






DIMENSION BID

WIRELINE INTERVENTION | PERFORATION SERVICES

SAFE GAS WELDING AND CUTTING - FLASHBACK ARRESTOR AND SAFETY ACCESSORIES DBSB-HSE-09

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HSE-MS	SAFE GAS WELDING AND CUTTING – FLASHBACK ARRESTORS AND SAFETY ACCESSORIES	DBSB-HSE-09-00	
		Rev.02	2014

AMENDMENT RECORDS

This sheet will record all amendment of this Procedure. All particulars of the amendment shall be stated clearly. The HSE Department of Dimension Bid (M) Sdn. Bhd. (DBSB) shall be responsible for the maintenance and update of this record sheet.

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HSE-MS	SAFE GAS WELDING AND CUTTING – FLASHBACK ARRESTORS AND SAFETY ACCESSORIES General	DBSB-HSE-09-01	
		Rev.02	2014

Subject **Gas Welding and Cutting**

Introduction Many hazards are associated with gas cutting/welding activities and these could be managed safely by adhering to established procedures and precautions.

It is the intent of this procedure to enhance safety in all aspects of onshore/offshore operations pertaining to the safe handling and use of industrial gases, for hot-work applications, and allied processes.

Appropriate preventive measures must be taken against the hazards likely to be encountered via:

- a) High temperature, molten metal, etc. (causing burns, v fire/explosions)
- b) Flashback and burn back
- c) Toxic fumes emitted during gas welding and cutting
- d) The brilliant light and radiation causing eye injuries e.g. "Arc eyes"
- e) Lacking of oxygen, causing asphyxia (working in confined space)
- f) Oxygen enrichment of the air due to oxygen leak
- g) Mishandling of gas cylinders

It is the Dimension Bid' requirement that before any work is to be undertaken requiring the operation of gas cutting, welding, appropriate safety accessories be fitted to the heating equipment, etc., including approved flashback arrestors. See Figure 1 for complete assembly of gas cutting/welding equipment.

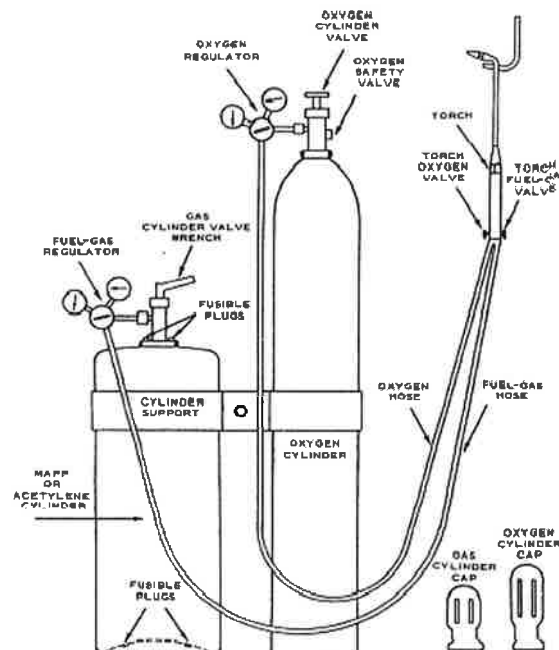


Figure 1: Assembly of gas welding/cutting equipment

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To eliminate the occurrence of flashback and associated hazards, essential guidelines have been set-forth and are to be complied with for safer operation of gas equipment.

The operation of gas cutting/welding equipment as guided by this procedure shall achieve:-

- Safe handling and use of Oxy-Acetylene Cylinders
- Selection of correct and suitable flashback arrestors.
- Prevention of the occurrence of flashback and burn back.
- Enhancement of safe gas cutting/welding operations.
- Promotion of user confidence in gas cutting/welding operations.

Scope This procedure complements the safety checklist for Gas Cutting/Welding etc. pertaining to the Hot-Work activities and it covers the following:

- a) Cylinders requirement and safe handling
- b) Causes of flashback and burn back.
- c) Minimum safe practices on the operation of gas cutting/welding equipment.
- d) Flashback arrestor selection, approval and maintenance.

Definitions

Competent person A person who has adequate technical knowledge (Mechanical/Instrumental) and experience to authorize him to carry out routine operation, maintenance and trouble shooting of equipment.

Lower Explosive Limit (LEL) The point where there is a minimum concentration of a particular combustible gas in the air which can be ignited. (Most combustible gases have a LEL which is between 1.0% and 4.0% by volume approx.)

Hot-work Means welding, burning, cutting, heating operations which may generate heat, incendiary spark or create a source of ignition.

