


CENTRAL WELDING SUPPLY
PACIFIC OXYGEN



Oxygen & Acetylene Safety Training

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
PACIFIC OXYGEN

Oxygen & Acetylene Safety


Topics we'll cover...

- Oxygen: General Properties and Hazards
- Acetylene: General Properties and Hazards
- Gas Properties, Storage, and Hazards
 - Oxygen
 - Acetylene
- Handling, storage, and equipment safety features
- Safety considerations and precautions
- What to do in the event of an emergency

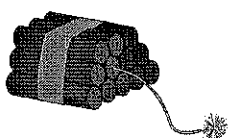
TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
PACIFIC OXYGEN

Oxygen & Acetylene Safety



Every time you use oxygen-acetylene equipment, if certain safety guidelines are not followed, it is the same as handling live explosives ready to go off.



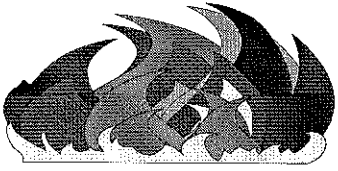
TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
PACIFIC *Welding & Fabrication*

Oxygen & Acetylene Safety

When the gases mix...

Oxygen and acetylene gases mixed at the correct proportions and ignited produce **one of the hottest flames known!**
Up to 6,330 F



TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [06/2013]

CENTRAL WELDING SUPPLY
PACIFIC *Welding & Fabrication*

Oxygen & Acetylene Safety

Remember, oxygen is not air!

- There is approximately 21% oxygen in normal air.
- Oxygen is found naturally in the atmosphere.
- It is produced industrially by distilling air below its freezing point.
- Pure oxygen does not burn or explode.
- Oxygen is an "accelerant" - it causes every thing it comes in contact with to burn hotter and faster.
- Oxygen is heavier than air - this means if an oxygen bottle is leaking it will settle in low areas before diffusing back into the atmosphere.
- **30% oxygen in the atmosphere will cause things to burn or explode 8 times faster!**

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [06/2013]

CENTRAL WELDING SUPPLY
PACIFIC *Welding & Fabrication*

O2 precautions

Never use oxygen...

- **In pneumatic tools** - the oil and the gas pressure friction can cause a fire or explosion
- **in oil pre-heating burners** - these burners are set to burn with 21% oxygen to air ratio
- **to start internal combustion engines** - gasoline is flammable enough with 21% oxygen available
- **to blow out pipelines** - leftover flammable or combustible vapors may still be present to cause an explosion
- **to dust off clothing or work area** - the oxygen will remain present in the cloth fibers causing them to be more flammable
- **to create pressure**
- **for ventilation**

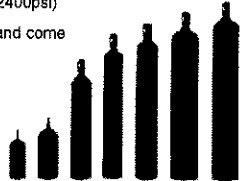
TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [06/2013]

CENTRAL WELDING SUPPLY
PACIFIC X *ASAC* Occupational Safety

Oxygen & Acetylene Safety

Oxygen Storage

- Stored in the pure state as a gas.
- Stored in compressed gas cylinders of various pressures (such as 1800psi, 2015psi, 2265psi, 2400psi)
- Cylinders are hollow in construction and come in varying sizes from 21cf to 337cf
- The orifice at the top of the bottle is the diameter of the lead in a pencil (if the bottle top is damaged, the bottle can become a projectile causing injury or property damage).



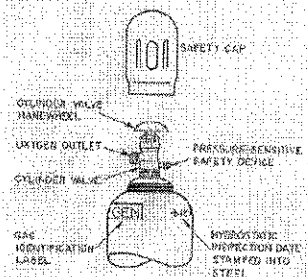
TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [06/2012]

CENTRAL WELDING SUPPLY
PACIFIC X *ASAC* Occupational Safety

Oxygen & Acetylene Safety

Oxygen Storage

- Equipped with a high pressure valve made of Bronze.
- Valve should be completely closed during storage.
- Valve has a safety device to drain oxygen slowly in the event of high temperatures.



TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [06/2012]

CENTRAL WELDING SUPPLY
PACIFIC X *ASAC* Occupational Safety

What is Acetylene?

- Acetylene is a compound of Hydrogen and Carbon (C₂H₂)
- Produced when calcium carbide is mixed with water
- Needs only 10% mix of oxygen to ignite
- An unstable gas; will violently decompose when in a pure state above 15 psi
- Auto-ignition temperature is 763° - 824° F. (Means if acetylene reaches 30 psi in a free state, it can explode by itself *without a spark or flame being present*)
- Has burning temperature of 4,600° F; 6,330° F when burned with oxygen.
- Remember... **acetylene is a very dangerous gas!**

$$\begin{array}{c} \text{H} \cdot \quad \cdot \text{C} \cdot \cdot \text{C} \cdot \quad \cdot \text{H} \\ | \quad \quad \quad | \\ \text{H} \quad \quad \quad \text{H} \end{array}$$

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [06/2012]

CENTRAL WELDING SUPPLY
TACIFIC *ACetylene*

Acetylene Storage

- Free acetylene is never stored under high pressure
- Cylinders are packed with a porous material and saturated with acetone
 - Acetone can absorb many times its volume in acetylene without changing the acetylene
 - Porous filler (8-10%), Acetone (42%), Acetylene gas (36%), Reserve volume-70° F (10-12%)
 - Crushed fire brick usually serves as the "porous material"

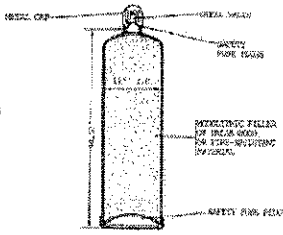


FIGURE 8-6. Acetylene cylinder construction.


TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (09/2013)

CENTRAL WELDING SUPPLY
TACIFIC *ACetylene*

Acetylene Storage

- Cylinders must be stored upright
 - Prevents acetone and acetylene from separating
 - Prevents the acetone from being lost

Allow to sit for at least 2 hours before using if transported in a horizontal position!
- Cylinders of steel construction in various sizes
- NEVER open valve more than one-half turn
- NEVER store below freezing (acetone may come out and clog the regulator)
- Acetylene cylinders must be refilled only by authorized gas distributors – and, *must NEVER be transfilled* (transferred from one bottle to another)

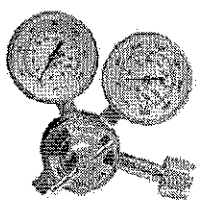


TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (09/2013)

CENTRAL WELDING SUPPLY
TACIFIC *ACetylene*

Handling & Using Regulators

- Use extreme care when removing regulators from cylinders
- Do not allow to remain on a bench top for any length of time
- Never use oil or grease
- Do not attempt to interchange oxygen and acetylene regulators
- Check adjusting screw before opening cylinder valve



TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (09/2013)

CENTRAL WELDING SUPPLY
PACIFIC Xcelite Corporation

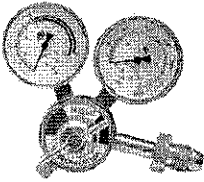
Handling & Using Regulators

- Crack cylinder valves before attaching the regulators.
- Have a qualified repair person

REPAIR IMMEDIATELY:

- If a regulator creeps
- If the gauge doesn't return to zero when pressure is released
- is not functioning properly

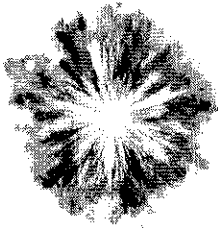
- Keep tight connections between the regulator and the cylinder.



TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
PACIFIC Xcelite Corporation

Oxygen & Acetylene Safety



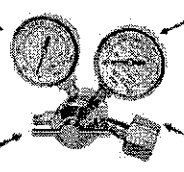
WARNING:

Never stand in front of, or behind, a regulator when opening the cylinder valve!

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
PACIFIC Xcelite Corporation

Handling & Using Regulators



Low Pressure Gauge
Indicates the delivery pressure to the hoses & torch

High Pressure Gauge
Indicates the pressure from the tank

Pressure Adjusting Screw
Clockwise to Open
Counterclockwise to Close.

