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An ongoing programme is underway to ensure cylinder colours comply with EN1089-3. Repainting is taking place at the time of scheduled cylinder testing. Until this programme is completed, cylinders bearing both the old & new colour schemes will be circulation.

**IMPORTANT**
Read all cylinder labels & stencilled marks.
Do not rely on colour of cylinder alone.
Never lift or crane a cylinder using its guard.

*Colour chart shown is with permission from ‘Air Liquide’*

### Generic & Special Gas Mixtures

<table>
<thead>
<tr>
<th>NEW</th>
<th>OLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Toxic</td>
</tr>
<tr>
<td>2</td>
<td>Flammable</td>
</tr>
<tr>
<td>3</td>
<td>Oxidising</td>
</tr>
<tr>
<td>4</td>
<td>Inert/Unreactive</td>
</tr>
<tr>
<td>5</td>
<td>Toxic &amp; Flammable</td>
</tr>
<tr>
<td>6</td>
<td>Toxic &amp; Oxidant</td>
</tr>
</tbody>
</table>
Standard Gases & Welding Mixtures

1. Acetylene
2. Air (blended)
3. Ammonia
4. Argon
5. Carbon Dioxide (non-dip)
5b. Carbon Dioxide (dip tube)
6. Carbon Monoxide
7. Chlorine
8. Helihi (Balloon Gas)
9. Helium
10. Hydrogen
11. Krypton
12. Methane
13. Neon
14. Nitrogen
15. Nitrous Oxide
16. Oxygen
17. Propane
18. Xenon
19. Welding Mixtures (Argon/CO₂ & Argon/CO₂) & Exellar
20. Hylar 1 & 2
21. Hylar 5, 8 & 35
22. Stellar (Helium/Argon & Helium/Argon/CO₂ Mixtures)
Different gas types have differing connections to reduce the possibility of cross connection.

Valve outlets are not unique to all gases. Note: Oxygen has the same outlet thread connection as inert gases like Nitrogen or Argon.

Gas users must check cylinder label for compatibility to equipment being connected.

Equipment for oxygen service must be specified for oxygen service & not used for other gases.

Equipment must match the valve outlet connection to ensure a safe, leak free union.

- Flammable gases have left-hand threads.
- Non-flammable gases have right-hand threads.

### Single Cylinder Valve Standard Fitted

<table>
<thead>
<tr>
<th>Pressure Range</th>
<th>Valve Standard Fitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 250 bar</td>
<td>BS 341</td>
</tr>
<tr>
<td>250- 300 bar</td>
<td>BS ISO 5145 (Identical to New European Valve Outlet Connection –NEVOC connections)</td>
</tr>
</tbody>
</table>

### Air Liquide Bank/ Bundles Valve Standard Fitted

<table>
<thead>
<tr>
<th>Pressure Range</th>
<th>Valve Standard Fitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 250 bar</td>
<td>Identical pair of BS341 outlet defined by gas type</td>
</tr>
</tbody>
</table>
| 300 bar        | Two Valve Outlets:  
1. 300 bar Mandatory NEVOC Connection delivering full pressure  
2. BS341 pressure reduced delivering circa 160 bar |

![BS341 Valve on a 200 bar Helium cylinder](image1)

![NEVOC Valve on a 300 bar Helium cylinder showing external thread](image2)
GAS PROPERTIES  ALWAYS REFER TO SAFETY DATA SHEETS

<table>
<thead>
<tr>
<th>FLAMMABLE</th>
<th>ACETYLENE</th>
<th>PROPANE</th>
<th>BUTANE</th>
<th>HYDROGEN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C₂H₂</td>
<td>C₃H₈</td>
<td>C₄H₁₀</td>
<td></td>
</tr>
<tr>
<td>OXIDISING</td>
<td>OXYGEN</td>
<td>NITROUS</td>
<td>FLUORINE</td>
<td>CHLORINE</td>
</tr>
<tr>
<td></td>
<td>O₂</td>
<td>OXIDE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INERT</td>
<td>NITROGEN</td>
<td>ARGON</td>
<td>CARBON</td>
<td>HELIUM</td>
</tr>
<tr>
<td></td>
<td>N₂</td>
<td>Ar</td>
<td>DIOXIDE</td>
<td></td>
</tr>
<tr>
<td>CORROSIVE</td>
<td>CHLORINE</td>
<td>AMMONIA</td>
<td></td>
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<tr>
<td>TOXIC</td>
<td>CARBON</td>
<td>SULPHUR</td>
<td>AMMONIA</td>
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<tr>
<td></td>
<td>MONOXIDE</td>
<td>DIOXIDE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PYROPHORIC</td>
<td>SILANE</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**SPECIFIC GRAVITIES @ 15°C IN RELATION TO AIR**

- Hydrogen 0.06
- Helium 0.1
- Nitrogen 0.9
- Oxygen 1.1
- Argon 1.4
- Carbon Dioxide 1.5
- Propane 1.5
OXYGEN

Oxidising Gas
Colourless, odourless, tasteless, supports life.
Forms 21% of the atmosphere.
Additional 3% Oxygen in an atmosphere may prevent fires being put out with water.
Reacts violently with hydrocarbons such as oils, greases, paints & solvents.
May be leak checked with an appropriate Leak Detecting Fluid - should not be leak checked with soap solutions.
PTFE tapes should not be used on Oxygen regulators & fittings. (A specialised PTFE may be seen being used in some applications where applied by competent qualified engineers only.)
Strongly supports combustion & may be a particular hazard if released into confined spaces.
Slightly heavier than air with a Specific Gravity of 1.1 where air = 1.
Fittings are right hand thread.
Hose on welding sets is normally coloured blue.
Cylinder has no safety relief device fitted.
Gas obtained from the air through liquefaction.
The absence of Oxygen leads to asphyxiation:
a. 18% or less is considered dangerous
b. 10% leads to unconsciousness
c. Below 10% usually fatal
Refer to page 55 for further effects of Oxygen deficiency
GAS PROPERTIES  ALWAYS REFER TO SAFETY DATA SHEETS

