

# **Black Dragon Forge**

## **MKI Post-Box Forge**

## **MKII Damascus Forge**

### **Operating Manual**

Please read and understand this information booklet BEFORE you use your forge! The forge manufacturers and suppliers cannot be held liable for any fires, accidents, damage or death that may be caused by the use of these forges.

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## **WARNING**

LPG (Liquefied Petroleum Gas) appliances that are burning consume oxygen and in enclosed or restricted spaces, will cause the depletion of the oxygen content of the available air. Never leave the forge burning unattended and be ware of the smell of gas leaks.

The incorrect installation and use of this forge in buildings can give rise to a variety of hazardous conditions such as a build up of unburned gas, a high concentration of carbon monoxide and the depletion of oxygen for breathing. Ventilation is therefore vitally important and special notice should be given to safety and warnings in these notes.

The forge manufacturers and suppliers cannot be held liable for any fires, accidents, damage or death that may be caused by the use of these forges.

## **EXCLUSION OF LIABILITY**

Information contained in this publication is accurate at the date of publication. The company does not accept liability arising from the use of this information, or the use, application, adaptation or process of any products described herein.

# LP (LIQUEFIED PETROLEUM) GAS & PROPANE

## HAZARDS IDENTIFICATION

The following information is an extract from the attached "MATERIAL SAFETY DATA SHEET (MSDS) - LIQUEFIED PETROLEUM GAS & PROPANE". Please read and understand the entire LPG & PROPANE MSDS before you use your forge!

### Main Hazards

All cylinders are portable gas containers, and must be regarded as pressure vessels at all times. Vapourised liquefied petroleum gas is highly flammable and can form explosive mixtures with air. The vapourised liquid does not support life. It can act as a simple asphyxiant by diluting the concentration of oxygen in the air below the levels necessary to support life. It can act as a simple asphyxiant.

### Adverse Health Effects

The liquefied petroleum gases are non-toxic. Prolonged inhalation of high concentrations has an anaesthetic effect.

### Chemical Hazards

Propane and butane (known most extensively in commercial and popular terms as LP gas or LPG) have an extremely wide range of domestic, industrial, commercial, agricultural and internal combustion engine uses. It is estimated that the two gases, un-mixed and in mixtures, have several thousand industrial applications and many more in other fields. Their very broad application stems from their occurrences as hydrocarbons between natural gas and natural gasoline, and from their corresponding properties. As a result of their wide application, misuse could result in serious chemical hazards.

### Biological Hazards

Contact with the liquid phase of liquefied petroleum gases with the skin can result in frostbite.

### Vapour Inhalation

As the vaporized liquid acts as a simple asphyxiant death may result from errors in judgement, confusion, or loss of consciousness, which prevents self-rescue. At low oxygen concentrations, unconsciousness and death may occur in seconds without warning.

### Eye Contact

The liquid can cause severe burn-like injuries.

### Skin Contact

Contact with the liquid phase can cause severe burn-like injuries.

### Ingestion

No known effect.

## FIRST AID MEASURES

Prompt medical attention is mandatory in all cases of overexposure to vaporized liquefied petroleum gas. Rescue personnel should be equipped with self-contained breathing apparatus. In the case of

frostbite from contact with the liquid phase, place the frostbitten part in warm water, about 40 - 42°C. If warm water is not available, or is impractical to use, wrap the affected part gently in blankets. Encourage the patient to exercise the affected part whilst it is being warmed. Do not remove clothing whilst frosted. Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be removed to an uncontaminated area, and given mouth-to-mouth resuscitation and supplemental oxygen.

### **Eye Contact**

Immediately flush with large quantities of (With the liquid phase) tepid water, or with sterile saline solution. Seek medical attention.

### **Skin Contact**

See above for handling of frostbite. (With the liquid phase)

### **Ingestion**

No known effect.

## **FIRE FIGHTING MEASURES**

### **Extinguishing Media**

Do not extinguish fire unless the leakage can be stopped. DO NOT USE WATER JET. Use dry chemical, CO<sub>2</sub> or foam.

### **Specific Hazards**

The rupturing of cylinders or bulk containers due to excessive exposure to a fire could result in a BLEVE (Boiling Liquid Expanding Vapour Explosion), with disastrous effects. As the flammability limits in air for the main constituents of liquefied petroleum gas vary between approximately 2 and 11% by vol, extreme care must be taken when handling leaks.