Blowpipe A term encompassing all varying configurations of gas torches used for all types of hot work applications

Flashback Flashback is an incident resulting from the ignition and explosion of an air/oxygen and fuel gas mixture within the blowpipe travelling back towards the source of supply. Flashback is characterized by a severe detonation and if continuous will produce a shrill hissing sound.

Burn back An incident of a flame travelling up an oxygen rich hose, or supply line towards the attached oxygen source.

HSE-MS	SAFE GAS WELDING AND CUTTING – FLASHBACK ARRESTORS AND SAFETY ACCESSORIES Standard and Codes of Practice	DBSB-HSE-09-02	
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Subject	Standards and Codes of Practice
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Oxy-Acetylene Cylinders	These gases are procured from vendors, supplied in cylinders which shall conform to the following requirements:
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|--|---|
| | <ul style="list-style-type: none"> i. Designed and manufactured in compliance with BS 5045. ii. Tested and maintained in accordance with BS 5430. iii. Color coded and marked in accordance with BS 349. |
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Flashback Arrestors	The specification of all company approved flashback arrestors must comply to either of the following international standards:
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|--|---|
| | <ul style="list-style-type: none"> a. Standards Country <ul style="list-style-type: none"> i. ISO 5175 U.S.A. ii. DIN 8521 GERMANY iii. BS 6158 U.K. |
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HSE-MS	SAFE GAS WELDING AND CUTTING – FLASHBACK ARRESTORS AND SAFETY ACCESSORIES Flashback	DBSB-HSE-09-03	
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Subject

Factors Contributing to Flashback

The following common practices have the potential to allow compressed air/oxygen to mix with the fuel gas within the hoses, or supply lines:

1. **Incorrect Operating Pressure**
Use of damaged regulators, leaking equipment, and failure to check the gas pressure remaining in the cylinders during periods of long use.

Acetylene gas used at pressures above 1.5 Barg (21 P.S.I.) can cause a detonation, called decomposition resulting in pressure between 25 Barg to 250 Barg accompanying a severe explosion and culminating in a fireball.
2. **Acetone Contamination**
Liquid acetone used inside acetylene cylinders will escape if the cylinder is used on its side, or rate of consumption of acetylene gas exceeds the permissible withdrawal rate, e.g. a normal acetylene cylinder contains approximately 7 kilograms of acetylene gas, the safe withdrawal rate of gas = 650 liters/hr. Continuous use of a cutting for one hour consume approx. 400- 500 liters.
3. **Poor Maintenance**
Carbon can accumulate within the torch which can sustain burning at the torch mixer. Excessive filing within the nozzle can enlarge the splines (nozzle hoses) allowing the flame to burn back into the torch. This event can create an internal explosion within the mixing chamber culminating in a discharge of metal fragments and flame towards the operator.
4. **Flow Restriction**
Kinked hoses, and molten slag blocking the nozzle creates a flow restriction and back feeding of gas.
5. **In-correct sequence of opening oxygen and fuel valves.**

HSE-MS	SAFE GAS WELDING AND CUTTING – FLASHBACK ARRESTORS AND SAFETY ACCESSORIES Guidelines for Safe Handling and Use of Oxy-Acetylene Cylinders	DBSB-HSE-09-04	
		Rev.02	2014

Subject **Guidelines for Safe Handling and Use of Oxy – Acetylene Cylinders**

Inspection of Cylinders

i) Visual Inspection:
All new supplies of full cylinders must be in good condition. Recipients of cylinders should ensure this by carrying out visual inspection prior to accepting them. Any cylinder which is suspected to be defective shall not be used. Arrangements should be made with the Supplier or Vendor for it to be emptied in a safe environment, under safe conditions and returned to the responsible Vendor.

ii) Testing and Certification of Cylinders:
The testing and certification shall be carried by any of the DOSH approved Third Party Surveyors in accordance with BS 5430.

Safe Handling and Use of Oxy-Gas Cylinders Due to the potential hazards associated with the handling and transportation of these cylinders, the Company has established the following guidelines:

- i) Handling & Transportation
- Bulk handling and transportation of gas cylinders shall be by well designed and constructed racks with lifting lugs. The racks secure cylinders in the vertical plane. When not in racks, the cylinders must be secured to prevent toppling.
 - Transport racks for cylinders shall be maintained in good condition and subjected to regular inspection, especially at the lifting lugs.
 - Different gases shall not be mixed together in the racks. Oxygen cylinders shall not be transported in the same racks with the acetylene or any other forms of flammable substances.
 - All cylinders when being transported shall have the protective caps in place over the valve assemblies.
 - Great care should be exercised at all times when loading or unloading gas cylinders to and from vehicles or vessels.
 - The stability of an empty rack for oxygen/acetylene cylinders shall be such that it can withstand a maximum roll of about 20° of any vessel at sea, if placed longitudinally on the deck. It is essential that the racks be placed cross-wise on the vessel's deck and secured to tie points to prevent it from toppling during an adverse sea

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condition. Where a cylinder has to be maneuvered into position horizontal rolling is not allowed.

