk to mark completed work “Hot”.
11. Chip slag so that the pieces fly away from you. Remove combustible materials from slag path before chipping.

Do Not

1. Do not change electrodes with bare hands, wet gloves or when standing on wet floors or grounded surfaces.

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2. Do not weld near degreasing operations. This causes the formation of hazardous gases.
 3. Do not cut or weld on containers, tanks, or drums until they have been thoroughly cleaned and properly ventilated. Follow practices outlined in safety regulations and standards.
 4. Do not cool electrode holders by dipping in water.
 5. Do not switch the polarity switch with an electric welder in operation. Turn off equipment to change polarity.

9.3.9 Workplace Inspections

General

1. Periodic inspections of mechanical rooms, will be carried out at least once every six (6) months, by using checklist by qualified trades.
2. Reports from these inspections, shall be discussed and forwarded to the principal and JOHSC of each area. A duplicate copy of this report, shall be forwarded to team leaders for action.
3. An approved inspection form, designed for this use, shall be used.

9.3.10 Gas Welding and Cutting – Setup

Equipment Connection

1. Oxygen cylinders have right turning valves and connections. Fuel cylinders have left turning valves and connections.
2. “Crack” open cylinder valves slightly and then close immediately (except hydrogen gas). This blows out dust and grit that could restrict the gas flow or damage the regulator.
3. Attach the oxygen and fuel gas regulators to their cylinders. Tighten nuts with a proper wrench. Never force poor fitting connections.
4. Install non-return valves and flashback arrestors on the torch and regulator end of the hoses.
5. Connect the green (black) hose to the oxygen regulator and the red hose to the fuel gas regulator.
6. Connect torch green hose to the oxygen inlet and red hose to the fuel gas inlet. Finger tighten hose nuts before using a wrench. The wrench may damage unprotected threads.

Checklist

Do

1. Keep cylinders upright in a cylinder trolley for firm support.
2. Examine hoses before use for signs of damage. Secure connections with clips or crimps. Check connections and on-return valves regularly.
3. Stand to one side of regulator face when opening the cylinder valve outlet. Open cylinder valves slowly.
4. Open cylinder valves only with approved keys or hand wheels. Do not use excessive force to open or close cylinder valve.
5. Select the proper welding head or mixer, tip or cutting nozzle from charts supplied by the manufacturer and screw it firmly into the torch.

6. Use table tops made of fire brick or steel plate. Regular brick may pop or explode from heat. Keep flames and hot metal off concrete.
7. Leave the valve wrench on the fuel gas cylinder whenever the valves are open. This permits emergency shut-off of the gas.

Do Not

1. Do not connect a hose longer than needed. Keep hose from becoming kinked or tangled.
2. Do not use tape to repair a leaky hose.
3. Do not have oil or grease on any welding and cutting equipment. Oil or grease may cause an explosion.

9.3.11 Gas Welding and Cutting – Regular Set Up

General

1. Make sure the regulator inlet threads match the cylinder valve outlet threads. Connect the regulator to the cylinder's outlet valve.
2. Release the pressure-adjusting screw on the regulator by turning counter-clockwise. Open the downstream line to the air to drain the regulator of gas.
3. Open the cylinder valve slightly to let the needle in the cylinder contents gauge move up slowly. On an oxygen cylinder, open the cylinder valve fully, but on an acetylene cylinder turn valve only 1 ½ times.
4. When closing down, shut the cylinder valve and open torch valve before slackening the pressure-adjusting screw.
5. If a regulator shows excessive pressure "creep" replace immediately. "Creeping" of a regulator is shown by a gradual increase in pressure after the torch valves are closed. The check for "creep", close the welding or cutting torch valves while the regulator is open and check for increase in indicated pressure. Refer to manufacturers' operating manuals.