### **Emergency Actions**

If possible, shut off the source of the spillage. Evacuate area. Post notices "NO NAKED LIGHTS - NO SMOKING" Prevent liquid or vapour from entering sewers, basements and workpits. Keep cylinders or bulk vessels cool by spraying with water if exposed to a fire.

### **Protective Clothing**

Self-contained breathing apparatus. Safety gloves and shoes, or boots, should be worn when handling containers.

### **Environmental Precautions**

Vapourised liquefied petroleum gas is heavier than air and could form pockets of oxygen-deficient atmosphere in low-lying areas.

## ACCIDENTAL RELEASE MEASURES

### Personal Precautions

Do not enter any area where liquefied petroleum gas has been spilled unless tests have shown that it is safe to do so.

### Environmental Precautions

The danger of widespread formation of explosive LPG/Air mixtures should be taken into account. Accidental ignition could result in a massive explosion.

### Small spills

DO NOT extinguish the fire unless the leakage can be stopped immediately. Once the fire has been extinguished and all spills have been stopped, ventilate the area.

### Large spills

Stop the source if it can be done without risk. Contain the leaking liquid, with sand or earth, or disperse with special water/fog spray nozzle. Allow to evaporate. Restrict access to the area until completion of the clean-up procedure. Ventilate the area using forced-draught if necessary. All electrical equipment must be flameproof.

## HANDLING AND STORAGE

Cylinders containing liquefied petroleum gas should only be handled and stored in the vertical position. Cylinders should never be rolled. Do not allow cylinders to slide or come into contact with sharp edges and they should be handled carefully. Ensure that cylinders are stored away from other oxidants. Comply with all local legislation.

## EXPOSURE CONTROLS & PERSONAL PROTECTION

### Occupational Exposure Hazards

As vapourised LPG is a simple asphyxiant, avoid any areas where spillage has taken place.

### Engineering Control Measures

Engineering control measures are preferred to reduce exposure to Oxygen-depleted atmospheres. General methods include forced-draught ventilation, separate from other exhaust ventilation systems. Ensure that all electrical equipment is flameproof.

### Personal Protection

Self-contained breathing apparatus should always be worn when entering area where oxygen depletion may have occurred. Safety goggles, gloves and shoes, or boots, should be worn when handling containers.

### Skin

Wear loose-fitting overalls, preferably without pockets.

## **STABILITY AND REACTIVITY**

### **Conditions to Avoid**

The dilution of the oxygen concentration in the atmosphere to levels which cannot support life. The formation of explosive gas/air mixtures.

### **Incompatible Materials**

Any common, commercially available metals may be used with commercial (or higher) grades of liquefied petroleum gases because they are non-corrosive, though installations must be designed to withstand the pressures involved and must comply with all state and local regulations.

### **Hazardous Decomposition Products**

The constituents of liquefied petroleum gas are relatively stable. However, on combustion, toxic compositions, typically carbon monoxide may be formed, depending on conditions.

## **ECOLOGICAL INFORMATION**

Vapourised liquefied petroleum gas is heavier than air, and can cause pockets of oxygen-depleted atmosphere in low-lying areas. It does not pose a hazard to the ecology, unless the gas/air mixture is ignited.

## **DISPOSAL CONSIDERATIONS**

### **Disposal Methods**

Disposal of liquefied petroleum gases, as with other gases, should be undertaken only by personnel familiar with the gas and the procedures for disposal. Contact the supplier for instructions. In general, should it become necessary to dispose of liquefied petroleum gases, the best procedure, as for other flammable gases, is to burn them in any suitable burning unit available in the plant. This should be done in accordance with appropriate regulations.

### **Disposal of packaging**

The disposal of cylinders must only be handled by the gas supplier.

## **GAS CYLINDERS**

The installation of the cylinder(s) complete with all associated equipment and appliances and any subsequent repair or modifications to the installation shall be carried out by a registered installer qualified to the appropriate grade (domestic or industrial).

### **Location**

Cylinders shall be located in an accessible position that:

- a) Full and empty cylinders can be changed easily
- b) Cylinders can be disconnected and removed quickly in case of an emergency
- c) The cylinder valve can be easily operated.

