Safety advice.
Safe transport of gases.

Properties

Cylinders can contain compressed gases (Oxygen, Nitrogen, Hydrogen etc.) up to 300 bar, liquefied gases (Carbon dioxide, Propane etc.) at a pressure from a few bar to about 50 bar, or dissolved Acetylene at 15 bar. Cryogenic liquids are stored in cryogenic receptacles ‘dewars’ at very low temperatures of below -150°C.

For more detail see Safety Advice Cryogenic Liquefied Gases and Gas in Cylinders.

Gases in cylinders and dewars are classified as Dangerous Goods and as such, their transport is governed by the relevant Transport of Dangerous Goods legislation, e.g. ADR in Europe or DOT in the U.S. If you are transporting gas purely for domestic use of a private individual, the regulations may not apply, but you need to check your relevant local regulations. However, you still have to obey to “Duty of Care” to ensure that you transport gases safely, with due regard to other road users and the public.

The cylinder/dewar label states the dangers of the gas and is the only way to positively identify the contents of a cylinder.

Hazard

Cylinder weight
Cylinders are very heavy and, if not adequately restrained in the vehicle, will move when the vehicle brakes or turns; they can cause severe damage and injury to the occupants of the vehicle.

Pressure release
Gases in cylinders are stored under pressure. This represents high energy, the hazard is therefore a sudden release of the pressure that could harm personnel or damage equipment.

Liquefied Gases
When a liquefied gas is released, it vaporizes and creates a large amount of gas; typically 1 litre of liquid creates about 600 to 850 litres of gas. Cryogenic liquids are very cold and can cause cold burns.
Specific hazards related to the different type of cylinder contents
Gases are potentially hazardous for a number of reasons:

- Some gases are flammable; a leakage may create an explosive atmosphere in a vehicle, which a single spark could ignite
- Oxygen enrichment causes materials to ignite and burn that would not do so in air and will increase the intensity of any fire. Nitrous oxide (laughing gas) has similar properties compared to Oxygen. See the Safety Advice about Oxygen Enrichment
- Inert gases can reduce the Oxygen levels in the atmosphere, which can result in asphyxiation and death. See the Safety Advice about Oxygen Deficiency
- Toxic or corrosive gases are hazardous to health

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Precautions

Basic Safety Rules
- No smoking
- Always ensure adequate ventilation
- Do not leave cylinders inside the trunk or inside the vehicle if it is unventilated
- Ensure that cylinders are properly secured or restrained
- Go directly to your destination
- Immediately unload when arriving at your destination or stopping for a longer period, and store the cylinders in a ventilated place
- Only persons who are directly involved with the transport should travel in the vehicle

Collecting Cylinders
When collecting cylinders ensure that:

- There are adequate anchorage points for securing the cylinders, or the load can be restrained
- Ignition sources are eliminated
- Hydrocarbons e.g. fuel cans or oily rags are kept outside of the vehicle
- A fire extinguisher is carried along
- A Safety Data Sheet and/or other safety information, e.g. Tremcard for the gases that are being carried, has been obtained and that they have been read and understood
- If you do not have an open vehicle or a vehicle designed for the transportation of gases:
  - Keep windows open
  - Ensure that the load is secure
  - Avoid transporting passengers also
  - Remove other substances that may react with the gases
- Toxic or pyrophoric gases should only be transported in open or dedicated vehicles

One litre of liquid oxygen produces approximately 850 litres of gas.

The safety data sheet informs users about chemical and physical properties of a material and its generic use, provides advice on the safe handling, storage, transport, use and disposal of the material, provides information about the health effects, exposure control, environmental effects and emergency procedures.

Smoking and naked flame are not recommended in and around the vehicle as long as it contains gas receptacles, irrespective of which ones and how many.

Only persons who are directly involved with the transport may travel in the vehicle.
Transport

• Never transport or use a gas cylinder that does not have a label
• Cylinders containing liquefied gases must only be carried upright as they are fitted with a pressure relief device. If the cylinder is lying down and operating, liquid would spill rather than gas
• Acetylene cylinders must only be carried upright, as Acetylene is dissolved in Acetone and held in a porous mass within the cylinder
• Remove any equipment such as regulators, hoses, and torches etc. from the cylinders before transporting
• Make sure that the cylinder valve is firmly closed and has been checked for leaks
• If the cylinder is designed to have a cylinder valve cap, it must be fitted
• Make sure that all cylinders are properly secured or restrained and can not move

Ventilation

While transporting cylinders, adequate ventilation is very important, ideally:

• Use an open vehicle or a vehicle designed for the transportation of gases
• The vehicle should have a gas tight bulkhead separating the driver from the load
• Vehicles with cylinders or dewars may only be parked in garages if proper ventilation is ensured

Loading and Unloading

When loading and unloading, switch the engine off. Check that the vehicle is capable of taking the cylinders’ weight without being overloaded or affecting its handling or braking. Consider how you are going to get the cylinders in and out of your vehicle without injury, manually handling cylinders that may weigh 70 kg. Only carry the minimum number of cylinders that are required for the job.

Once the cylinders are out of the vehicle, follow these simple rules:

• Never turn your back on a free-standing cylinder
• Never try to catch falling cylinders
• Wear safety boots, gloves and safety glasses
• Place cylinders onto firm level ground
• Use a trolley to move cylinders

Emergency

The precise actions depend on the type of gas being carried, but if you do discover a leak from a cylinder, especially containing a flammable gas:

• If possible and safe, try to move your vehicle to an isolated place
• Minimise potential ignition sources, e.g. shut off the engine and any electrical equipment, avoid smoking or naked flame
• Ventilate your vehicle, open the doors
• Do not try to enter the vehicle or to turn on the ignition
• If safe to do so, try and close the cylinder valve
• Keep the public away
• Call the Emergency Services: give them your exact location and the number and type of cylinders involved

A leaking non-flammable, non-toxic gas is best dealt with by simply allowing the gas to vent to atmosphere in a well-ventilated area. Leave the vehicle and keep well back.

If you notice a fire heating up the cylinders, leave the area, wait for the fire brigade to arrive and tell them that there are cylinders involved, including the number and type.

Refer to the relevant Safety Data Sheet for further information / Contact your local Linde supplier for specific questions

More information available from the EIGA campaign “Transporting Gas Cylinders or Cryogenic Receptacles in Non-Dedicated Vehicles”, available on the EIGA website www.eiga.eu