Checklist

Do

1. Stand to one side and away from regulator gauge faces when opening cylinder valves.
2. Leave key wrenches on cylinders in use, so they can be closed quickly.
3. Ensure connections between the regulators and cylinder valves are tight.
4. Check accuracy of regulator pressure gauge at least yearly.

Do Not

1. Do not use pipe wrenches or pliers for attaching regulators to cylinders. Use wrench of proper size.
2. Do not open cylinder valve until the regulator is drained of gas and the pressure-adjusting screw on the regulator is fully released.
3. Do not thaw a frozen regulator with a flame. Use warm water.
4. Do not interchange regulators for a gas with similar equipment intended for use with other gases.
5. Do not use oil or grease as a lubricant for tight threads. Any oil or grease on a regulator or fittings may cause an explosion.
6. Do not release the pressure-adjusting screw when there is pressure in the hose and the hose torch valve is closed. The valve diaphragm will be damaged.

9.3.12 Gas Welding and Cutting – Leaking & Overheating Cylinders

Leaking

1. Check regularly and every time equipment is set up for gas leaks at cylinder valves, regulators and torch connections.
2. Return cylinder to supplier with protection cap in place when empty. Do not ship a leaking cylinder.
3. Close the valve on a cylinder if a leak is found around the valve stem.
4. Stop temporarily a leak through the cylinder valve by attaching a regulator.
5. Take a leaking cylinder out-of-doors well away from any source of ignition, if the leak cannot be stopped. Clearly tag it. Call and follow instructions of supplier.
6. Post a sign on cylinders warning not to approach within 6 m (20 ft.) with a cigarette or other source of ignition.
7. Open the cylinder valve slightly and allow gas to escape slowly.

Acetylene Cylinder Overheating

1. Acetylene cylinders may become hot from severe backfire or accidental heating. To prevent an accident:
 - a) Remove source of heat.
 - b) Shut cylinder valve, detach regulator.
 - c) Clear all other workers away.
 - d) Call supplier.
 - e) Cool cylinder with a large supply of water, from behind a protective barrier.
 - f) If the cylinder valve safety device opens and gas ignites, cool with water. Do not try to extinguish the flames. So gas does not ignite, remove all sources of ignition from the area if this can be done safely.
 - g) Periodically stop cooling.
 - h) Check if water dries off the cylinder or if it remains wet.

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- i) When the cylinder remains wet on removal of the water, remove cylinder to an open space.
 - j) Open valve and continue to cool cylinder with water until cylinder is empty.

Gas Welding and Cutting – Lighting Up

General

1. Use torch as described in manufacturer's instructions. A procedure for one torch is not always safe for another.

Pressure Setting

1. Open the oxygen cylinder valve slowly and fully.
2. Open the fuel gas cylinder valve about $\frac{3}{4}$ of a turn but not more than $1 \frac{1}{2}$ turns.
3. For welding, open the oxygen torch valve, turn the pressure-adjusting screw on oxygen regulator to desired pressure and close torch oxygen valve.
4. Open the fuel torch valve $\frac{1}{4}$ turn. Adjust fuel gas to working pressure. (Refer to manufacturers' recommendations for pressure settings.) Set gas pressures as low as possible.

Purge

1. Purging removes mixed gases in hoses which can cause a flashback when lighting up.
2. Do not purge equipment in confined spaces or in the presence of any ignition source.
3. To purge, in turn open and close each torch valve for 1 second for every 3 m (10 ft.) of hose.
4. Purge hoses before using and after each shut down or more than $\frac{1}{2}$ hour.

Lighting Up

1. Open the torch fuel gas valve and $\frac{1}{4}$ turn. Do not open fuel and oxygen valves at the same time. Make sure that the torch is not pointed at any person, cylinder, or combustible material.
2. Immediately light the gas at the tip/nozzle with a spark lighter or a pilot flame. Do not use matches, hot metal or welding arc.
3. Increase the fuel gas flow until the flame stops smoking.
4. Open the torch oxygen valve and adjust the flames to that required for the process.
5. Check the regulator, set pressures and adjust if necessary.
6. When the flame is adjusted to manufacturers' recommendations but is too large (hot) or small (cold) do the job, change the tip size.