### Locations to be avoided

It is essential that in the selection of the location of the cylinders, the following locations be avoided:

- Any position in which the cylinders are likely to cause obstruction, to become damaged or to be exposed to conditions likely to affect their safety
- Any position that is subject to extremes of temperature (excluding natural elements)
- Near corrosive or readily combustible substances
- Positions adjacent to cellars, drains, hollows, etc. where escaping gas might collect.
- Cylinders shall never be located below ground level in a building, for example in cellars or basements.
- Cylinders shall not be located above or on top of any appliance used for cooking or heating.
- Cylinders shall be located in a place with floor-level ventilation to the outside air. An airbrick situated near the bottom of an external wall or a normal gap of at least 6mm underneath an external door (or a combination of these) usually provides sufficient ventilation.
- Cylinders shall be located in an upright position with the valve uppermost and shall be so placed on a firm level base that there can be no danger of the cylinder tilting or falling over.

### Other Considerations

Also consider the following in selecting your cylinder location:

- Good ventilation at floor level is essential to prevent any possible accumulation of gas in the event of leakage.
- Hoses and any item that may burn should be well away from the forge.  $\pm 2$ m
- Keep the cylinder at least 2m away from a coal forge or gas forge, but at least 1 m away if an approved insulating guard is fitted between the cylinder and the forge.
- Cylinders inside a building shall not be manifolded i.e. mount manifold outside.
- Cylinder and regulator installed outside the building with shut-off valve inside.
- All equipment outside the building shall be protected against damage and weathering.

### Cylinder Safety

- Empty cylinders should be considered dangerous and always kept closed.
- Do not use cylinders that are dented or damaged in any way.
- Store and transport cylinders in an upright position only.
- Do not use any cylinders that have been in a fire.
- Never use oil or grease as a lubricant on any part of the regulator, valves, burners, etc.

## Outdoor Location

### Considerations

- Cylinders shall be located on a firm, clean, well drained and level base.
- The area surrounding a cylinder should be kept clear of any combustible materials, for example weeds, dry grass, paper and waste.
- The cylinder shall be located and protected against tampering by unauthorised persons and also damage and interference by for example, animals and / or vehicles.
- Cylinders shall be at least:
  - 1m away from any opening (into a building) that is below the level of the container valve, i.e. doors, windows and airbricks
  - 2m away from any drain, pit or manhole
  - 3m away from the property boundary unless the boundary has a fire wall in which case the cylinders could be next to the fire wall, and where there are only two cylinders, the boundary distance can be reduced to 1m
  - 3m away from any opening (or window) directly above the cylinders except if a non-combustible roof is installed between the cylinder and the opening (or window).

## GAS FORGE

### Installation Considerations

Forges shall be installed it a position that provides shelter from drafts that are strong enough to extinguish the burners when they are set to a "low" flame.

Mount the forge securely, on a firm and level base, utilising the 4 pilot holes provided, at a comfortable working height. Ensure that the forge is stable and secure BEFOERE continuing. The forge should not be able to topple over, even if accidentally bumped into.

A table or shelf used as a mount / support for the forge should be large and sturdy enough to accommodate the forge. The support should also be fire proof (steel or masonry recommended).

Position the gauge (fixed to the regulator) in a way that you can see its reading and conveniently make adjustments to the gas pressure. Screw the bull nose fittings onto the cylinders. Remember these threads are left hand threads.

Forges shall NOT be installed in small, confided spaces that are poorly ventilated. Gas burners require an unrestricted supply of fresh air. Ensure that the supply of fresh air for combustion is not impeded. Provision shall be made for any accidental accumulations of un-burnt gas to disperse safely, and also for the free escape of burnt gas.