Inlet Connections
Oxygen are right-hand thread;
Acetylene are left-hand thread

The internal working parts of the regulator are precision units. Only qualified technicians should clean or repair a regulator!

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
PACIFIC X *Great Companies*

Backfires And Flashbacks


- Backfires
 - occur when the torch flame burns back into the torch tip and is extinguished with a loud pop
 - due to insufficient gas pressure, or torch tip touching the work
 - generally harmless, but can turn into Flashbacks
- Flashbacks
 - When this happens, the popping sound turns to a whistle as the gases burn back through the tip and torch head. If not stopped, the fire can travel through and damage the torch, hoses and **explode the cylinder!**

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [09/2013]

CENTRAL WELDING SUPPLY
PACIFIC X *Great Companies*

Backfires And Flashbacks

- Flashbacks, cont'd...



If you calculate the volume of 100 feet of hose with an inside diameter of 1/4 inch, should oxygen enter the fuel gas hose or should fuel gas enter the oxygen hose, a **mixed gas explosion with the force potential of 20 sticks of dynamite could occur!**

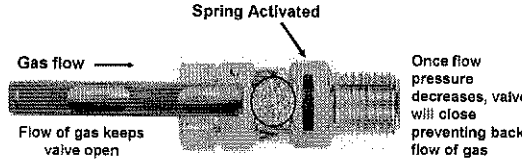
Check Valves and Flashback Arrestors help prevent this.

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [09/2013]

CENTRAL WELDING SUPPLY
PACIFIC X *Great Companies*

Check Valves

- The purpose of an internal check valve is to reduce the possibility of reverse flow gas.
- It is not intended to act as a fire stop!
- Ensure that the internal check valves are working properly by testing at least every six months, more often if the hoses are frequently removed from the torch.



Flow of gas keeps valve open

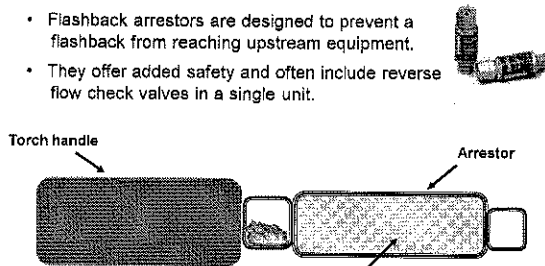
Once flow pressure decreases, valve will close preventing back flow of gas

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
PACIFIC Xpress Connections

Flashback Arrestors

- Flashback arrestors are designed to prevent a flashback from reaching upstream equipment.
- They offer added safety and often include reverse flow check valves in a single unit.



Torch handle

Arrestor

Flame is extinguished by meshed material inside


TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (09/2013)

CENTRAL WELDING SUPPLY
PACIFIC Xpress Connections

Backfires And Flashbacks

Keep Flashbacks and Backfires to a Minimum!

- Avoid leaks and loose connections.
- Keep tips clean.
- Maintain proper gas pressures, never starve a tip.
- Avoid overheating the metal and tip.
- Do not dip luminous cone in the molten pool.
- Watch for and repair or replace damaged equipment.



If a flashback occurs, immediately turn off the oxygen, then the acetylene and allow the torch unit to cool. Check for damage and make repairs as needed!

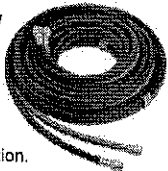
TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (09/2013)

CENTRAL WELDING SUPPLY
PACIFIC Xpress Connections

The Hoses

Use the right hose for the right gas!

- Hoses are usually color coded:
 - Oxygen (green)
 - Acetylene (red)
- Hoses are neoprene over braided inner section.
- Hoses may be cut easily. Be careful around sharp objects!
- They are constructed of flame retardant materials, but will burn if there is a flashback or exposed to sustained heat.
- Hoses are graded.




TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (09/2013)

CENTRAL WELDING SUPPLY
PACIFIC X *Linear Cylinders*

The Hoses

General Safety...