9.3.13 Gas Welding and Cutting – Shut Down

Shutting Off Torch

1. Close torch fuel gas valve then close oxygen valve. This is satisfactory for temporary stops not involving leaving the equipment. (Check manufacturers' recommendations. Some recommend closing oxygen valve first.)
2. In case of backfire or flashback, close torch oxygen valve first. This cuts off the oxygen supply to the internal flame.

Closing Down

1. Shut off torch as described above.
2. Close fuel gas cylinder valve and then close oxygen cylinder valve.
3. Drain fuel gas line by opening torch fuel gas. When both gauge needles have fallen to "0" close the fuel gas torch valve.
4. Drain oxygen line by opening torch oxygen valve. Allow both gauge needles to fall to "0". Close the torch oxygen valve.
5. Back off regulatory pressure-adjusting screw until no spring tension is felt.
6. Regulators and torches can not be disconnected or, if shut down temporarily, hang up the torch and hoses to prevent damage.

Checklist

Do

1. Shut off the gas at the regulators to change torches, do not crimp the hose.
2. Close cylinder valves when work is finished. Put valve protection caps in place and release pressure in regulators and hose lines before cylinders are moved or placed in storage.
3. Mark completed pieces "Hot" with chalk.

Do Not

1. Do not put down a torch until the valves have been completely shut off.
2. Do not hang torches from a regulator or other equipment so that they come in contact with the sides of gas cylinders. If the flame is not out or if a leaking torch ignites, it may heat the cylinder.
3. Do not leave the hoses pressurized. Always turn off the supply from the cylinder, bleed the lines, and with lines open, back off the regulator. Lines should then be coiled without kinks.
4. Do not re-light torches from hot work. If gases do not light instantly, ignition may be violent.

9.3.14 Gas Welding and cutting – Operating Faults

General

1. Minor “explosions” known as backfires and flashbacks may occur during welding and cutting. Common causes are:
 - a) Torch nozzle obstructed or held too close to work.
 - b) Pressures exceed the capacity of the cutting nozzle or welding tip. Gas at the higher pressure flows into the lower pressure line.
 - c) A leak from regulator, hose, or connection causes a drop of pressure in a line. Gas from the higher pressure line back feeds into it.
 - d) Leaking valves allow gas to seep through and mix when the equipment is not in use.
 - e) Lighting up with both torch control valves open, but one cylinder closed.
 - f) The fuel gas may backfeed into the oxygen line regulatory and cylinder when an oxygen cylinder becomes empty. If the regulatory is then placed on a new oxygen cylinder, and the cylinder valve is opened too rapidly, the pressure can increase the temperature of the mixed gas enough to ignite it.

Backfire

1. Return of the flame into the torch with a popping sound. The flame is either extinguished or re-ignited at the nozzle.

What to do:

 - a) Close oxygen torch valve.
 - b) Close fuel gas torch valve.
 - c) Check cylinder pressures.
 - d) Check and adjust regulatory settings.
 - e) Cool torch and clean nozzle or tip.
 - f) Re-light when gas flow is properly set.

Flashbacks

1. Return the flame through the torch into the hoses and the regulators. They are caused by oxygen and fuel gas in the same supply line. Flashbacks will damage equipment. A serious flashback or several minor ones makes equipment unsafe.

What to Do:

- a) Close oxygen torch valve.
- b) Close fuel gas torch valve.
- c) Close fuel and oxygen gas cylinder valves.
- d) Extinguish fire.
- e) Inspect torch, hose, regulators and cylinders. If cylinder is hot, cool.

Non-Return Valve

- 1. A device designated to prevent the back flow of gases. When fitted to the torch end of the hose it reduces the chance of oxygen and fuel gas mixing, but may not stop a flashback reaching the hose, regulator, and cylinder. For this reason, a flashback arrestor is preferred.