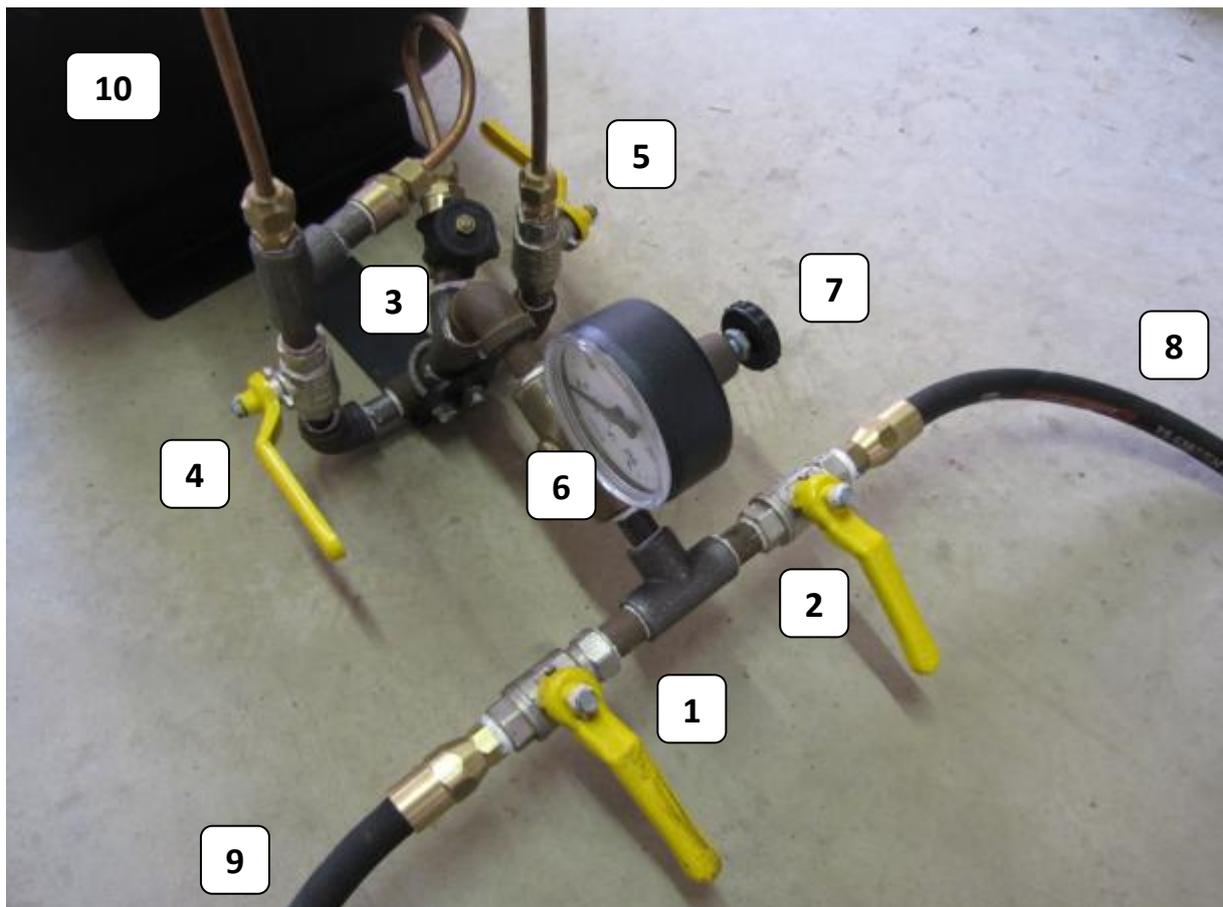
The forge will be installed in a room so that there is no danger that they could set fire to any thing that is combustible. Note that there is a flame shooting out of the back of the forge to consider! Two fire bricks behind the forge will make a movable fire wall.

The forge shall not be installed in positions likely to cause overheating of walls and ceilings, and suitable deflector plates shall be used where necessary. Where combustible or ignitable material near an appliance is liable to attain ignition temperature or to be exposed to heat damage, provision is to be made to protect such material. Loose or piled combustible material and weeds and long grass shall not be permitted within 3 m of any container.

Where LPG installations are closer than 3 m to any either compressed gas (oxygen and or acetylene), special fire protection precautions shall be considered, for example a fire wall.

NOTE: Fixed forges (manifolds, rigging gas piping through brick walls, etc.) shall be installed by a registered installer.

## MKII Damascus Forge Components



1. Right Cylinder Ball Valve (Yellow Handle)

2. Left Cylinder Ball Valve (Yellow Handle)
3. Idler Needle Valve (Black Knob)
4. Primary Burner Ball Valve (Yellow Handle)
5. Secondary Burner Ball Valve (Yellow Handle)
6. Gas Pressure Gage (Max 250 kPa)
7. Gas Pressure Regulator (With Adjustable Pressure Bar / Thumb Screw)
8. Right Cylinder Pigtail (Black Flexible Tubing with Brass Bull Nose Fitting - Brass Bull Nose Fitting Not Shown)
9. Left Cylinder Pigtail (Black Flexible Tubing with Brass Bull Nose Fitting - Brass Bull Nose Fitting Not Shown)
10. Forge Body

## Operating Instructions

### Refractory Dry Out

***THE REFRACTORY MUST BE DRIED OUT BEFORE INITIAL USE!***

Why is this ***important?*** If the refractory is not dried out, a steam pocket could form in the refractory that could cause an explosion. The drying process also increases the life of the refractory of your forge.