- Extreme caution shall also be exercised to avoid knocking or jarring acetylene cylinders. Acetylene gas is sensitive to shock and in its free state at pressure of more 1.5 Barg (21 psi), it decomposes violently (polymerize). If the cylinder becomes hot, it may lead to the risk of explosion. Under no circumstances shall acetylene cylinder be placed in horizontal position as the acetone content may be ejected/leaked; even when the cylinder is empty.
- No person shall attempt to lift a cylinder on his own, instead get help or use suitable lifting appliances.
- Never transport cylinders with the regulators and hose attached unless on a purpose-designed trolley or carrier where it only involved in manual shifting between two points within proximity of each other at a job site.
- When using a cylinder trolley, cylinders must be stable and secured to prevent toppling.
- An "empty" gas cylinder still contains residual gas inside the cylinder and it shall be handled with cautions similar to that of any "full" gas cylinder.

ii) Safe Storage of Oxy-gas Cylinders

- Stores shall be located as far as possible from flammable substances such as oil, gasoline or waste.
- Cylinder storage areas shall be prominently posted with the names of the gases conspicuously displayed.
- Where gases of different types are stored at the same location, cylinders shall be grouped by type of gas e.g. flammable gases should not be stored near oxidizing gases.
- Oxygen cylinders shall be stored separately from flammable gases e.g. Propane, Acetylene, and Butane. These stores should be separated by a distance of at least 6 meters or a fire resisting wall.
- Charged and empty cylinders shall be stored separately within a storage area.
- Protective caps shall be fitted to all full and empty cylinders within the store.

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Safe Use of Oxy-Acetylene Cylinders

These cylinders shall be handled and used only by experienced and properly instructed persons. Safe operation of gas equipment connected to outlet points of the cylinders is discussed in DBSB-HSE -09-05 below in detail.

The user shall verify the contents of a cylinder by the markings before use.

HSE-MS	SAFE GAS WELDING AND CUTTING – FLASHBACK ARRESTORS AND SAFETY ACCESSORIES Guidelines for Safe Operation of Gas Equipment Connected to Outlet Points	DBSB-HSE-09-05	
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Subject **Guidelines for Safe Operation of Gas Equipment Connected To Outlet Points**

**Connection of
Equipment**

(i) Cylinders

Ensure cylinder valve outlets are free of foreign material (stones and metal fragments), and oil or grease.

Before attaching the regulators, briefly open and close the cylinder valves in a well-ventilated area to allow the pressurized gas to blow out any contamination.

Ensure cylinders are standing upright in mobile trolley and secured; never leave them "free" standing.

If acetylene cylinder has been laid down on its side, allow the cylinder to stand upright for at least 20 minutes before use, thus avoiding acetone contamination entering the attached regulator.

(ii) Regulators

Prior to fitting, ensure that the gauges are not damaged and that the pressure regulating screw is in the zero gas delivery position. Outlets are to be cleaned from oil and grease.

Check for leaks using soapy water at threaded connections at regulators and other parts of the cylinders' valve assemblies.

(iii) Flashback Arrestors

a) Torch Mounted Flashback Arrestors - to be used in conjunction with a flashback arrestor fitted to the regulator/manifold outlet. It will provide the first line of defense for operator and equipment against damages resulting from flashbacks and flame entering the attached hoses.

b) Regulator Mounted Flashback Arrestors - to be installed to the regulators/ manifold outlet. It provides the primary protection to the entire gas supply system.

Connections are to be clean and of identical thread size as the attached equipment.

Adaptors should not be used so to avoid unnecessary connections, and possibility of gas leaks and dangerous mixing of standard fittings.

iv) Gas Hoses

Twin oxy-gas hose shall be manufactured of a composite retardant to the effects of flame, and or molten and shall only be used for the purpose of welding/cutting. The hoses shall be color coded. Hoses used for other purposes should never be used for oxy-gas applications.

New hose, prior to use, shall be purged of talcum powder deposits before fitting flashback arrestors as talcum may clog the filter.

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Check for signs of cuts, abrasions, burn or general deterioration.