Flashback Arrestor

- 1. A device designed to prevent the back flow of gas, and stop the flashback flame front. Prevents the flashback reaching the regulator and cylinder.
- 2. Fit small flashback arrestors between the torch and hose. Install larger units at the regulator outlets. Maintain regularly to ensure satisfactory performance.
- 3. Use of flashback arrestors does not reduce the need to follow safe operating procedures.

9.3.15 Lockout/Tagout

General

1. With modern technology we find more sophisticated equipment and work practices. This increases the possibility of harm or injury in the work place. To minimize harm to people and equipment it is essential that all South Shore Regional School Board employees utilize proper work procedures when working in any type of energy system.
2. This section details the procedures to be followed for securing the locking out of equipment undergoing repairs, maintenance or set up operations where injury could result from unexpected motion, and start up or contact with energized systems.

When to Lockout

1. Any authorized employee who will be performing the work is required to lockout.
2. If more than one employee is working on the same equipment, each employee shall install his or her own lock.
3. All lockout personnel must be trained on how to do lock out.

Lockout Equipment

1. Padlock shall be master #1 or equivalent.
2. Lockout hasps shall be used for this procedure.
3. Lockout tags shall be approximately 3" x 5" and suitable for all environmental applications.
4. All lockout equipment shall be kept in good working order, and be available to all authorized employees.

Lockout/Tagout Test Procedure

1. All personnel affected by the lockout shall be notified.
2. Stored energy must be neutralized by releasing hydraulic or pneumatic pressure; blocking or releasing spring or gravity mechanisms; disconnecting electrical power supplies from their source.
3. All energy sources must be checked to ensure they are de-energized.

Lockout/Tagout

1. All switches and valves shall be locked and tagged with an approved lockout device.
2. The key to each employees lock shall stay with that employee until work is completed.
3. If more than one tradesperson is involved to complete the work, the relief person should place his/her lock on the energy isolating device prior to the removal of original lock and tag.

Return to Service

1. Only the person who installed the lock shall remove it.
2. If emergency start up of equipment is required every effort must be made to locate the employee whose lock is on the equipment. If they cannot be located, and after positive assurance is made that no one is working on the locked out equipment, the Supervisor, may personally remove the lock, but must make every effort to inform the person whose lock he removed.
3. Clear away all tools and materials before removing the lock and tag.
4. Notify all affected employees that the work is completed.

Note: When working on hydraulic systems of a hydraulic elevator, in addition to lockout and tag, the elevator must be “landed” on pipe stands or similar supports to prevent accidental motion resulting from the loss of hydraulic pressure.

Lockouts for Confined Spaces

1. Where work is to be done in confined spaces, such as tanks, bins, or silos, the supply lines must be blanked off wherever possible. Valves must be locked out when depended upon. Agitators, fans, pump, and other rotating equipment must be locked out and tagged, and the employee in the confined space should keep the key.

Summary

1. No job is too small to merit locking and tagging out. Yielding to the temptation to bypass this procedure, could cost a life.

9.3.16. Material Handling

General

1. Heavy loads should be lifted with mechanical lifting devices.
2. Workers will take precautions not to lift loads beyond personal limitations.
3. Use gloves as required when handling hot, abrasive or heavy materials.
4. Always keep clear vision when carrying or moving loads.

Compressed Gases

1. Compressed air should never be used to dust off, clean or in any way to remove particles from workers.
2. Never use oxygen as compressed air.
3. Cylinders shall not be stored near heat sources, direct sunlight, flammable materials, electrical circuits, in areas where they may be struck or near building fresh air intake.
4. Where toxic, flammable or corrosive gases exist, minimize the hazard by ventilating the area.
5. All cylinders must be stored or transported in the upright position with valves closed, protective caps in place and cylinders held by non flammable straps and appropriate signate.
6. When lifting by crane appropriate cage, basket or cradle shall be used.