To dry out the refractory, run the burners at a low heat, until the unit starts to steam (approximately 45 minutes to 1 hour). Shut off and allow the forge to cool. Repeat this operation several times, until there is no steam. Although the refractory is rated at 1700 degrees Celsius, do not be alarmed when small cracks start to appear - This is well within expected operating parameters.

### Warning

- Never stand in front of either of the forge chamber openings.
- Ensure that there is nothing in the vicinity of the forge that can accidentally be set alight when lighting or operating the forge.

### Lighting the Forge - Black Dragon MKII Damascus Forge

1. Make sure the gas is turned OFF at ALL cylinders connected to the forge.
2. Make sure that all the Ball Valves [#1, #2, #4, #5] are turned to their "SHUT" positions.
3. Make sure the Idler Needle Valve [#3] is closed properly.
4. Open the gas on all cylinders connected to the forge.
5. Depending on the amount of cylinders connected to the forge, open the appropriate Ball Valve [#1 and /or #2] to pressurise the system.
6. Adjust the Pressure Bar / Thumb Screw on the Gas Pressure Regulator [#7] to 50 kPa as indicated by the Gas Pressure Gage [#6].
7. Ensure that there are NO gas leaks present – Refer to the Gas Leak Detection section of this manual.

8. Place a small piece of crumpled up newspaper in the forge chamber before lighting it with a match.
9. Once the paper is burning well, open the Idler Needle Valve [#3] slightly to light the primary burner. PLEASE NOTE: THE NEWSPAPER WILL BE EJECTED OUT OF THE FORGE BY THE FORCE OF THE IGNITION. Make sure to put out the flaming newspaper!
10. Adjust the Idler Needle Valve [#3] to a low / soft burn and let it idle for at least 60 seconds to heat up the primary burner nozzle.
11. If the forge does not light immediately, turn OFF the gas and let the forge chamber ventilate for a few minutes before relighting to ensure there is no residual gas in the forge.
11. Once the primary burner nozzle is sufficiently heated, open the Primary Burner Ball Valve (Yellow Handle) [#4] to run the Primary Burner at capacity.
12. Open the Secondary Burner Ball Valve (Yellow Handle) [#5] to start the Secondary Burner.

### Lighting the Forge - Black Dragon MKI Post-Box Forge

1. Make sure the gas is turned OFF at ALL cylinders connected to the forge.
2. Place a small piece of crumpled up newspaper in the forge chamber before lighting it with a match.
3. Once the paper is burning well, open the cylinder Valve by a single turn to light the burner. PLEASE NOTE: THE NEWSPAPER WILL BE EJECTED OUT OF THE FORGE BY THE FORCE OF THE IGNITION. Make sure to put out the flaming newspaper!
4. If the forge does not light immediately, turn OFF the gas and let the forge chamber ventilate for a few minutes before relighting to ensure there is no residual gas in the forge.
5. Adjust the Pressure Bar / Thumb Screw on the Gas Pressure Regulator to 50 kPa as indicated by the Gas Pressure Gage to allow for a low / soft burn and let it idle for at least 60 seconds to heat up the burner nozzle.
6. Ensure that there are NO gas leaks present – Refer to the Gas Leak Detection section of this manual.

### Switching Off the Forge

Simply reverse the process as described in “Lighting the Forge”.

### Suggested Operating Pressures

The MKII Damascus Forge should consume approximately 3.2 kg to 3.5kg of gas per hour at a working pressure of 100 kPa, while running both burners simultaneously.

Pressures:

- General forging is done between 70 to 100 kPa.
- Normalizing and heat treatment is done between 20 to 30 kPa.
- Welding heats are reached between 100 and 130 kPa.
- Avoid pressures above 150 kPa as this results in dangerous pressure in the hoses and overall system and will not aid in overall forge performance.

Note that these pressures are just guides and will vary from forge to forge, but largely depend on the following; your height above sea level, the capacity of your cylinders and how full they are, and the ambient temperature.