ACETYLENE

Highly explosive gas with a flammability range of between 2.5 - 81% in air.
Gas has a natural garlic-like odour.
Manufactured by dissolving Calcium Carbide into water.
Gas slightly lighter than air with a Specific Gravity of 0.9 where air = 1.
Inside the cylinder the gas is dissolved in Acetone & stabilised within the porous mass.
Reacts with Copper, Silver & Mercury to form the explosive compound, Acetylide.
Connections & fittings are notched left hand thread.
Hose on welding sets coloured red.
Cylinder should preferably be stored & moved with the valve uppermost to prevent Acetone within the cylinder being drawn over with the gas.
Do not approach or move cylinders that have been involved in fires or are generating their own heat.
Cylinders may have bursting discs or fusible plugs which may operate in a fire.
ARGON

Inert Gas.
Colourless, odourless & tasteless.
Forms less than 1% of the atmosphere.
A simple asphyxiant as it can displace Oxygen.
The absence of Oxygen leads to asphyxiation:
  a. 18% or less is considered dangerous
  b. 10% leads to unconsciousness
  c. Below 10% usually fatal

Heavier than air with a Specific Gravity of 1.4 where air = 1.
Fittings right hand thread.
Hose coloured black.
Obtained through the liquefaction of air.
Cylinder has no pressure relief devices fitted.
May be leak checked with an approved leak detecting fluid.
GAS PROPERTIES  ALWAYS REFER TO SAFETY DATA SHEETS

NITROGEN (GASEOUS)

Inert gas.
Colourless, odourless & tasteless.
Forms 78% of the atmosphere.
A simple asphyxiant as it can displace Oxygen.
The absence of Oxygen leads to asphyxiation:
   a. 18% or less is considered dangerous
   b. 10% leads to unconsciousness
   c. Below 10% usually fatal
Slightly lighter than air with a Specific Gravity of 0.9 where air = 1.
Fittings right hand thread.
Hose coloured black.
Obtained through the liquefaction of air.
Cylinder has no pressure relief devices fitted.
May be leak checked with an approved leak detecting fluid.
PROPEANE

Highly flammable gas with a flammability range of between 2-10% in air.
Has been given a distinctive fish-like smell.
Obtained from oil.
Cylinder contains liquid Propane with the gas forming above it.
Heavier than air with a Specific Gravity of 1.5 where air = 1.
Will collect in low-lying areas such as ducts, trenches, basements & pits.
An asphyxiant where it displaces air.
Hose coloured orange.
Connections are notched left hand thread.
Propane cylinders must be stored & transported in an upright position. (Fork lift truck cylinders when attached to the vehicle are considered to be in use but must be stored & transported upright once removed from the vehicle.)
May cause cold burns.
HYDROGEN

Highly flammable.

Colourless, odourless & tasteless gas.

Lighter than air with a Specific Gravity of 0.06 where air = 1.

Non-toxic but may act as an asphyxiant in high concentrations.

Flammability range in air 4-75% by volume.

Hydrogen diffuses rapidly & may leak from systems which may be gas tight for other gases.

Never ‘sniff’ Hydrogen cylinders, Hydrogen has a very low energy of ignition & may ignite if released suddenly from the cylinder.

Gas flame is invisible in normal light.

Consider non spark tools.

Protect from sources of heat & ignition.

Consider earthing lines & equipment where there is the possibility of electrostatic discharge.

Use appropriate leak detection methods.

Specialist Hydrogen monitors may warn of the build up of gas in the workspace.
AMMONIA

Flammable liquefied gas.
Toxic by inhalation; colourless.
Lighter than air with a Specific Gravity of 0.6 where air = 1.
Flammability range 15-30% by volume in air.
Corrosive effects to eyes, respiratory system & skin.
In a fire may produce the following toxic &/or corrosive fumes by thermal decomposition:
Nitric Oxide; Nitrogen Dioxide.
May react violently with oxidants.
May react violently with acids.
Reacts with water to form corrosive alkalis.
Wear suitable protective clothing, gloves, eye & face protection.
Extinguishing a leaking gas flame may lead to spontaneous or explosive re-ignition.
Containers should normally be kept below 50°C in a well ventilated area.
Purge air from system before introducing gas.
UK Long-Term Exposure Limit 25 ppm.
UK Short -Term Exposure Limit 35 ppm.
HELUM

Inert gas.
A colourless odourless gas.
Lighter than air with a Specific Gravity of 0.14 where air = 1.
An asphyxiant in high concentrations.
Helium diffuses rapidly & may leak from systems that are gas tight for other gases.
GAS PROPERTIES ALWAYS REFER TO SAFETY DATA SHEETS

CARBON DIOXIDE

Non-toxic liquefied gas under pressure.
Odour in the form of a sharp smell may become apparent at high concentrations.
Asphyxiating in high concentrations.
Heavier than air with a Specific Gravity of 1.5 where air = 1.
Slightly corrosive in the presence of moisture.
If Carbon Dioxide is dissolved in water, particularly at elevated pressures & in the presence of Oxygen, materials resistant to Carbonic Acid need to be considered.
Use only properly specified equipment for this product.
One volume of liquid will give approximately 500 volumes of gas.
Contact with liquid may cause cold burns &/or frostbite.
Low concentrations of Carbon Dioxide cause increased respiration & headache.
Refer to page 56 for effects of Carbon Dioxide enrichment.
Short-Term Exposure Limit 15,000 volume parts per million.
Long-Term Exposure Limit 5,000 volume parts per million.
Sublimes from solid form (Dry Ice) at -78°C.
Use in well ventilated areas.
Carbon Dioxide monitoring is recommended if it is used or stored in confined spaces.
Cylinder vapour pressure above liquid product is 57.3 bar at 20°C.
REGULATORS BEFORE USE CHECKS

**Cylinder**
Correctly labelled &/or certificated by Supplier.
Cylinder colour appropriate to the label.
(Reject if information incorrect)
Contents appropriate for application.
Cylinder pressure not more than regulator pressure rating.
Secured against movement.

**Cylinder Valve**
Capped if new.
Undamaged.
Free from oils, greases & PTFE tape.
Free from moisture, dirt & debris.

**Regulator Body & Pressure Adjustment Screw**
Label in place.
Undamaged.
Max inlet pressure appropriate for the cylinder in use.
Max outlet pressure appropriate for application.
Manufacturers name / logo in place.
Pressure Adjustment Screw stays fixed to the body of the regulator.
*Note: there are exceptions to this rule - some Nitrogen & Hydrogen regulators for example have a ‘T’ bar system which may be removable.*
Pressure Adjustment Screw operates freely & to full extent.
European or British Standard BS EN 2503.
Check the regulator is not due its ‘Periodic recorded examination’.
Regulator Bullnose
Bullnose free from damage.
*Note: In some instances a rubber 'o' seal may be present - this should only be replaced with an approved part.*
Threads undamaged.
Free from oil greases, solvents & PTFE tape 90° to the body.
Tightening nut undamaged & of correct thread type.
Free from unauthorised modifications or repairs.