WHMIS

1. WHMIS stands for Workplace Hazardous Materials Information System. It is a Canada-wide system to provide information about hazardous materials used by employees on the job. There are three essential elements to WHMIS:

Labels

MSDS – Material Safety Data Sheets
Education and Training

2. WHMIS is for every employee's protection. WHMIS describes the danger of materials employees use on the job and tells how to protect yourself from their hazards. Employees must know if material has hazardous labels and safety data sheets.

CLASS

Class A: Compressed Gas (Oxygen)

Class B: Flammable and Combustible Material (Acetylene)

Class C: Oxidizing Material (Chromic Acid)

Class D: Poisonous and Infectious Material

1. Material causing immediate and serious toxic effects (Ammonia)
2. Materials causing other toxic effects (Asbestos)
3. Biohazardous Infectious Material (contaminated Blood Products).

Class E: Corrosive Material (Hydrochloric Acid Sodium Hydroxide)

Class F: Dangerous Reactive Material (Metal Azides)

A. Labels

1. All controlled products must have a label that identified the product by:
 - a) Name
 - b) WHMIS Hazard Symbol
 - c) Risk Factor
 - d) Precautions
 - e) First Aid Instructions
 - f) MSDS Referral
 - g) The Supplier

B. Material Safety Data Sheets

1. Give detailed information of a product and its hazards:
 - a) Product Information
 - b) Hazardous Ingredients
 - c) Physical Data
 - d) First Aid Measures
 - e) Fire and Explosion Data
 - f) Toxicological Properties
 - g) Reactivity Data
 - h) Preventative Measures
 - i) Preparation Date and Group

2. Every employee can and must protect himself/herself by:
 - a) Practicing safe work habits
 - b) Be informed
 - c) Use personal protective equipment
 - d) Known emergency procedures
 - e) Follow first aid practices.

3. WHMIS is for safety in the workplace – if an employee is not sure ASK SUPERVISOR.

9.3.17. Transportation of Dangerous Goods

General

1. This work procedure has been written to make sure that the proper information is provided to people who handle, offer for transport or transport dangerous goods, as well as to people who respond to emergencies involving dangerous goods.
2. Under the Transportation of Dangerous Goods Regulation, anyone who handles, offers for transport or transports dangerous goods must be trained.
3. You must carry your Certificate at all times, and produce it at the request of a dangerous goods inspector.
4. Dangerous goods regulations may be enforced by police officers or weight-scale operators, or by inspectors who are designated by the Federal and Provincial government.
5. Certificate of Training must be renewed every three years and a record must be kept for five years by the trainer.
6. There has to be a 24 hour contact number of the shipper on the Bill of Laden.
7. The quantity of Dangerous Goods that we carry in our vehicles do not require placards or shipping document as our vehicles are classed as service vehicles.

Classes of Dangerous Goods

1. Dangerous Goods are divided into nine (9) classes.

Class 1	Explosives
Class 2	Gases
Class 3	Flammable Liquids
Class 4	Flammable Solids
Class 5	Oxidizing Substances and Organic Peroxides

Class 6	Poisonous and Infectious Substances
Class 7	Radioactive Materials
Class 8	Corrosive Substances
Class 9	Miscellaneous Dangerous Goods

2. It is the responsibility of the shipper to ensure shipping document contains all the required information.
3. It is the responsibility of the carrier to ensure the document accompanies the consignment.
4. The driver shall ensure that one copy of the dangerous goods document is kept in a pocket mounted on the driver's door.
5. No person shall transport dangerous goods that are contained in a cylinder unless the cylinder is securely stored in or on that means of transport.
6. Transportation of large quantities of hazardous goods will be done by an approved carrier (i.e. have the supplier deliver to site).