- Keep hoses clear of any falling metal, slag or sparks.
- Never allow hoses to become coated with oil, grease or dirt, which could conceal damage.
- Examine the hoses before attaching to torch handle or regulators.
- If cuts, burns or damaged fittings are found, replace the hose.
- Completely replace hose if it contains multiple splices or when cracks or severe wear is noticed.



TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [06/2013]

CENTRAL WELDING SUPPLY
PACIFIC X *Linear Cylinders*

Cutting Tips and Nozzles




- Make sure equipment is rated for tip size selected
- A tip with too much capacity for the equipment can starve or choke the tip to cause overheating of the head and a flashback.
- A damaged seating surface on the tip or head can result in a fire or flashback that may damage the cutting attachment.
- If the seating surface of a tip becomes damaged, DO NOT use it. Discard the damaged tip.
- If the head requires repair, take the torch to a qualified repair technician.

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
PACIFIC X *Linear Cylinders*

Cutting Tips and Nozzles



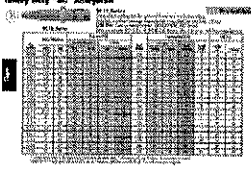
- Never starve or choke a multi-flame heating nozzle, which can cause overheating of the head that results in a flashback.
- Should a flashback occur (flame disappears and/or a hissing sound is heard, the flame is burning inside the nozzle), immediately turn off the oxygen valve on the torch handle. Then, turn off the fuel valve.
- Allow the nozzle to cool before using.
- If a flashback reoccurs have the apparatus checked by a qualified technician before using again.

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [06/2013]

CENTRAL WELDING SUPPLY
PACIFIC Division

Cutting Tips and Nozzles

- Tip sizes and regulator settings are dependent on the thickness of the material to be worked and the type of torch being used.




- Always refer to the manufacturer's supplied cutting chart for the tips you are using!
- Remember, if you do not use the proper oxygen to acetylene ratio you may cause an accident. At the very least you will waste gas, which costs \$\$\$.

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (08/2013)

CENTRAL WELDING SUPPLY
PACIFIC Division


Safety Precautions

PERSONAL PROTECTION & PPE



- Eye Protection
- Hand Protection
- Clothing/Equipment Free of Grease & Oil
- Clean and well-ventilated work area
- Fire Extinguisher

Always remember proper task training!



TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (08/2013)

CENTRAL WELDING SUPPLY
PACIFIC Division

General Safety Tips


- Work under the supervision of trained and qualified personnel when appropriate.
- Always use proper PPE (shield, goggles, gloves, clothing, etc.)
- Always work in a well ventilated area.
- Keep regulators free of oil, grease and other flammable substances.
- Use the proper regulator for each specific gas.
- Never mix equipment brands.
- Always keep cylinders in an upright position.

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (08/2013)

CENTRAL WELDING SUPPLY
PACIFIC X Division

General Safety Tips

- Oxygen cylinder valves must be opened all the way.
- Do not open acetylene cylinder valves more than 1/2 turn.
- Turn pressures into gauges gradually.
- Always use an approved friction striker, never use matches or a cigarette lighter.
- Check pressures carefully:
 - Welding: 5 psi Acetylene/5 psi Oxygen
 - Cutting: 5 psi Acetylene/20 psi Oxygen





TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
PACIFIC X Division

General Safety Tips

- Ensure that hoses are not damaged
- Keep cylinders away from fire.
- Extinguish the torch flame by closing the OXYGEN valve first and then the ACETYLENE (fuel).
- Do not relight flames on hot metal in a small confined space.
- Purge the lines before and after usage.
- Be ready to put out any fire promptly.
- Watch where hoses are when cutting.



TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
PACIFIC X Division

REVIEW: See a problem?

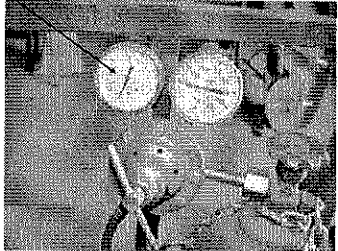


TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
PACIFIC Xcel Energy

REVIEW: See a problem?

