Oxylance

OXYLANCE THERMIC TORCHES
(Burning Bars)

READ ALL SAFETY INFORMATION BEFORE USING

ALL CUTTING OPERATIONS SHOULD BE PERFORMED IN ACCORDANCE WITH O.S.H.A. 29 CFR, STANDARDS 1910.251, 1910.252, AND 1910. 253 AND ANSI Z49.1:1999 . SEE PAGE 2 FOR ANSI Z49 SAFETY CLOTHING REQUIREMENTS. Observe all company safety policies and the safety policies of the company where cutting is being performed, and all local regulations. **(READ PAGE 5 OF THIS DOCUMENT FOR AN UNDERSTANDING OF FIRE POTENTIAL IN OXYGEN SYSTEMS)**

SAFETY: READ ALL SAFETY INFORMATION BEFORE USING THERMIC TORCHES (BURNING BARS)

1. **DO NOT OPERATE THERMIC TORCHES WITHOUT PROPER FIRE RESISTANT CLOTHING. SEE PAGE 2.**
2. **USE ONLY PURE OXYGEN WITH THESE TORCHES. NO FUEL GAS IS REQUIRED OR SHOULD BE USED.**
3. Inspect all thermic torches (burning bars), holders, and oxygen hose for contamination from oil, grease, or other substances that can initiate a fire in an oxygen system. **DO NOT USE CONTAMINATED EQUIPMENT.** (see page 5)
4. Check all parts of oxygen system for leaks. **DO NOT USE CUTTING SYSTEM IF LEAKS ARE PRESENT.**
5. Remove all combustible materials from work area or move work to an area free of combustibles. If project cannot be moved or the fire hazard cannot be removed, use a guard or shield to confine heat, sparks, and hot slag from causing a fire. Provide a fire watch and insure that adequate fire extinguishers are available.
6. Insure that material to be cut contains no flammable or explosive material.
7. Insure that material to be cut contains no substances that will create harmful fumes and/or explosive vapors.
8. Provide fresh air breathing equipment and ventilation where dangerous smoke and fumes may be created.
9. **NEVER USE OXYGEN AS A FRESH AIR BREATHING SUPPLY** – USE ONLY APPROVED COMPRESSED AIR

IF USING LIQUID OXYGEN, DO NOT USE A SINGLE PORTABLE LIQUID CONTAINER FOR GAS SUPPLY. READ THE ENCLOSED SAFETY PROCEDURES FOR USING LIQUID OXYGEN. REFER TO FLOW CHARTS FOR PRESSURE AND VOLUME REQUIREMENTS. (READ OXYGEN SAFETY PAGE 5 FOR INFORMATION CONCERNING FIRE IN OXYGEN SYSTEMS.)

STORAGE AND HANDLING:

WARNING: EXPLOSIONS OR FIRE CAN OCCUR WHEN OXYGEN CONTACTS SOME SUBSTANCES.

Oxylance products are cleaned for Oxygen Service. You **MUST** handle and store Oxylance cutting torches and equipment so they are protected from **contamination from oil, grease, or any substance that may initiate a fire in an oxygen system. NEVER** use any torches, holders, or Oxygen hose that have been contaminated. **(SEE PAGE 5 OXYGEN)**

EQUIPMENT REQUIRED

1. **FIRE RESISTANT PROTECTIVE CLOTHING, APPROVED FOR FLAME CUTTING OPERATIONS, (SEE PAGE 2).**
2. **Eye protection should be a full-face shield and safety goggles (See Page 2 for ANSI Z49 requirements)**
3. Oxylance Thermic Torches and Oxylance Torch Holder
4. High Flow Oxygen Regulator. For more than one burning bar on an oxygen system use a manifold type regulator.
5. Oxygen system capable of supplying required **VOLUME** and **PRESSURE** for the size torches being used. See flow chart on page 6 for oxygen consumption and pressure settings for all sizes of burning bars.
6. Oxygen lance hose. Hose I.D. is dependant on length of hose and size torch being used. The minimum recommended hose diameter is 1/2" I.D. Hoses longer than 300' should be larger I.D. to prevent flow restriction.
7. Oxy / Acetylene torch for igniting Oxylance Thermic Torches