Gasoline and Other Highly Flammable Liquids

1. Must be carried and stored in approved containers, with properly fitted caps, and must be presented from over turning. Always remove container from vehicle when filling.
2. Provide adequate ventilation.
3. Provide a fire extinguisher in transporting vehicle.
4. Do not use gasoline as a cleaner.

9.3.18. Use of Portable Ladders

Do

1. Check for overhead electrical wires before setting up ladder. Ensure using the right ladder for the right job.
2. Clear area around base and top of ladder of debris, tools and other objects.
3. Tie yourself off with a safety harness when working 3 m (10 ft.) or more off the ground or when working with both hands.
4. Ensure that only one person is on a ladder. Only one person is allowed on each side of a double-sided ladder.
5. Maintain three point contact by keeping two hands and one foot, while climbing up to 3 m (10 ft.).
6. Grab rungs when climbing ladder, not side rails. If your foot slips on ladder, it is easier to hold onto rungs than to side rails.
7. Ensure that all electrical equipment used during ladder work is in good condition and properly grounded.
8. Drape your arms over a rung and rest your head against another rung or side rail if you become dizzy or panicky. Climb down slowly.

Do Not

1. Do not splice together short ladders to make a long ladder. Side rails are not strong enough to support the extra load.
 2. Do not use ladder in passageways, doorways, driveways or other locations where a person or vehicle can hit it. Erect suitable barricades or lock doors shut.
 3. Do not place ladder against flexible or moveable surfaces.
 4. Do not straddle the space between ladder and another object.
 5. Do not erect ladder on boxes, carts, tables or other unstable surfaces.
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6. Ladder must rest on both side rails.
7. Do not allow anyone to stand under ladder.
8. Do not use ladder on ice.
9. Do not overreach from ladder; move as required.
9. Do not use ladder near electrical wires.

Storage and Handling

Do

1. Store ladders where they are not exposed to the weather.
2. Keep ladders clean and free of foreign materials.
3. Ensure that storage areas are easy to access.
4. Return ladders to storage area after use.
5. Avoid long overhangs beyond support points when transporting ladders on vehicles.
6. Tie ladders to each support point to minimize damage. Load other equipment so that ladders are not damaged in transit.
7. Mark ladders which overhang vehicles with a red or orange flag.
8. Grasp ladders near the center when carrying them.
9. Use caution when carrying ladders through passageways, doorways or any place where your view is obstructed.
10. Use a partner to help carry long or heavy ladders.
11. Ensure that you and your partner are on the same side when carrying a ladder. Stay in step. Work out in advance any hand or voice signals to coordinate stopping or changing direction.

Do Not

1. Do not store materials on ladders.
2. Do not expose fiberglass ladders to excessive temperatures (above 93 degrees C/ 200 degrees F).
3. Do not hold the front of ladders at head level when carrying.

Securing Portable Ladders

1. Rest top of ladder against a solid surface that can withstand the load.
2. Attach a ladder stay across the back of ladder where a surface cannot stand the load. Extend the stay across a window for firm support against the building walls or window frame.
3. Guard or fence off area around ladder when it is not possible to tie it at the top or at the foot.
4. Station a person at the foot of ladder when it is not possible to tie it at the top or at the foot.
5. Ensure that the person at the foot of the ladder faces the ladder with a hand on each side rail and one foot resting on the bottom rung.
6. Attach hooks on top of ladder rails where ladder is to be used at a constant height.
7. Do not rest ladder on any rung. Only the side rails are designed for this purpose.

Extension Set-Up

1. When setting up an extension ladder, use the following method to avoid straining muscles or losing control of ladder. With ladders more than 24 ft. in length or where conditions complicate the task, have two persons set up ladder, step by step as follows:
 - a) Lay ladder on the ground close to intended location.
 - b) Brace the ladder base using helper's feet.
 - c) Grasp the top rung with both hands, raise the top end over your head and walk towards the base of ladder. Grasp the center of the rungs to maintain stability.