### **Fuel to Air Mixture**

You will notice that each burner have a yellow sliding “choke” that can be adjusted to affect the air intake into the burner. As with a cars carburettor, the ratio of fuel to air mixture needs to be balanced. You are trying to achieve a neutral to slightly fuel rich flame. You will find this by experimentation and notice when your forge air supply is set correctly that it produces a nice “roar” and that there is not too much scaling on your steel.

TIP: When making Damascus you notice that your flux is “dry” on the billet at welding temperature, turn the air down a bit and the flux will become liquid again.

## **SAFETY**

Make sure that you always wear the following safety equipment when ever you use your forge:

- Safety glasses that protect against UVA and UVB rays
- Cotton clothes
- Leather gloves
- Leather apron
- Closed leather shoes

### **Fire Extinguisher**

The acquisition and installation of a dry powder fire extinguisher of size at least 9 kg that complies with SANS 1910 is required for installations of combined capacity in excess of 100 kg of gas. (i.e. Two 48 kg cylinders), however it is suggested that one is installed for capacities less than this too. The extinguisher shall be installed near to the work area; it should be securely mounted and its position should be indicated in an approved manner with appropriate symbolic signs.

### **Safety Tips**

- Do not stare into the flame, only look at your work periodically as it heats up.
- Have your dry powder fire extinguisher within reach.
- Have a bucket of water with a wet towel in it in case of fire.
- Make sure your garden hose pipe can reach your work place.
- Don't be distracted and forget your work in the forge.
- Prior to locking up your workshop, check to see that nothing has been set alight (use your eyes and nose too) and that your gas is properly turned off at the cylinder.

- If you have an accidental accumulation of unburnt gas in the work area, make sure that it is well ventilated and that you cannot smell any gas at ground level before relighting your forge.
- Never leave the lit forge unattended.
- Do not rest your work in the forge unattended – this could cause the forge to topple over. Hold the tongs or handle of your work with your hands or use a work rest at the appropriate height.
- Remember that the forge chamber will remain extremely HOT for at least 2 to 3 hours after completely switching off the forge.

Material Safety Data Sheet (MSDS) for LP Gas

# MATERIAL SAFETY DATA SHEET (MSDS)

## LIQUEFIED PETROLEUM GAS & PROPANE

Please ensure that this MSDS is received by the appropriate person

DATE: May 2008 Version no.1

### 1 PRODUCT AND COMPANY IDENTIFICATION

#### PRODUCT IDENTIFICATION

**Product Name** HANDIGAS (LIQUEFIED PETROLEUM GAS)  
**Chemical Formula** C3H8 PLUS C4 H10 PLUS C3 H8  
**Trade Name** Handigas  
**Colour Coding** Plascon Dark Admiralty Grey (SABS 1091 – G.12) body, with a HANDIGAS decal affixed to the cylinder. All cylinders fitted with an internal eductor tube for liquid withdrawal shall be clearly marked with two Yellow (B.49) stripes painted diametrically opposite each other along the length of the cylinder.  
**Valve** Brass 5/8 inch BSP left hand female, either single or two-way outlet.  
**Company Identification** African Oxygen Limited  
 23 Webber Street  
 Johannesburg, 2001  
 Tel. No: (011) 490-0400  
 Fax No: (011) 490-0506

**EMERGENCY No** 0800147112 (24 hr) (HAZMAT)  
**10752** **COMPOSITION/INFORMATION**

#### ON INGREDIENTS

<b>Chemical Name</b>	Butane / Propane / Propylene		
<b>Chemical Family</b>	Aliphatic Hydrocarbon		
<b>CAS No.</b>	Butane	106-97-8	UN No. 1075
	Propane	74-98-6	UN No. 1978
	Propylene	115-07-01	UN No. 1077
<b>UN No.</b>	1075		
<b>ERG No.</b>	115		
<b>Hazchem Warning</b>	2A Flammable gas		

### 3 HAZARDS IDENTIFICATION

**Main Hazards** All cylinders are portable gas containers, and must be regarded as pressure vessels at all times.

Vapourised liquefied petroleum gas is highly flammable and can form explosive mixtures with air. The vapourised liquid does not support life. It can act as a simple asphyxiant by diluting the concentration of oxygen in the air below the levels necessary to support life. It can act as a simple asphyxiant.