Regulator Outlet Connection
Threads undamaged.
Free from oil, greases, solvents, PTFE tape & carbon deposits.
Free from unauthorised modifications or repairs.

Regulator Pressure Relief Valves
External—no damage, free from unauthorised modifications or repairs.
Internal—outlet opening free from obstruction.

Regulator Gauges
In place & correct for the gas type.
Marked EN562 &/or ISO5171.
Clear covers in place & undamaged.
Needles reading zero, correct side of stop, not bent.
Appropriate high & low pressure scales.
Backs in place.
Free from unauthorised modifications or repairs.

Five Year Rule
Manufacturer date stamp present or regulator known to be less than 5 years old.
*Note: It is recommended that regulators should not be used where they are more than 5 years old.*
(or whatever service life the manufacturer recommends)

Connect to Cylinder
Only if in good condition & passing the above checks
Rising Pressure Characteristic

To open the regulator valve, force is applied via the spring. The force of the spring must be sufficient to overcome the gas cylinder pressure which is acting to close the internal valve pin. During use the cylinder pressure decreases therefore the force acting to close the valve also decreases. The result is that the pressure adjustment screw spring forces the valve open further. Consequently the pressure rises on the low-pressure side of the regulator & the low pressure gauge indicates an increase in outlet pressure.

An outlet pressure rise of 50% is typically experienced during operation & must be countered by winding out the pressure adjustment screw slightly at intervals over prolonged use.

The above chart shows the rising pressure characteristic of a single stage regulator. In this example the regulator has been set to 30 psi.
Multi stage regulators are basically two regulators placed in series.

The first stage reduces the pressure from the cylinder down to approximately 20 bar which is then fed into the second stage.

This means that the spring & diaphragm, acting on the valve, only act against a pressure of 20 bar at any time. The result is that the rising pressure characteristic is virtually eliminated.

Typical rise in pressure for two-stage regulators is 2-3% over the life of the cylinder.
Creep
It is important that cylinder valves are opened slowly to prevent damage to the nonmetallic parts within a regulator. Such damage can lead to creep which appears as a slow increase of pressure on the outlet side of the regulator. The majority of internal damage to valve seats manifests itself as creep.

Adiabatic Compression
Definition: No heat is transferred from (or to) the gas during the compression process, all the heat is retained within the gas. The result is that the gas heats rapidly with no transfer of heat to the surrounds.

When the cylinder valve is opened quickly, compression heat is generated by the gas rapidly entering the regulator.

Inert gases such as Argon also generate heat under such conditions.

Where the gas is Oxygen the consequences can be serious.

If Oxygen is present with hydrocarbons such as oil or grease, the result can be an ignition.

**IT MUST BE REMEMBERED THAT THE OXYGEN DOES NOT BURN BUT SUPPORTS THE COMBUSTION OF THE HYDROCARBON.**

Once the ignition has been established the Oxygen may use the regulator components as a fuel source.

Consequently regulator bodies are made of brass, as copper & copper based alloys are generally far less likely to burn than steel.

Inappropriate PTFE tapes, contamination & dirt can, under conditions of high gas velocities &/or adiabatic compressions, lead to Oxygen regulator fires. For that reason PTFE tapes should not be used on the regulator bullnose or fittings.
Hose
Correct colour code for the gas type in use.
Entire length undamaged.
Protected from damage.
Marked to the correct standard:
  BS EN 559 rubber / ISO 3821:2008
  BS EN 1327 thermoplastic
  BS EN ISO 14113 rubber & plastic hose assemblies (450 bar)

Hose Connections
Correct standards:
  BS EN 560 Hose connections
  BS EN 561 Quick action couplings

No reusable worm-drive clips.
Free from contamination, oils greases etc.
PTFE taped joints should not be used.

Hose Repairs
It is not recommended that hoses be repaired - they should be replaced.

Hose Length
No longer than is necessary for the task in hand; if long lengths are often required consider permanent piping.
Hose Fittings

Quarter Inch Non Return Valve (Hose Check Valve)
Left Hand Thread

Hose Nipple or Tail

Nut Coupling
Right Hand Thread

Five Eighths Non Return Valve
Right Hand Thread

Equal Coupler
Left Hand Thread

Unequal Coupler
Right Hand Thread

Hose Splicer

‘O’ Clips
FLASHBACK ARRESTORS

Flashback Arrestors
These should be used where Oxygen & Fuel gas are in use supplying the same equipment. (See Page 23)
Replace every 5 years or according to manufacturer’s recommendations.

5 Year Life
Check the manufacturer’s date stamp or coding.
Not all manufacturers may date the flashback arrestors.
If code not present ascertain from purchase records or management whether the arrestor is under 5 years old.
If in doubt replace.

Flashback Arrestor Date Coding Positioning Examples:

Before Using a Flashback Arrestor Check:
Appropriate for the gas in use.
The body is free from damage, contamination & correctly labelled.
Conforms to BS EN 730.
Connections are free from oil, grease, PTFE tape & other contamination.
Appropriate Maximum Working Pressure of the FBA.
Reset button or lever:
Check for gas flow in the operating position; if no gas flow, check for signs of damage caused by previous flashback on the flashback arrestor or any attached hoses & regulators.
FLASHBACK ARRESTORS

Number of Flashback Arrestors Fitted
For systems with hoses well in excess of 3 metres long &/or hoses greater than 6.3 mm bore, a second flashback arrestor should be considered at the torch end.

Seek advice from the system supplier as the flow capacity of the system may be reduced due to the additional flashback arrestor.

Risk Assess the system.

Attach the flashback arrestor only if it passes the above checks

Minimum Safety Requirement For all Hose Sizes & Lengths
1 Flashback arrestor incorporating a pressure sensitive cut off valve or a non-return valve, plus a temperature sensitive cut off valve.
2 Hose check valve (non-return valve).
FLASHBACKS

Flashback
A potentially serious occurrence where a detonation takes place within the system & a high velocity pressure wave is generated. This ‘explosion’ may cause damage to the system.