Proper gas hose clips are to be used for securing of hose to fittings. The use of "Jubilee" clips is not allowed. Repair joints in hoses are not allowed for use in areas where a Hot Work permit is required.

Where more than one joint of hose is required due to nature of work, the hose to hose connection shall be suitably and adequately fitted.

v) Blowpipes (Torches)

Ensure threads and seats are in good condition with no oil contamination on the oxygen inlets.

Ensure that all valves on the blowpipe are fully closed.

**Lighting Up Of
Blowpipe**

(i) Pressurizing Hoses

Open cylinder valves slowly to 1 1/2 turns open. Never open valves completely so that the spindle is tight against the back-stop. The spindle key is to remain on, or in the immediate vicinity of the cylinder at all times whilst the cylinder is in use. Check connections of the complete assembly for leaks.

(ii) Operating Pressure

a. Operating outlet pressure of acetylene gas shall not exceed 1 Barg (15 psi).

b. Operating outlet pressure for oxygen gas is variable depending upon equipment and application.

(iii) System Purging (Essential Precautionary Practices)

Before lighting the blowpipe, open and close both blowpipes valves separately after the other to allow each gas line to be purged in the appropriate hose.

Purging must be done following each period of work stoppage, before relighting the blowpipe, and after hoses changing/cylinder changing.

(iv) Light the blowpipe and adjust as recommended by the supplier's instructions. Friction flint guns shall be used to ignite the torch. Lighters or matches shall not be allowed to be used in lieu of friction flint guns.

The equipment shall be shut down and the fault rectified upon signs of leakage, fluctuations of gas supply and starvation.

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**Closing Down
Equipment**

When closing down for short periods, steps i to vii below shall apply. For longer periods, follow full operating procedure.

- i) Extinguish Blow Pipe (Torch)
- ii) Close Cylinder Valves
- iii) Open blowpipe to vent hose separately, reclose blowpipe valves
- iv) Adjust regulator screw to zero delivery position
- v) Check equipment for damage
- vi) Store equipment in a safe, ventilated area
- vii) Ensure cylinder valves are fully closed and not leaking.

HSE-MS	SAFE GAS WELDING AND CUTTING – FLASHBACK ARRESTORS AND SAFETY ACCESSORIES Personal Protection and Precaution	DBSB-HSE-09-06	
		Rev.02	2014

Subject

Personal Protection and Precautions

Overalls or apparels to be worn by Welders shall be made of cotton or other flame retardant materials; and be designed to avoid spark traps, e.g. Velcro or zip fastenings and pocket flaps, etc. to reduce the risk of burns. Safety footwear must be worn.

Welding masks and goggles mask shall be fitted with dark filters conforming to BS 679 to protect the eyes of the welders, assistants or firewatchers from welding flash and UV radiations.

Welding screens shall be provided to protect other workers in the area. Adjacent equipment shall be protected from slag and welding spatter using fire proof blankets and water spray. Smoke and UV detectors shall be protected from fumes and welding flash.

Welding fumes must be dispersed by any appropriate means. Where it cannot be freely dispersed, fume extractor with ducted system shall be used.

Ear protection must be worn when welding in a noisy area.
Company approved type Safety belt/harness must be worn when carrying out welding jobs at aloft locations or via scaffolding platforms.

HSE-MS	SAFE GAS WELDING AND CUTTING – FLASHBACK ARRESTORS AND SAFETY ACCESSORIES Minimum Requirements for Flashback Arrestors	DBSB-HSE-09-07	
		Rev.02	2014

Subject **Minimum Requirements For Flashback Arrestors**

Flashback arrestors shall conform to standards as specified under DBSB -HSE-09-02 and must also be endorsed by either of the following testing establishments

Minimum Standards and Approvals

Approvals Institute	Country
U.L.	U.S.A.
B.A.M.	Germany (or equivalent)
H.S.E.	U.K.

Minimum Safety Features Each flashback arrestors must have the following essential features:

Flashback Arrestors Fitted To	Torch	Regulator, Manifold Outlets
Inlet Filter	√	√
Non Return Check valve	√	√
Stainless Steel Sintered Element	√	√
Flame Trap	√	√
Temperature Activated Cut-off Valve		√

Maintenance Of Flashback Arrestors

The design of flashback arrestors is in such a manner as to be maintenance free. However, due to impurities within gas lines filters may become clogged, thereby restricting gas flow, and should be replaced by a trained operator or Competent Person when necessary or after inspection.

Dismantling of flashback arrestors may damage internal components and shall only be undertaken by the manufacturer.

Periodic functional testing of flashback arrestors is essential and to be carried out in accordance to the Manufacturer's testing requirements.