**Adverse Health effects.** The liquefied petroleum gases are non-toxic. Prolonged inhalation of high concentrations has an anaesthetic effect.

**Chemical Hazards** Propane and butane (known most extensively in commercial and popular terms as LP gas or LPG) have an extremely wide range of domestic, industrial, commercial, agricultural and internal combustion engine uses. It is estimated that the two gases, un-mixed and in mixtures, have several thousand industrial applications and many more in other fields. Their very broad application stems from their occurrences as hydrocarbons between natural gas and natural gasoline, and from their corresponding properties. As a result of their wide application, misuse could result in serious chemical hazards.

**Biological Hazards.** Contact with the liquid phase of liquefied petroleum gases with the skin can result in frostbite.

**Vapour Inhalation** As the vaporized liquid acts as a simple asphyxiant death may result from errors in judgement, confusion, or loss of consciousness, which prevents self-rescue. At low oxygen concentrations, unconsciousness and death may occur in seconds without warning.

**Eye Contact** The liquid can cause severe burn-like injuries.

**Skin Contact** Contact with the liquid phase can cause severe burn-like injuries.

**Ingestion** No known effect.

### 4 FIRST AID MEASURES

Prompt medical attention is mandatory in all cases of overexposure to vaporized liquefied petroleum gas. Rescue personnel should be equipped with self-contained breathing apparatus. In the case of frostbite from contact with the liquid phase, place the frostbitten part in warm water, about 40 - 42°C. If warm water is not available, or is impractical to use, wrap the affected part gently in blankets. Encourage the patient to exercise the affected part whilst it is being warmed. Do not remove clothing whilst frosted. Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be removed to an uncontaminated area, and given mouth-to-mouth resuscitation and supplemental oxygen.

**Eye Contact (With the liquid phase)** Immediately flush with large quantities of tepid water, or with sterile saline solution. Seek medical attention.

**Skin Contact (With the liquid phase)** See above for handling of frostbite.

**Ingestion** No known effect.

### 5 FIRE FIGHTING MEASURES

**Extinguishing media** Do not extinguish fire unless the leakage can be stopped. DO NOT USE WATER JET. Use dry chemical, CO<sub>2</sub> or foam.

**Specific Hazards** The rupturing of cylinders or bulk containers due to excessive exposure to a fire could result in a BLEVE (Boiling Liquid Expanding Vapour Explosion), with disastrous effects. As the flammability limits in air for the main constituents of liquefied petroleum gas vary between approximately 2 and 11% by vol, extreme care must be taken when handling leaks.

**Emergency Actions** If possible, shut off the source of the spillage. Evacuate area. Post notices "NO NAKED LIGHTS - NO SMOKING" Prevent liquid or vapour from entering sewers, basements and workpits. Keep cylinders or bulk vessels cool by spraying with water if exposed to a fire. If tanker has overturned, do not attempt to right or move it. CONTACT THE NEAREST AFROX BRANCH.

**Protective Clothing** Self-contained breathing apparatus. Safety gloves and shoes, or boots, should be worn when handling containers.

**Environmental precautions.** Vapourised liquefied petroleum gas is heavier than air and could form pockets of oxygen-deficient atmosphere in low-lying areas.

### 6 ACCIDENTAL RELEASE MEASURES

**Personal Precautions.** Do not enter any area where liquefied petroleum gas has been spilled unless tests have shown that it is safe to do so.

**Environmental precautions.** The danger of widespread formation of explosive LPG/Air mixtures should be taken into account. Accidental ignition could result in a massive explosion.

**Small spills** DO NOT extinguish the fire unless the leakage can be stopped immediately. Once the fire has been extinguished and all spills have been stopped, ventilate the area.

**Large spills** Stop the source if it can be done without risk. Contain the leaking liquid, with sand or earth, or disperse with special water/fog spray nozzle. Allow to evaporate. Restrict access to the area until completion of the clean-up procedure. Ventilate the area using forced-draught if necessary. All electrical equipment must be flameproof.

**7 HANDLING AND STORAGE** Cylinders containing liquefied petroleum gas should only be handled and stored in the vertical position. Cylinders should never be rolled. Do not allow cylinders to slide or come into contact with sharp edges and they should be handled carefully. Ensure that cylinders are stored away from other oxidants. Comply with all local legislation.