It is vital that the necessary safety equipment such as a Flashback Arrestor is used.

A flashback explosion propagating back into an Acetylene cylinder can lead to very serious incidents.

Flashback arrestors should be considered for all systems where a Fuel gas & Oxygen are used together in process equipment. (See Page 23)

Causes
Failure to purge equipment / Faulty or damaged equipment. Operator error; i.e. incorrect light up procedure. Incorrect equipment selection. Gas velocity is less than flame burning velocity. Wrong size, blocked or dirty nozzle in use. Incorrect pressures set. No hose check valves (non return valves) in system. Kinked or trapped hoses. Failure to undertake routine maintenance.

It is vital to purge equipment before use.
This is done to remove air or combustible gas mixtures from the process hoses thus preventing ignition.

Fuel gas is allowed to flow through the system for a few seconds thus pushing out unwanted air or gas mixtures. Ensure the unwanted gas is vented safely to the atmosphere. Avoid carrying out this operation in confined spaces.

90% of all flashback incidents are caused by failure to carry out a purging procedure.
With a gloved hand immediately close the cylinder valve. 
If using Acetylene check the cylinder for signs of heat. Start at the top using the back of the hand & move down the cylinder. 
If the cylinder appears to generate heat at any time immediately evacuate the area & call the Fire Brigade. 

**Under no circumstances attempt to move an Acetylene cylinder which is generating its own heat!**

If the cylinder remains cool thoroughly check all equipment for damage.

Hoses showing signs of damage caused by the flashback must not be repaired.

It is not acceptable to cut out a damaged section & rejoin the hose.

Replace damaged hoses.

Consider checking the Acetylene cylinder for heat generation at intervals for a time after the initial flashback.

*When welding & cutting remember the correct eye, face & safety clothing such as gloves, aprons, overalls etc should always be worn.*

*For laboratory or other process equipment always check with the equipment manufacturer the initial set up & emergency actions required in the event of a flashback.*

They can also advise on the type & number of flashback arrestors to be used on their systems.
MOBILE OXY-FUEL SYSTEMS  BEFORE USE CHECKS

Cylinders
Upright & secured in an appropriate trolley or against a wall. Correctly labelled & colour coded to identify the gases & fill pressures. Valve outlets undamaged, clean & uncontaminated by oil, grease, solvents or PTFE tape.

Regulator Body (see pages 15-16)
Labelled, Manufacturer’s name displayed. Undamaged, standard marked BS EN 2503. Pressure Adjustment Screw fixed to body & operates freely. Inlet & outlet pressure appropriate.

Bullnose (Not applicable if regulator already fitted)
Undamaged uncontaminated & unmodified 90° to body.

Outlet Connection (Not applicable if regulator already fitted)
Undamaged uncontaminated & unmodified.

Pressure Relief Valve
If fitted, undamaged & unmodified.

Gauges
In place & correct type. Undamaged uncontaminated & unmodified; backs in place Needles zero, correct side of stop & not bent.

Non Return / Hose Check Valves / Flame Traps
Non return valve in good condition; one per hose fitted at the torch end.

Connections
Undamaged, correct type of crimp fitting & fit for purpose. No worm wheel drive clips.

PTFE Tape
Check components & fittings are free from PTFE tape, joining compounds & sealants. PTFE tape shall not be used.
MOBILE OXY-FUEL SYSTEMS  BEFORE USE CHECKS

Flashback Arrestors (see pages 22-23)
Body undamaged, standard marked EN 730.
Connections clean, uncontaminated.
Pressure rating legible & suitable for cylinder.
Date Stamp or Code less than 5 years or within manufacturer’s recommended life.
Reset Button/Lever/Cap if fitted, not tied down, restricted, modified or damaged. Easily accessible.

Hoses (see pages 20-21)
Correct colour code & Standard marked EN 559 / ISO 3821:2008
Undamaged.
Appropriate hose clips; no tapes or wires.
Uncoiled & unwrapped from cylinders when in use.

Hose Fittings
Appropriate thread; clean & uncontaminated.

Hose Repairs
If hoses have been repaired check they have been repaired competently using BS EN 560 fittings & the whole assembly fitted to BS EN 1256.
Hose repairs however are not recommended.

Torch
Designed & rated for the gas & application to BS EN 5172.
Undamaged & fit for purpose.

Rotary Valves
Operate freely; undamaged.

Lever Valve
No excessive play.

Inlet Filters & Connections
Clean & uncontaminated.
MOBILE OXY-FUEL SYSTEMS  BEFORE USE CHECKS

Body
Undamaged; uncontaminated; no discolouration.

Pipework
Straight & undamaged.

Nozzle
Correct type; undamaged; uncontaminated.
Designed & rated for the gas & torch type.
Correct for the job in hand.
Pressure correct for nozzle size & task - refer to Nozzle Data Sheets available from the manufacturer.

Nozzle Seat
Undamaged; uncontaminated; threads in good condition.
Round in shape (not oval).

Leak check all system
(Use approved leak detector solution only.)
This is a typical light up procedure - remember to always follow the manufacturer’s operating instructions & company procedures.

The content of the Safety Data Sheets for the gases being used should be available & be understood.

Precautions
- Local fire procedure followed
- Fire extinguishers available
- Appropriate PPE in use
- Cylinders secured
- Gas type & pressures appropriate

System Checks
- Before use checks completed
- Ensure torch valves remain closed on completion

Cylinder Valves & Regulator
- Ensure Oxygen & fuel gas cylinder valves open 1½ turns
- Set initial regulator working pressures

Purge Oxygen & Fuel Gas Hoses in Turn

Purging should only take place in well ventilated areas & not in confined spaces
- Open torch valve
- Check for gas flow & adjust regulator working pressure if necessary
- Completely purge hose
- Ensure torch valves are closed before proceeding

Lighting the System

Naked flames must not be used
- Use correct spark lighter for fuel gas in use
- Open fuel gas torch valve
- Light the torch
- For Acetylene increase fuel gas to reduce smoke if necessary
- Slowly open the Oxygen torch valve until a clear sharply defined flame is achieved
MOBILE OXY-FUEL SYSTEMS SHUTTING DOWN

This is a typical shut down procedure - remember to always follow manufacturers operating instructions & company procedures - for confined spaces & ship holds different procedures may apply.