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- d) Move the erect ladder to the desired location. Lean it forward against the resting point.
2. One person can erect shot ladder step by step as follows:
 - a) Place the bottom of ladder firmly against the base of a building or stationary object.
 - b) Lift the top of the ladder, and pull upwards to raise ladder to a vertical position.
 - c) Transfer ladder to its required position when it is erect.
 - d) Keep ladder upright and close to the body with a firm grip.
 3. The method for lowering any ladder is the reverse procedure of erecting it.
 4. Leave all tie-off devices in place until they must be removed.
 5. Do not raise or lower ladder when extended.

9.3.19 Welding – Ventilation

General

1. Fumes and gases are released from welding rods and torches and coating on the metal. They rise in a cloud or plume from the welding site.
2. Fumes and gases are toxic and can be harmful. Check regulations and standards for recommended personal protection. Mechanical ventilation is necessary unless the work being done is in the open air.
3. Take advantage of any general ventilation such as open windows so that the fumes are blown away from your face. Keep your head out of the welding plume.
4. Local exhaust ventilation is better than general ventilation. It captures the fumes and gases at the source.
5. Locate exhaust openings as close as possible to the welding site.
6. Discharge exhaust air where it cannot contaminate fresh air being drawn into the workroom.

9.3.20. Welding – Protective Clothing

General

1. Wear 100% wool or flame-retardant cotton clothing. Wear long-sleeved shirts with buttoned cuff and a collar to protect the neck. Dark colours prevent light reflection. Remove shirt pockets or have flaps with buttons, e.g. wear coveralls.
2. Pant legs without cuffs should cover the tops of the boots. Cuffs can collect sparks.
3. Repair all frayed edges, tears or holes in clothing.
4. Wear high top boots to prevent sparks from going into the boots. The top of the toe of the boot should be smooth so that sparks will not get caught in the seams.
5. Boot protectors or spats can be strapped around the pant legs and boot tops to prevent sparks from bounding in the top of the boots.
6. Remove matches and lighters from pockets. The hot welding sparks may light the matches or burn a hole through a plastic lighter, causing a serious burn.
7. Leather is a good insulator. Wear gauntlet-type cuff leather gloves or protective sleeves of similar material, which protect wrists and forearms. Arrange seams inside to prevent burning of stitches and trapping of hot metal particles. Unseamed gloves with reinforcement between thumb and forefinger are preferred.
8. Wear leather aprons to protect your chest and lap when standing or sitting. Leather jackets with full sleeves, back and high neck are good for out-of-position Work.
9. Wear a flame-resistant skull cap under your helmet to prevent head burns.
9. Keep clothing free of oil or grease to avoid fire or slipping. Keep dry to reduce electrical risk.

9.3.21 Welding – Eye and Face Protection

General

1. The arc welding lens assembly consists of 3 parts. The outside lens is clear plastic or tempered glass. It protects the shade lens from damage. The center lens is a shade lens which filters out the harmful light. The inner lens is clear and must be plastic.
2. Use gasket provided with helmets or goggles.
3. Wear arc welding helmets for all arc welding or cutting operations.
4. Do not use gas welding goggles for arc welding.
5. Wear safety glasses with side shields at all times in a welding shop, even under welding helmets.
6. Replace pitted or cracked lenses.
7. Protect eyes from flying pieces of slag when chipping the weld.
8. Do not substitute modified glasses, sunglasses, smoked plastic or other materials for proper welding lenses.
9. Replace loose or damaged helmets. Invisible and dangerous light rays (ultraviolet) can get in undetected.
9. Contact lens users should prevent dust and particles from getting in their eyes. Foreign particles can collect behind the lens and cause severe discomfort and possibly eye damage.

Screens

1. Prevent the welding arc from affecting other workers by screening/protective covering electric welding operations.
2. Ensure all screens are constructed of sturdy opaque or translucent materials. Permit at least 50 cm (20 inc) bottom clearance for ventilation. Post warning Notices to alert other workers.