Line Pressure Gauge Failure!




TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (08/2013)

CENTRAL WELDING SUPPLY
PACIFIC Xcel Energy

REVIEW: See a problem?

What Should Be Done?

Electrical arc damage



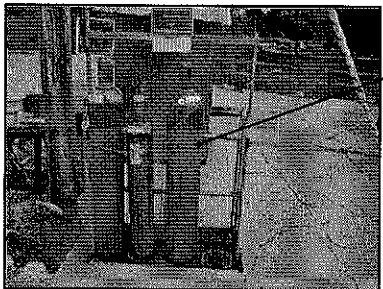
Cylinder is damaged and should be taken out of service immediately!
An electric arc can cause an oxygen bottle to explode (the carbon in the steel will atomize into a fuel).

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (08/2013)

CENTRAL WELDING SUPPLY
PACIFIC Xcel Energy

REVIEW: See a problem?

Unsecured Cylinder

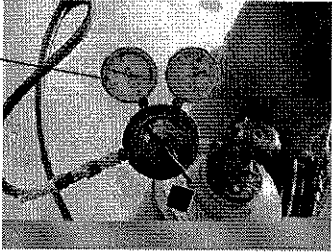


TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM (08/2013)

CENTRAL WELDING SUPPLY
PACIFIC Xpress Connections

REVIEW: See a problem?

Change Out The Tank

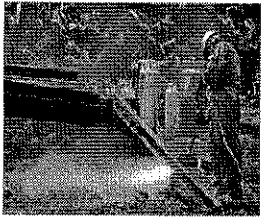


Never allow a tank to go completely empty, this may allow the gases to mix by traveling into the other lines or bottle!

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [06/2013]

CENTRAL WELDING SUPPLY
PACIFIC Xpress Connections

Personal Safety Tips




- Wear flame resistant clothing, protective gloves, sleeves, aprons and safety shoes to protect skin and clothing from sparks and slag.
- Keep collars, sleeves and pockets buttoned.
- **DO NOT** roll up sleeves or cuff pants.

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [06/2013]

CENTRAL WELDING SUPPLY
PACIFIC Xpress Connections

Personal Safety Tips

- Gas flames produce infrared radiation which may have a harmful effect on the skin and especially on the eyes.
- Select goggles or a mask with tempered **lenses shaded 5 or darker** to protect your eyes from injury and provide good visibility of the work.




TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [06/2013]

CENTRAL WELDING SUPPLY
TRACIFIC Xcel Energy

Personal Safety Tips

- Ventilate welding and cutting work areas adequately.
- Maintain sufficient air flow to prevent accumulation of explosive or toxic concentrations of gases.
- Welding or cutting operations using certain combinations of metals, coatings, and gases generate toxic fumes. Use respiratory protection equipment in these circumstances.

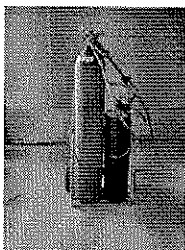


TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
TRACIFIC Xcel Energy

Oxygen & Acetylene Safety

- Good housekeeping practices improve the safety of any work area. They are essential to the safety of welding and cutting operations due to the potential hazards involved.
- Keep all welding and cutting apparatus clean and free of grease, oil, and other flammable substances.



TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]

CENTRAL WELDING SUPPLY
TRACIFIC Xcel Energy

SAFETY RESOURCES



www.centralwelding.com

CALL TO REQUEST OUR SAFETY CATALOG!

Our Safety Specialist can be helpful in assessing the hazards in your workplace and recommend compliant solutions.

Call to schedule a walk-through or to learn more about the products and services available through our Occupational Safety Division.

SAFETY SPECIALIST CONTACT:
 (206) 423-1161

Or, call ANY of our 18 Locations!
www.centralwelding.com

TRAINING SOURCE: CENTRAL WELDING SUPPLY, OCCUPATIONAL SAFETY DIVISION, WWW.CENTRALWELDING.COM [08/2013]