The fuel gas is normally switched off first
Consult equipment supplier’s handbook as there may be variations
✓ Extinguish the working flame at the torch
✓ Fuel gas off
✓ Oxygen off

Vent System (Until no gas remaining)
✓ Turn the cylinder valve keys clockwise until closed
✓ Open torch valves in turn
✓ Vent the gas from each of the hoses
✓ Check gauges reading zero

Close Torch Valves
✓ Close all torch valves

Close Regulator
✓ Close regulator pressure adjustment screw

CHECK:
No Gas
Three stops employed!
1. Cylinder closed
2. Regulator closed
3. Torch taps closed

Safely Stow Hoses
✓ Preferably not around the cylinders
✓ Remove cylinders from any confined space

Long Period Shut Down
✓ According to locally agreed procedures
✓ May extend to equipment & regulator removal
✓ Return cylinder to safe storage
✓ Check valve shut & leak tight
**Before Use Checks**

**Cylinders**
Upright & secured in an appropriate trolley or against a permanent fixture.

**Labelling**
Cylinder correctly labelled &/or certificated. Cylinder colour appropriate to the label. Cylinder contents appropriate for application. Cylinder pressure not greater than regulator pressure rating.

**Valve**
Prior to connecting any equipment check the cylinder valve outlets are undamaged clean & uncontaminated by oil, grease, solvents or PTFE tapes.

**Regulator** See Pages 15-16

**Hoses** See Page 20-21

**Flame Arrestors & Cut-off Valves**
Inert gases do not require non-return valves in the hoses.

**Oxygen or Flammable Gases -**
*No ignition source present*
If Oxygen or a flammable gas are used individually in a process, flame arrestors are optional if no other ignition source is present.

**Oxygen & Flammable Gases -**
*Ignition source present*
If Oxygen is used in conjunction with a flammable gas, a **non-return valve** is required at the process equipment connection on both gas hose assembly supply lines. Flame arrestor & cut-off valves should be fitted at the regulator outlet connection on both gas supply lines.
Hose Length
No longer than is necessary for the task in hand - if long lengths are needed consider permanent piping. (BCGA CP4)

PPE Personal Protective Equipment
Appropriate for the task in hand.
Gloves; Safety shoes; Overalls;
Glasses (Connecting & disconnecting gases)

Set Up & Shut Down Guidance

Pressurising The System
Understand the manufacturer’s or agreed set up procedures.
Regulator & all downstream valves closed (where appropriate).
Slowly open cylinder valve.
Set regulator to required pressure.
Check for leaks with:
  Approved leak detector fluid or
  pressure drop test
All downstream valves open where appropriate.
Purge system according to local procedures or risk assessments.

Close Down Procedure
Understand the manufacturer’s or agreed shut down procedures.
Close cylinder valve.
Close regulator pressure adjustment screw.
Remove cylinders from confined spaces.

Long Period Shut Down
According to locally agreed procedures.
May extend to equipment & regulator removal.
Check valve shut & leak tight.
Return cylinders to safe storage.
Installation
Adequately signed for products & hazards; secure.

Personal Protective Equipment PPE
Wear appropriate PPE as directed by local procedures.

Cylinders
Numbers should be kept to a minimum.

‘Empty’ Cylinder(s)
Isolate & disconnect prior to removal.
Return to the cylinder store.
Refit caps or blanking nuts as appropriate.
Safely position & secure.

Replacement Cylinder(s)
Correctly labelled &/or certificated by Supplier.
Cylinder colour appropriate to the label.
(Reject if information is incorrect)
Contents appropriate for application.
Cylinder pressure not more than regulator pressure rating.
Position & secure.
Remove tamper evident seals & dispose of correctly.
Displace (but not remove) outlet dust or blanking caps.
Check valve outlet for damage dust or hydrocarbons.
If hydrocarbons are present change the cylinder.
If dust is present remove with lint free cloth or use an OIL FREE compressed air / Nitrogen line.
Check the condition of the ‘pigtails’, valve connections & ‘O’ rings if applicable.
**MANIFOLD SYSTEMS BEFORE USE GUIDANCE**

**Opening Cylinders**
For manifold cylinders, open cylinder valves fully then back off half a turn.
Leave the spindle key with the cylinder.

**Leak Test**
Test all joints with an approved leak test solution or pressure drop test.
Always depressurise the system before rectifying faults.

**Connections**
Never use thread tapes or jointing compounds to stop leaks.

**MANUAL CYLINDER CHANGE-OVER**
The diagram demonstrates flow of gas when ‘In Use’ cylinder is operational, for change over OPEN A - OPEN B - CLOSE C - CLOSE D

[Diagram showing the process of changeover]
MANUAL CYLINDER CHANGEOVER

*Always follow locally agreed procedures.*

Remember the principle:
Identify & start with the Standby Bank.
Operate the valves in the sequence: OPEN-OPEN-CLOSE-CLOSE towards the Working Bank.

**Method**
Change over is performed when cylinder delivery pressure falls to within 2 bar of the required regulator outlet pressure.
(*For Acetylene manifolds this is indicated when the pressure falls in the working bank.)

1. **Open the standby bank cylinder valve slowly,** enough to hear the gas flowing. Once the audible flow has stopped fully open the cylinder valve then back off half a turn.

2. **Open the standby bank isolation valve slowly,** enough to hear the gas flowing. Once the audible flow has stopped fully open the isolation valve then turn it back a half turn so it is clear to others that the valve is in the open position.

3. **Close** the empty bank isolation valve.

4. Change bank signage over to indicate the working bank.

5. **Close** the empty bank cylinder valve.

6. Change the cylinders on the empty bank for full cylinders.

7. Remove empty cylinders to the store.

8. Ensure NO FREE STANDING CYLINDERS.
MANIFOLD SYSTEMS

SEMI AUTOMATIC CHANGE-OVER
Semi automatic manifolds often have the option of an alarm to indicate one cylinder is empty. The manifold automatically selects to the full cylinder(s) to keep continuity of supply. The alarm is to indicate the empty cylinder(s) requires changing.