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EQUIPMENT SETUP

1. Place Oxygen Cylinders in a location protected from heat, sparks, and hot slag. Insure that cylinders are secured so they cannot be turned over or damaged by other equipment operating in the area.
2. Route oxygen hose to protect from heat, sparks, and hot slag from the burning operation. Insure oxygen hose does not create a trip hazard. Insure oxygen hose is protected from damage by other equipment operating in the area. Use an oxygen hose long enough to keep the torch a safe distance from oxygen cylinders.
3. Hook oxygen hose to regulator. Close oxygen valve on holder, turn on oxygen system and check entire system for leaks. **DO NOT OPERATE IF THERE ARE ANY OXYGEN LEAKS.**

WARNING: DO NOT PERFORM CUTTING OPERATIONS WITHOUT FIRST READING ALL SAFETY MATERIAL ENCLOSED AND REVIEWING OSHA AND ANSI REQUIREMENTS

The following information on Safety Clothing and Safety in Welding, Cutting and Allied Processes is based on ANSI Z49.1:1999 and OSHA Standard 29 CFR. Portions of this information is reprinted with permission from ANSI / AWS. The complete ANSI Z49 standard is available from Global Engineering at (800) 854-7179, or the American Welding Society, 550 N.W. LeJeune Road, Miami, Florida 33126. For complete copies of OSHA 29 CFR 1910.251, 1910.252, and 1910.253 and all OSHA safety requirements can be downloaded from the World Wide Web at www.osha-slc.gov.

EYE PROTECTION (ANSI Z49.1:1999 Page 6 PARAGRAPH 4.2.1.2)

OXY-FUEL GAS CUTTING: Goggles or other approved eye protection shall be worn during all oxy-fuel gas cutting operations.

OXYLANCE RECOMMENDATION: Due to the amount of spatter and slag from exothermic cutting, Oxylance **REQUIRES** either a tinted full-face shield and clear goggles or a clear full-face shield with tinted goggles. The shade of the tint should be 3 or 4 for thin material (under 1"), 4 or 5 for 1" to 6" material, and 5 or 6 for material over 6" thick.

PROTECTIVE CLOTHING (Based on ANSI Z49.1:1999 PAGE 9 PARAGRAPH 4.3 TO PAGE 10 PARAGRAPH 4.6)

TO REDUCE THE POTENTIAL OF PERSONNAL INJURY, ALL UNDER GARMETS SUCH AS WORK SHIRTS AND PANTS SHOULD BE COVERED BY FLAME RESISTANT GARMETS AND SHOULD BE FREE OF GREASE AND OIL.

1. Clothing shall be selected to minimize the potential for ignition, burning, or trapping hot sparks or slag.
2. Clothing shall provide sufficient coverage, and be made of suitable material to minimize skin burns caused by sparks, spatter or radiation. **Oxylance recommends Aluminized clothing designed for repelling sparks or slag and reflecting the heat away from the operator.**
3. **Gloves:** All torch operators shall wear protective flame-resistant gloves. **Oxylance recommends Aluminized Kevlar gloves for the best possible protection.** DO NOT USE CLOTH OR THIN LEATHER GLOVES SUCH AS TIG WELDING OR GARDENING TYPE GLOVES. (DO NOT USE OILY OR GREASY GLOVES).
4. **Jackets:** Durable **flame-resistant** jackets shall be worn to protect the front of the body. **Oxylance recommends an Aluminized Kevlar Jacket for the best protection from sparks or slag and for its ability to reflect heat away from the operator.**
5. **Leggings:** Flame-resistant leggings or other equivalent means shall be used to give added protection to the legs. **Oxylance recommends Aluminized Kevlar Leggings for the best protection from sparks or slag and for reflecting heat away from the operator.**
6. **Capes and Sleeves:** Cape sleeves or shoulder covers with bibs made of leather or other flame-resistant material shall be worn during cutting operations. **Oxylance recommends an Aluminized Kevlar Jacket for its ability to deflect sparks or slag and to reflect heat away from the operator.**
7. **Other Protective Clothing:** Properly fitted flame-resistant plugs in the ear canals, or equivalent protection, shall be used where hazards to the ear canals exist. Caps made from flame resistant material shall be worn under helmets, when necessary, to prevent head burns.
8. **Noise Control:** Noise shall be controlled at the source when feasible. When control methods fail to bring noise exposure within allowable limits, personal protective devices such as earmuffs or earplugs shall be used.