**8 EXPOSURE CONTROLS/PERSONAL PROTECTION**

**Occupational Exposure Hazards.** As vapourised LPG is a simple asphyxiant, avoid any areas where spillage has taken place.

**Engineering control measures.** Engineering control measures are preferred to reduce exposure to Oxygen-depleted atmospheres.

General methods include forced-draught ventilation, separate from other exhaust ventilation systems. Ensure that all electrical equipment is flameproof.

**Personal protection.** Self-contained breathing apparatus should always be worn when entering area where oxygen depletion may have occurred. Safety goggles, gloves and shoes, or boots, should be worn when handling containers.

**Skin.** Wear loose-fitting overalls, preferably without pockets.

**9 PHYSICAL AND CHEMICAL PROPERTIES**

**PHYSICAL DATA**

Specific Volume @ 20°C & 101,325 kPa	471ml/g
Auto ignition temperature	±450°C
Relative density (Air=1) @ 101,325 kPa	+1,75
Flammability in air	2,2 - 9,6%
Colour - Liquid	Clear
Taste	None
Odour	Ethyl Mercaptan Added
Specification	SABS 690

**10 STABILITY AND REACTIVITY**

**Conditions to avoid** The dilution of the oxygen concentration in the atmosphere to levels which cannot support life. The formation of explosive gas/air mixtures.

**Incompatible Materials.** Any common, commercially available metals may be used with commercial (or higher) grades of liquefied petroleum gases because they are non-corrosive, though installations must be designed to withstand the pressures involved and must comply with all state and local regulations.

**Hazardous Decomposition Products.** The constituents of liquefied petroleum gas are relatively stable. However, on combustion, toxic compositions, typically carbon monoxide may be formed, depending on conditions.

**11 TOXICOLOGICAL INFORMATION**

Acute Toxicity	TLV 1000 VPM.
Skin & eye contact	No known effect.
Carcinogenicity	Severe cold burns can result in carcinoma.

(For further information see Section 3. Adverse Health Effects).

**12 ECOLOGICAL INFORMATION**

Vapourised liquefied petroleum gas is heavier than air, and can cause pockets of oxygen-depleted atmosphere in low-lying areas. It does not pose a hazard to the ecology, unless the gas/air mixture is ignited.

**13 DISPOSAL CONSIDERATIONS**

**Disposal Methods.** Disposal of liquefied petroleum gases, as with other gases, should be undertaken only by personnel familiar with the gas and the procedures for disposal. Contact the supplier for instructions. In general, should it become necessary to dispose of liquefied petroleum gases, the best procedure, as for other flammable gases, is to burn them in any suitable burning unit available in the plant. This should be done in accordance with appropriate regulations.

**Disposal of packaging.** The disposal of cylinders must only be handled by the gas supplier.

**14 TRANSPORT INFORMATION**

**ROAD TRANSPORTATION**

UN No.	1075
ERG No.	115
Hazchem warning	2A-Flammable gas

**SEA TRANSPORTATION**

IMDG	1075
Label	Flammable gas

**AIR TRANSPORTATION**

ICAO/IATA Code	1075
Class	2.1
Packaging group	
Packaging instructions	
- Cargo	200
- Passenger	Forbidden
Maximum quantity allowed	
- Cargo	150kg
- Passenger	Forbidden

**15 REGULATORY INFORMATION**

EEC Hazard class	Flammable
Risk phrases	R2 Risk of explosion by shock, friction, fire or other sources of ignition R13 Extremely flammable liquefied gas R18 In use may form flammable explosive vapour-air mixture R44 Risk of explosion if heated under confinement
Safety phrases	S2 Keep out of reach of children S3 Keep in a cool place S4 Keep away from living quarters S9 Keep container in a well-ventilated place S15 Keep away from heat S16 Keep away from sources of ignition S29 Do not empty into drains S33 Take precautionary measures against static discharges S38 In case of insufficient ventilation, wear suitable respiratory equipment S41 In case of fire and/or explosion do not breathe fumes S51 Use only in well-ventilated areas

Refer to SANS 10265 for explanation of the above.

**16 OTHER INFORMATION**

**Bibliography**  
Compressed Gas Association, Arlington, Virginia  
Handbook of Compressed Gases - 3rd Edition  
Matheson. Matheson Gas Data Book - 8th Edition  
SANS 10265 - Labelling of Dangerous Substances

**17 EXCLUSION OF LIABILITY**

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