**Always follow locally agreed procedures or manufacturer’s instructions for the manifold in use as these will take precedence.**

Description (Gas Arc 300 Bar SWP)

1. The alarm indicates the reserve cylinder(s) are in use.
2. Move the operating lever to indicate the bank of cylinders supplying gas.
3. Close all cylinder valves on the ‘empty’ bank.
4. Close the manifold isolation valve
5. Disconnect tailpipes/hoses from the empty bank using an appropriate spanner on the bullnose fitting. *(NOTE: Some gas pressure may be released from the connection; use spark proof spanners on fuel gases.)*
6. Remove one cylinder at a time & return each to the store on a trolley. NO FREE STANDING CYLINDERS.
7. Check cylinder labels confirming correct gas & pressure are suitable for the manifold in use.
8. Place full cylinders in each now vacant manifold position; secure in position with the chain.
9. Remove valve caps & seals; inspect for contamination.
10. Correctly orientate & fit the bullnose & tailpipes.
11. Open each cylinder valve slowly.
12. Leak check.
13. Open manifold isolation valve.
14. Check high pressure gauge is reading in accordance with the pressure on the cylinder label.

**NOTE:** Use only full cylinders as replacements otherwise the manifold will not operate correctly
WEEKLY CHECKLIST

Visually Check Equipment
In good order & being used correctly.

Framework & Chains
In good condition.

Flexible Hoses & Pigtails
No sign of damage

Valves
Shut off & open correctly.

Regulators
Correct types are being used for the pressures & gases in use.
Operate correctly in open & shut positions as appropriate.
Undamaged.

Leaks
No indications of:
  Pressure drop
  Smells of gas
  Other signs of gas loss
  e.g. unaccounted large usage

Oil & Combustible Material
Manifold area is free from contaminants & combustible material.

Incorrect Use of Area
Storage of materials or other incorrect use of manifold room.
CYLINDER HANDLING

Cylinder data sheets should be available which give the weights & types of cylinders.

Handling
Be aware of milk churning techniques & their use over short distances.

Trolleys
Suitable, regularly checked & maintained trolleys should be provided.

Cylinders
Be familiar with the peculiarities of handling cylinders:
- Inherent instability
- Weight
- Shape
- Valve & guard arrangement

Personal Protective Equipment
Wear protective footwear, gloves & goggles when handling cylinders. (This includes management & laboratory staff!)

Lifting Equipment
Can lifting equipment be provided for use as a suitable alternative to manual handling? Cylinders must not be lifted by crane or similar device without the use of a supporting guard & a guard cap/bell in place.

Ledges, Lips & Steps
Check if you have to lift cylinders onto or over:
- Cylinder retaining stands
- Poorly designed trolleys
- Pallet lips
- Large or small concrete sills
- Steps/Ledges

Can alternatives be found? This also applies to inside & outside of the stores area & point of use.
**Use of Forklift Trucks**
Cylinders should be transported upright & secured in an appropriate pallet. Never lay cylinders across the forks of forklift trucks. Should the cylinder fall between the forks the valve & cylinder may be damaged. It has been known for the valve to be completely unscrewed from the cylinder head - the cylinder may torpedo for some considerable distance!

**Cylinders With Carrying Handles**
Small cylinders may be carried using the appropriate carrying handles where provided. Small cylinders should never be carried across the shoulders.

**Emergencies**
Be familiar with the safety relief devices fitted to cylinders & the actions to take should they operate. Be aware that all cylinders, especially Acetylene, should not be abused or dropped from heights. Know the emergency procedure in the event of accidental release of gas or excessive valve damage.

**Beware!**
Secured cylinders where slopes are towards the handler, cylinders in this position may suddenly break free once the restraining straps/chains are removed.

**Never!**
Attempt to catch a falling cylinder. Turn one’s back on an unsecured free-standing cylinder.
VENTILATION

The store should be well-ventilated, preferably outside & in open air.

At least 50% of the perimeter of the storage area should be unobstructed to allow the free flow of air; this may be relaxed for small quantities, if in doubt contact supplier.

Storage of gas cylinders indoors requires great care & you are advised to contact your gas supplier.

SIGNAGE

Designated as follows:
- NO SMOKING area
- No unauthorised personnel
- Fire-fighting equipment
- Gases by type
  - Inert & Oxygen/Flammable/Propane/Toxic/Hydrogen

Full & empty cylinders should be stored separately & signed accordingly.

Refer to storage diagram Page 45 for further information.

FIRE-FIGHTING

The store should have adequate fire-fighting facilities.

At least one 9 kilograms dry powder fire extinguisher at the entrance to the store.

LOCATION

At least 1 metre from site boundary.

Give due regard to low-lying areas such as drains, ducts, trenches, pits & basements where heavier than air gases may accumulate creating hazardous conditions.

Ensure emergency services can gain access to deal with any incident.

To reduce manual handling distances check if the store could be relocated.

Ensure the floor is level to prevent cylinders toppling.
GAS STORES

Construction Considerations
Is the store constructed of non-combustible material?
Is fencing of industrial type & equivalent to 1.8 metres high?
Is provision made for the suitable securing of gas cylinders?
(Typically racking or chain arrangements)
Does the store have suitable exits with outward opening panic bars?
Are emergency exits unobstructed at all times?
Is adequate lighting provided for the reading of cylinder labels?
Are electrical fittings intrinsically safe?
Are electrical appliances placed at a suitable distance & protected? (Refer to Page 44 for instruction)
Consider crash barriers to offer protection from forklift trucks or vehicle impacts - risk assess.
Is the stores area free from standing water or other hazards or obstructions?
Are cylinders required to be lifted manually over lips or edges - risk assess? Consider ramps or lowering or raising of surfaces.

Carbon Dioxide Cylinders
These cylinders are best protected from sunlight.

Toxic Gases
Keep toxic gases in a well ventilated, locked enclosure with access restricted to authorised personnel.
Refer to the distance table Page 44
GAS STORES

Receipt of Cylinders from Supplier
Do not accept gas cylinders from supplier if:
• cylinder label is damaged, missing or incorrect
• tamper proof seals are missing
• cylinder certification is incorrect
• load order/documentation is incorrect

Housekeeping
The gas store should be used exclusively for cylinders. Free from rubbish, combustible materials & other miscellaneous items.

Emergency Procedures
Users should be aware of the emergency procedure used for the stores & drills carried out.
Emergency procedures should be reviewed regularly.
GAS STORES

LPG - Guide to Minimum Separation Distances

Note 1 The distance x is dependent on the total quantity of LPG stored or the larger stack size. Use whichever result gives the greatest distance.