Respiratory Protective Equipment: When controls such as ventilation fail to reduce contaminants to allowable levels or when, implementation of such controls are not feasible, respiratory protective equipment shall be used to protect personnel from hazardous concentrations of airborne contaminants.

1. Only approved respiratory protective equipment shall be used.
2. Whenever the use of respirators is required, a program to establish the proper selection and use of respirators shall be implemented.
3. Compressed air for air supplied respirators or other breathing equipment shall at least meet the Grade D requirements of the Compressed Gas Association ANSI / CGA G-7.1, Commodity Specification for Air. **DO NOT USE OXYGEN FOR BREATHING AIR IN CUTTING AND WELDING APPLICATIONS.**

Training: Persons exposed to cutting hazards shall be trained in the use of, and understand the reasons for, protective clothing and equipment.

ACCORDING TO TESTING BY OUTSIDE AGENCIES THE SMOKE AND FUMES FROM OXYLANCE THERMIC TORCHES ARE WITHIN ALLOWABLE EXPOSURE LIMITS, HOWEVER; THE MATERIAL THAT IS BEING CUT WITH THE THERMIC TORCHES MAY CONTAIN, OR BE COVERED WITH, SUBSTANCES THAT PRODUCE HAZADORUS SMOKE AND FUMES. **OPERATORS MUST WEAR RESPIRATORY PROTECTION THAT IS SUITABLE FOR THE MATERIAL BEING CUT.**

FOR A COPY OF THE OXYLANCE MSDS SHEET CALL TOLL FREE (800) 333-9906 OR (205) 322-9906. MSDS SHEETS CAN BE DOWNLOADED FROM OUR WEB PAGE AT, www.oxylance.com

OPERATING INSTRUCTIONS

1. Purge hose and holder prior to putting torch in holder. With holder pointed in a safe direction, slowly crack open oxygen valve and purge hose and holder. Insure full flow with no restrictions.
2. Oxylance manufactures thermic torches with three different end finishes. Plain End, no modifications to either end of the outer tube. Expanded End or Quick Connect (QC) has one end of outer tube expanded to allow joining torches together. Threaded and Coupled (T&C) pipe threads on both ends and a pipe collar to join torches together.
3. Oxylance torches have a pressed crimp 8 inches from holder end. **CRIMPED** end of the torch goes in the holder. **DO NOT OPERATE WITH WRONG END OF TORCH IN HOLDER.**
4. Oxylance torch holders utilize a rubber insert (grommet) to seal the torch in the holder. Insert the **CRIMPED** end of torch in the holder. **TORCH (BURNING BAR) MUST BE INSERTED THROUGH THE RUBBER INSERT AND FULLY SEAT IN APPROPRIATE MACHINED NOTCH IN BASE OF HOLDER (SEE ENCLOSED DRAWING pg 6).**
5. Adjust the tension on the rubber grommet to insure it is fully compressed and torch is secured in holder.
6. Slowly open oxygen valve to purge torch and check for Oxygen leaks **(DO NOT LIGHT TORCH WITH OXYGEN LEAKS).** Insure oxygen flows freely through torch. **(DO NOT ATTEMPT TO LIGHT TORCH WITH RESTRICTED OR NO OXYGEN FLOW.)** Close oxygen control valve completely before applying heat to end of torch.

IGNITING TORCH

Igniting thermic torches requires two people, one to operate the thermic torch and the second to heat the end of torch.

Thermic Torch Operator

1. Secure thermic torch properly in holder
2. Point torch in safe direction
3. Purge torch and turn oxygen valve off

Oxy Acetylene Torch Operator / Safety Fire Watch

1. Position operator between end of thermic torch and thermic torch operator (do not get in front of thermic torch)
2. Heat the end of the thermic torch filler material until it is red and dripping molten metal. (With QC rods the fuel wires stop just behind the shoulder of the expansion joint. Cut the expansion off and heat the fuel wires)
3. When tip of torch is properly heated slowly open oxygen valve. Torch will ignite and burn until oxygen is turned off, or torch is consumed to the crimp. **DO NOT BURN PAST CRIMP**
4. While thermic torch operator is working the oxy-acetylene torch operator should standby as a safety / fire watch.

IF TORCH DOES NOT IGNITE

1. Check Oxygen flow to end of torch. Insure that end of torch is open.
2. Check Oxygen system for proper pressure and volume.
3. Correct problem and repeat ignition process, making sure the end of the torch and fuel wires are properly heated.

