

Insight: Flammable Gases Stored in Cylinders

Recognizing the Risk

Compressed gases such as liquified petroleum gas (LPG), propane, butane, oxygen, hydrogen and acetylene stored in cylinders are flammable and are subject to fire and explosion should even a small leak occur. The results can be devastating where a complete loss of assets can be expected. Consider the following contributors to the risk:

- a) LPG is stored at sufficient pressure to liquefy the gas and other flammable gases are held at higher pressures – normally around 15 atmospheres. Consequently, even a minor leak from a cylinder under pressure can result in a large volume of gas at room temperature and atmospheric pressure.
- b) Flammable gases can be heavier than air and may travel a considerable distance to an ignition source.
- c) Fire propagation and flashback is possible. The cylinders may vent rapidly or rupture violently as a result of pressure build-up, when involved in a fire situation.
- d) Flammable gases form ignitable mixtures with air over an exceptionally wide range of concentrations and are liable to explode, when in contact with an ignition source, such as a flame or electrical spark. As an example, propane forms explosive concentrations with air between its lower and upper explosive limits of 2.2% and 9.5% respectively are maintained at all times and prevent buildups of combustible waste inside the warehouse / storage area.

Controlling the Hazard

Hazards associated with the use and storage of flammable gases need to be adequately risk assessed and controlled to eliminate, reduce or control them and create a safe working environment.

General Management

- Undertake fire risk assessments to identify hazards and develop appropriate self-inspection checklists.
- Maintain good housekeeping regimes to eliminate the unnecessary presence of combustibles, especially in close proximity to flammable gas storage areas or compounds.
- Obtain safety data sheets, users manuals and other appropriate publications from suppliers of cylinders or equipment. Provide and maintain up to date records of induction and refresher training to employees in the correct use of cylinders or equipment.
- Develop written emergency plans and have regular drills incorporating action to be taken in the event of an incident.
- Every effort should be made to prevent cylinders suffering impact damage. They should be treated with care, never rolled along the ground or floor during transportation
- During delivery, cylinders should be checked to ensure they are appropriately labeled and color coded.
- Damaged or contaminated cylinders should not be accepted from suppliers. Never attempt to repair cylinders or their valves.
- Smoking should be specifically prohibited in all areas where cylinders are stored or used. Appropriate warning notices should be displayed.

General Storage

- Hazardous operations e.g. forklift truck battery charging etc. should be adequately separated from the main warehouse / storage area, preferably by fire walls of at least 2 hours fire-resistance.
- Warning notices identifying gases stored and prohibiting ignition sources should be prominently displayed at storage areas.
- Cylinders should be stored in the upright position, i.e. with valves uppermost. Protective valve covers should be retained on cylinders which are not in use. Cylinders should be securely supported either on trolleys, within racks or fixed to structural elements such as walls or pillars.
- Full, nominally empty and cylinders of different gases should be segregated from each other in the storage area.
- Nominally empty cylinders should be returned to the supplier at the earliest opportunity. A check should be made to ensue their valves are fully closed.
- As oxygen has particularly dangerous characteristics relative to fire hazard – it supports and accelerates combustion – oxygen cylinders should not be stored within 3m (10ft) of any fuel gas cylinder. Similarly, acetylene cylinders should not be stored within 3m (10ft) of LPG cylinders.
- Internal fire walls between adjacent warehouse / storage areas and between warehouse / storage areas and production areas should be of a least 4 hours fire resistance or 2 hours where the areas on both sides of the wall are adequately sprinkler protected.
- A clear area of at least 2m (6.5 ft) should be maintained on both sides of all fire doors.
- The use of high intensity discharge (HID) lighting inside warehouse / storage areas should be avoided unless they have a non-combustible external containment barrier enclosing the whole of the lamp unit.
- Light fittings should be sited over aisles and clear of stock.
- Heaters should be preferably of the fixed black heat type sited at least one meter clear of stock and where floor mounted within a substantial fixed metal barrier.
- Warehouse and storage areas should be fully protected by an adequate automatic sprinkler system.
- Where smoke vents are required they should be preferably under manual control. Automatic operation of smoke vents should allow for the operation of the automatic fire protection systems to operate prior to the operation of the smoke ventillation.

[For more information, contact your local AIG Risk Engineer.](#)

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