Note 2 LPG cylinders should not be stored closer than 1.5 metres to a firewall if provided. The 1.5 metres need not be applied when the quantity is no more than 400 kilograms &:

1. LPG is stored in a corner between two walls
2. LPG is stored between two winged walls

** A minimum of 2 metres is permissible
3 metres is preferable

*** 8 metres minimum if building houses a vulnerable population

- Liquid Oxygen storage tank
- Bulk LPG vessel > 5000 litres
- Highly flammable liquid
- Vehicles under occupiers control
- Bulk LPG vessels <5000 litres
- Drain, cellar, pit
- Building opening **
- Public boundary
- Public access
- Any building ***
- Fixed ignition source
- Smoking
- Combustible materials

---

7.5 metres

3 metres

x metres

---

44
**GAS STORES**

### Minimum Recommended Separation Distances (Metres)

BCGA GN2 Rev 5 2012 does not show any recommended separation distances between different types of cylinder; risk assessments they have made have shown no safety benefits from such separation.

<table>
<thead>
<tr>
<th>Typical Exposure</th>
<th>Oxidising</th>
<th>Inert &amp; CO2</th>
<th>Flammable</th>
<th>LPG</th>
<th>Toxic Gases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk storage of flammable gases &amp; liquids</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Transportable cryogenic containers</td>
<td>Oxidants</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Unprotected electrical equipment</td>
<td>0</td>
<td>3</td>
<td></td>
<td>1&lt;400kg</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3&gt;400kg</td>
<td></td>
</tr>
<tr>
<td>Site boundaries</td>
<td>1</td>
<td>3</td>
<td>1&lt;400kg</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3&gt;400kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Compressors &amp; Ventilators</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Building openings, pits, basements, cellars</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Smoking, naked flames, heat sources</td>
<td>1</td>
<td>3</td>
<td>1&lt;400kg</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3&gt;400kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combustible materials storage area</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

LPG cylinders should not be placed within 1 metre of a fence.
GAS STORES

Typical Toxic/Corrosive Storage Area

Typical Oxy/Fuel Storage Area

Fire Fighting
At least one 9kg dry powder extinguisher at the entrance

Where access is required a 0.6 metre gap is suggested between full & empty cylinders.

Propane
< 50 kg no specific separation defined.
50 - 1,000 kg diagram distances apply.
> 1,000 kg refer to UKLPG Code of Practice 7.
Empties are classed as full.
Retail & domestic refer to UKLPG Code of Practice 7.
TRANSPORTING GAS CYLINDERS BY ROAD

Vehicle Type:

1. Vehicles Used Solely for Transporting Cylinders
Where possible vehicles should have an open load space e.g. pick-up truck.
Where this is not possible, the load space should be well ventilated. Under ADR 2009, open windows & vehicle fan-assisted ventilation are not adequate.
If an unventilated vehicle is used the loading doors must be signed:

WARNING: NO VENTILATION OPEN WITH CAUTION

2. Mobile Workshops & Service Vehicles
Specific ventilation requirements are outlined for these vehicles including:
- Minimum ventilator area of 2% of the vehicle floor area.
- Fixed non adjustable ventilation at low level.
- Fixed vent, preferably a roof spinner or similar, at high level
- Ventilation should be equally divided between front & rear of the vehicle.
Toxic gas must not be carried in closed vehicles unless they are specifically designed for this purpose.

Mobile Workshops
These are vehicles where cylinders are carried for specific work processes & they are used on or near the vehicle. These processes typically involve welding, testing & laboratory functions, & can utilise a wide variety of gases.
Hot work should be carried out outside the vehicle compartment.
Fire extinguishers should be located nearby & exit routes should be clear of obstructions.
Consider additional ventilation for the comfort & safety of persons in the vehicle.
TRANSPORTING GAS CYLINDERS BY ROAD

Special Site Service Vehicles
These are vehicles with cylinder installations supplying appliances such as those used for cooking, heating or lighting facilities.

The gas normally used is Propane or Butane.

Ensure appliances are manufactured to the appropriate British Standards & installed according to the manufacturer’s instructions.

Each appliance should have a gas isolation valve for use during maintenance or for emergency shut off.

Appliances should not be lit during transit. (Refrigerators with flame failure devices are acceptable).

Catering devices should not be left unattended when in use.

Cylinder Segregation from Driver
Where cylinders to be used off the vehicle are carried within a closed vehicle, the load compartment should be separated from the driver’s cab by a gas-tight bulkhead. This should be constructed & secured so as to protect the driver from cylinder impact in the event of a road traffic accident.

Fire Extinguishers
The Law for small vehicles & vans requires a suitable 2 Kg Fire Extinguisher to be carried on the vehicle; CO₂ or Dry Powder type Extinguishers are suitable for Flammable & Oxidising gases.

Vehicle Maintenance
The vehicle must comply with statutory requirements when in use & be properly maintained.

Records of maintenance should be kept.

Vehicle Documentation
The documentation required for a journey may vary according to the quantity & type of gas cylinders carried. (See Page 51-52)
Vehicle Signage
It is not a legal requirement to display hazard-warning signs on the vehicle when the load carried is below the Threshold Quantity.

It is good practice to display appropriate warning signs on the vehicle whenever gas cylinders are carried; the signs must be removed once the cylinders have been unloaded.

Driver Training
Regardless of load quantity any driver carrying gas cylinders should be:

- Trained in the hazards & properties of the gases they carry.
- Trained in the safe use & handling of the gases they carry.
- Trained in the use of vehicle Fire Fighting Equipment.
- Conversant with CDG 2009 & relevant Emergency Procedures.

Note: ADR training is required for drivers of vehicles below 3.5 tonnes if the load Threshold Calculation shows that limiting quantities will be exceeded.

Emergency Procedures
Drivers should be fully conversant with the Emergency Procedures adopted by the company in the case of:

- Vehicle accident.
- Incidents involving gas cylinders in fires.
- Incidents involving gas escapes.
- Evacuation distances & drills.
- Actions regarding Acetylene cylinders involved in fires.
TRANSPORTING GAS CYLINDERS BY ROAD
BEFORE JOURNEY CHECKS

Before commencing a journey when gas cylinders are to be carried, the driver should check the following:

**Cylinders**
Cylinder Valves are closed.
Preferably equipment disconnected from cylinders.
Leak checked before the journey.
Correctly labelled.
Propane cylinders should be carried in an upright position at all times. (Refer to UKLPG CP27 for information on the transportation of Propane)

In a closed vehicle cylinders should be loaded in a single layer & constrained to prevent any movement or displacement.