Cutting can begin as soon as Thermic Torch is fully ignited. Torch can be extinguished at any time during cutting operation and can be re-ignited. Check oxygen flow prior to applying heat to the tip of partially burned torch.

OXYGEN PRESSURE

Starting oxygen pressure should be 90 to 100 psi. Pre set the regulator and ignite the torch. Adjust pressure with torch burning and oxygen control valve full open. If adequate volume of oxygen is not available, pressure will drop and torch will not burn properly. **DO NOT OPERATE TORCH WITH LOW OXYGEN PRESSURE OR VOLUME (see pg 6).** Proper oxygen pressure can be verified by extinguishing the torch and inspecting burnt end. If pressure is correct the outer tube should be slightly longer than the fuel wires. **(MAXIMUM PRESSURE 150 PSI)**

Pressure too Low: Fuel wires will burn back inside the outer tube 2 or more inches
Pressure too High: Outer tube will burn back leaving exposed fuel wires.

CUTTING WITH OXYLANCE THERMIC TORCHES

Oxylance Thermic Torches will rapidly cut most ferrous and non-ferrous metals, as well as concrete and refractory. The cutting speed will depend on the material type and its oxidation rate, or its melting temperature. Materials that do not oxidize have to be melted and blown away. Melting and blowing material away will require an increase in oxygen pressure.

PIERCING

To pierce thick material, start the torch at a slight angle and allow the material to begin to melt. Gradually point the torch straight into the base material and work the torch in and out of the hole. Piercing thick material may cause the outer tube to burn back exposing fuel wires. When piercing, the torch may need to be removed from the hole occasionally to allow the fuel wires to burn off even with the end of the Torch. Oxygen pressure may need to be increased for piercing thick material. Do not exceed the maximum recommended pressure of 150 psi.

CUTTING TECHNIQUES

For most applications using the push method of cutting with the tip of the torch pointed towards the cut will produce the fastest travel speed. Cutting techniques will vary according to the material, thickness, position and direction of cut i.e. flat, vertical, horizontal.

For cutting thick material, operator will need to hold the torch nearly perpendicular to the cut and move the torch in and out of the cut in a sawing motion.

For thin material, the torch can be held at a steep angle to the cut and travel much faster. Operator will have to adjust the Torch angle for optimum cutting speed.

For material such as concrete, refractory, and cast iron, the cutting method is to melt the material and then allow the oxygen pressure to blow the molten material away from the cut. Cutting this type of material will be slower than cutting carbon steel, stainless steel or aluminum and requires higher Oxygen pressure. **DO NOT EXCEED MAXIMUM PRESSURE OF 150 psi.**

CONNECTING TORCHES TOGETHER

On jobs where operators need a longer reach than a standard length torch, or to eliminate wasted torches, two torches can be joined together. QC (Expanded End) and T&C (Threaded and Coupled) Torches are designed for joining two full-length torches or a full-length torch and a partially used torch. **DO NOT JOIN MORE THAN TWO TORCHES TOGETHER.** Joining more than two torches will restrict the oxygen flow and create a safety hazard.

To join torches together:

1. Joining two new torches together; Insert the holder end of one torch in expanded or coupler end of the torch in the holder. For QC torch tap end of torch against solid surface to lock torches together. For T&C torches tighten threaded torch into collar of new torch.
2. For Partial Torches: Remove the partially consumed torch from the holder.
3. Insert the crimped end of the partially burned torch into the Q.C. or T&C end of the new torch.
4. For QC torches tap end of torch against hard surface to lock torches together. For T&C torches thread the crimped end of partially used torch into the coupling end of the new torch and tighten.
5. Open Oxygen valve and check for leaks at the holder and at the joint. Insure free flow of oxygen. Close oxygen valve before lighting.
6. Follow lighting instructions to re-light torch.

OXYGEN HOSE AND FITTINGS

OSHA 910.253(e)(5)(iii) requires oxygen hose fittings and clamps must pass tests specified by CGA E-1-2005. The test requires that the fittings must be pressure tested to 300 psi. CGA E-1-2005 Section 6.1 and 6.2 also has specific test for strength of the fitting assembly. These test include a straight pull test and a right angle pull test.

Oxylance requires that hose fittings be pressed on with a hose ferrule and crimping machine or high pressure bandits with a bandit machine. (**RADIATOR** type hose clamps will not hold the required pressure and will not meet the tension test requirements of OSHA or CGA.)