It is strongly recommended that all cylinders are carried upright & secured.
Where fitted, gas tight plugs should be in place.
Where more than four LPG cylinders are carried the driver should carry sufficient spare plugs or caps for use where they are missing on returned cylinders.
Cylinders should not project beyond the side or back of the vehicle.

**Vehicle**
Appropriate for use.
Within weight limits.
Road worthy.
Engine stopped for loading & unloading.
Vehicle crew only no passengers.
Ventilation points free from debris & uncovered.
NO SMOKING allowed.

**Driver**
Trained in emergency procedures.
Training current.
TRANSPORTING GAS CYLINDERS BY ROAD
CDGR

Carriage of Dangerous Goods Regulations CDGR/ADR
The following information on pages 50-52 is required for all journeys under the load threshold limit as is the driver training requirements see page 48.

If the load exceeds the load threshold limit, the full requirements of ADR apply & the driver must:
- Carry Consignor Information & Information in Writing
- Be trained to ADR standards
- Display an orange plate on the vehicle
- Carry first-aid & fire fighting equipment
- Consult the latest CDGR & ADR regulations

Load Size
This is the total quantity of dangerous goods to be carried
It may be calculated by using the calculation tables provided on Page 51.

For gases in cylinders it is determined from the litre capacity of the cylinder that is its capacity filled with water, not the pressure or volume filled with gas.

For liquefied gases such as Propane & Ammonia it is determined from the weight of product in kilograms.

These figures can be obtained from your gas supplier.

The maximum quantity of product for single gas type loads that can be carried without the full need for compliance with ADR requirements is:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxic gases</td>
<td>20 (ltrs/kg)</td>
</tr>
<tr>
<td>Ammonia &amp; Chlorine</td>
<td>50 (ltrs/kg)</td>
</tr>
<tr>
<td>Flammable gases</td>
<td>333 (ltrs/kg)</td>
</tr>
<tr>
<td>Inert gases/Oxygen</td>
<td>1000 (ltrs/kg)</td>
</tr>
</tbody>
</table>
Calculating Load
The following information is required:
1. Transport Category
2. Quantity in kilograms or litres of the gases determined by the
cylinder size/number of cylinders which then equates to points

This is then used on the calculator table (example below)

The table works by determining the total load size by using a
multiplier to reflect the hazard category of the product:

<table>
<thead>
<tr>
<th>Transport Category</th>
<th>Gas Category</th>
<th>Multiplier Quantity x</th>
<th>Load Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Toxic</td>
<td>50</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>Flammable</td>
<td>3</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td>Asphyxiant/Oxidising</td>
<td>1</td>
<td>C</td>
</tr>
<tr>
<td>Load Size = A + B + C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If the load size A + B + C exceeds 1,000 ltr/kg (points) the full
operational provisions of ADR apply to the journey

Example of a Completed Load Table:

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas type</td>
<td>Transport Category</td>
<td>Cylinder Size</td>
<td>Number of Cylinders</td>
<td>Multiplier (50, 3 or 1)</td>
<td>Load size =c × d × e</td>
</tr>
<tr>
<td>Propane</td>
<td>2</td>
<td>47</td>
<td>2</td>
<td>3</td>
<td>282</td>
</tr>
<tr>
<td>Propane</td>
<td>2</td>
<td>18</td>
<td>2</td>
<td>3</td>
<td>108</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>3</td>
<td>50</td>
<td>1</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Oxygen</td>
<td>3</td>
<td>50</td>
<td>1</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>490 points</strong></td>
</tr>
</tbody>
</table>

For Acetylene, Propane, liquefied gases & refrigerants the net
mass of gas in kg is used, this will be available from your gas
supplier & will vary according to cylinder size.

It is strongly recommended that drivers carry with them
Instructions in Writing available from www.iri.org & Gas Data
Sheets available from gas supplier for the products being carried.

These are mandatory where the load threshold has been
exceeded & the full requirements of ADR apply.
TRANSPORTING GAS CYLINDERS BY ROAD
CALCULATING ROAD

Example Documents

Load Data

<table>
<thead>
<tr>
<th>Gas</th>
<th>Cylinder size in litres or kg specific to each gas supplier</th>
<th>UN No.</th>
<th>Transport Category</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argon</td>
<td></td>
<td>1006</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>Butane</td>
<td></td>
<td>1011</td>
<td>2</td>
<td>2.1</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td></td>
<td>1013</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>Compressed Air</td>
<td></td>
<td>1002</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>Diesel/Gas oil</td>
<td></td>
<td>1202</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Dissolved Acetylene</td>
<td></td>
<td>1001</td>
<td>2</td>
<td>2.1</td>
</tr>
<tr>
<td>Helium</td>
<td></td>
<td>1046</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>Hydrogen</td>
<td></td>
<td>1049</td>
<td>2</td>
<td>2.1</td>
</tr>
<tr>
<td>Nitrogen</td>
<td></td>
<td>1066</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>Oxidising Gases</td>
<td></td>
<td>3306</td>
<td>1</td>
<td>2.3</td>
</tr>
<tr>
<td>Oxygen</td>
<td></td>
<td>1072</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>Propane</td>
<td></td>
<td>1978</td>
<td>2</td>
<td>2.1</td>
</tr>
<tr>
<td>Toxic/Flammable</td>
<td></td>
<td>Contact Supplier</td>
<td>1</td>
<td>2.3</td>
</tr>
</tbody>
</table>

Load Information Document

Company name : ......................... tel no : ....................
Address : ........................................

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>Transport Category</th>
<th>Cylinder Size</th>
<th>Number Carried</th>
<th>Quantity (B x C)</th>
<th>Multiplier</th>
<th>Load size (D x E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. Oxygen</td>
<td>3</td>
<td>50</td>
<td>2</td>
<td>100</td>
<td>1</td>
<td>100</td>
</tr>
</tbody>
</table>

Grand total of load size

The Consignor declares that these goods are permitted for carriage in the quantities carried & are properly classified, packaged and labelled
Signed............................ On behalf of (Company).........................

Date...............................