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Oxylance

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OXYGEN SYSTEM SAFETY

The design and operation of oxygen systems are the responsibility or the operators. Qualified professional assistance should be used when setting up oxygen systems. Your Welding Supply / Gas Distributor should be your first contact.

This technical information is based on Oxygen Safety requirements from the following sources; (ASTM) American Society for Testing and Materials, (NFPA) National Fire Protection Association, (ANSI) American National Standards Institute, (AWS) American Welding Society, (CGA) Compressed Gas Association and (NASA) National Aeronautical and Space Agency. Oxylance Inc. makes no warranty as to the absolute correctness or sufficiency of any of the foregoing.

HAZARDS

Oxygen is an odorless, tasteless, non flammable non explosive gas that makes up 21% of our atmosphere. Oxygen is a fire hazard because it promotes combustion. Any atmosphere that contains more than 23.6% oxygen is considered to be oxygen enriched and materials that may not be combustible in a normal air environment will burn in an oxygen enriched atmosphere. Combustible materials are easier to ignite and burn faster and hotter when exposed to oxygen or when in an oxygen enriched atmosphere.

OXYGEN SYSTEM FIRES

Three elements are required to have a fire, Oxidizer, Fuel, and Heat. This is commonly referred to as the Triangle of Fire. Fires in normal atmosphere can be prevented or put out by removing any one of the 3 elements. In an oxygen system 2 of the required elements are always present, the system of piping, fittings, regulators and valves is the FUEL and the oxygen contained in the system is the OXIDIZER. In a Burning Bar application the Burning Bar is also fuel. Hazards are increased in the system as the oxygen is normally under substantial pressure. The ignition energy comes from within the system, often through mechanisms that under normal atmospheric conditions would not cause an ignition. Oxygen system fire potential cannot be eliminated however fire can be avoided by risk management based on a careful analysis of the hazards and risks. System design, component materials and fabrication methods as well as proper system operation and maintenance will greatly reduce the potential for fire.

POTENTIAL CAUSES OF FIRES IN OXYGEN SYSTEMS

To understand the hazards of fires in oxygen systems you must first understand the chain of events that can cause a fire, this is referred to as the KINDLING CHAIN. The kindling chain begins when a small amount of energy is released in a system and ignites a material with a low ignition temperature or a particle with a small mass and large surface area. Once a small object is ignited, the heat that it generates ignites larger materials with higher ignition temperatures that generate even more heat until the fire becomes self-sustaining. There are three common ignition mechanisms that can potentially occur in burning bar systems.

AUTO IGNITION TEMPERATURE

Auto Ignition Temperature is the lowest temperature at which a material will spontaneously ignite in an oxygen enriched atmosphere under specific test conditions.

PARTICAL IMPACT

We have all seen small sparks fly off of steel when struck by an object such as a hammer hitting a nail or if you observe a sand blasting operation in low light you will see very small sparks created when the particles of sand strike a piece of steel. In normal atmosphere these sparks do not create a fire. Small particles carried along in a flow of oxygen, often at high velocity, can strike a surface in the system. When the particles strike a surface the impact energy is released as heat. Because of their small mass, the particles become hot enough to ignite larger materials. Particles such as metal shavings, fly ash from coal fired power plants, coal particles, and other solid objects are potential risks for particle impact fires.

COMPRESSION HEATING

When a gas flows through an orifice from high to low pressure it expands and its velocity can reach the speed of sound. If the gas flow is blocked, it recompresses to its original pressure and becomes hot. The greater the pressure difference, the higher the gas temperature. This effect is similar to the way an air compressor and volume tank will heat up when the compressor is pumping up the air pressure. In an oxygen system, the oxygen temperature can be high enough to initiate the kindling chain. Small metal particles, lubricants or organic materials can heat up to their kindling temperature in a compression situation igniting a fire that then spreads to the other fuels such as the steel tube and wires in a burning bar.

FRICTION

When two solid materials rub together, they generate heat which can ignite other materials.

AVOIDING OXYGEN FIRES

Although oxygen systems present serious and unusual hazards, they are used safely throughout industry because risk of injury can be managed and controlled. To insure that the oxygen system is being maintained and used in a safe manner follow all of the instructions in this document and refer to other recommended safe practices available from ASTM, ANSI, AWS, CGA as well as OSHA regulations.