

Industrial High-pressure Gas Safety Work Guide



‘영어’

English

First: Types and Characteristics of Industrial Gases

- ✓ High-pressure gases, such as flammable and toxic gases used in various applications in industrial sites, if mishandled, can lead to accidents accompanied by great damage.
- ✓ To prevent accidents that may occur during gas use, the "raising of gas users' safety awareness" and "acquiring and practicing knowledge and skills of safety management" must be top priorities.

<Examples of Various Gases Used in Industrial Sites>

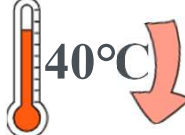
Flammable, oxidizing	Toxic	Non-flammable	Compressed/ liquefied gas
▶ Flammable gases such as LPG, city gas, hydrogen, acetylene, ammonia, etc. ▶ Strongly reactive oxidizing gases such as oxygen	▶ Special gases for semiconductors (PH₃, GeH₄, etc.) ▶ Chlorine (Cl), carbon monoxide (CO) ▶ Ammonia (NH₃) for refrigeration facilities, etc.	▶ Carbon dioxide (CO₂), nitrogen (N₂), argon (Ar), helium (He), etc.	▶ Other high-pressure cylinders and storage tanks of 1 MPa or higher
"Fire/Explosion"	"Poisoning"	"Suffocation"	"Rupture"
 	 		

Gases can largely be classified according to "combustibility (flammable/oxidizing/non-flammable)," "toxicity (toxic/non-toxic)," and "storage state (compressed/liquefied gas)."

- * "Flammable gas" means one with a lower explosive limit of 10% or less, and where the difference between the upper and lower explosive limits is 20% or more.
- * "Toxic gas" means one with a permissible concentration (LC50) of 5,000 ppm (5,000/1,000,000) or less.

Second: Handling and Storage of High-pressure Gas Cylinders

✓ High-pressure gases must be safely stored in a "cylinder storage room" at "40°C or below," and when moving, must be tied to a handcart, etc., for transport and use.

Transporting	▶ When using cylinders while moving them, firmly tie them to a handcart.	
Storage	▶ After use, cylinders must be safely stored in the cylinder storage room. ① Charging cylinders, residual gas cylinders, and flammable/toxic and oxygen cylinders must be stored separately. ② Prevent cylinders from tipping over and protect valves, etc., from damage due to impact. ③ Do not place fire/open flame or flammable/ignitable substances nearby. ④ Charging cylinders for high-pressure gases must always be kept at 40°C (104°F) or below.	 
Handling	▶ Cylinder valves must be opened and closed slowly, and after use, the valve must always be kept closed.	

Third: Daily Inspection of Gas Facilities

✓ Before starting and after ending the use of gas equipment, you must always check for the "presence or absence of abnormalities." Inspect the "operating condition at least once a day," and if abnormalities are found, take the necessary measures such as repair.

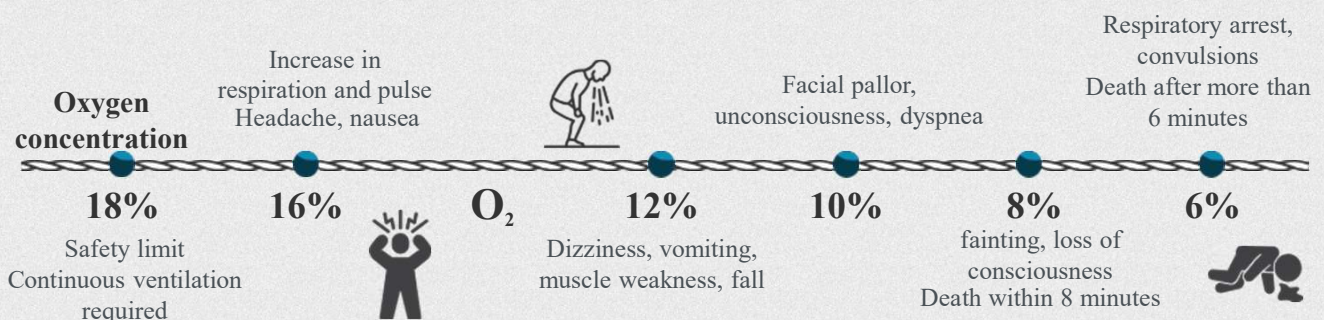
Leak inspection	▶ Check whether or not there is gas leakage from gas facilities such as pipe connections.	
Checking for equipment abnormalities	▶ Indications, alarms, and control status of instruments (pressure gauges, thermometers, flow meters, etc.) ▶ Presence or absence of external corrosion, wear, cracks, or other damage in gas facilities ▶ Unusual sounds, abnormal vibrations, atypical temperature rise, or other operating conditions of equipment with high noise or vibration such as rotary machinery	

Fourth: Safety Rules When Repairing and Cleaning Gas Facilities



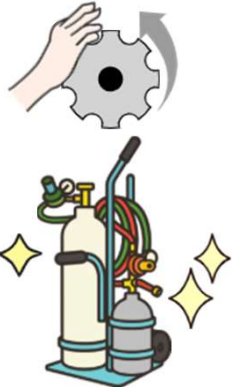
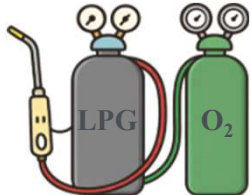
Repair, cleaning, and dismantling work of gas facilities must be carried out "under the supervision of the safety manager" and according to the safety rules.

Work plan establishment	▶ When repairing, cleaning, or dismantling gas facilities, a work plan must be established, specifying the content, schedule, and responsible person of the work, and carried out under the supervision of the manager.	
Gas replacement	▶ When repairing flammable gas, toxic gas, or oxygen facilities, the inside must first be replaced with an inert gas or liquid (such as nitrogen or water) that does not react with the gas in question.	
Gas re-replacement	▶ When workers enter the inside of such gas facilities, the interior must be re-replaced with air. • Frequently check oxygen concentration during work (★18%–22%) ▶ In the case of toxic gas facilities, reconfirm with gas detectors, etc. that the concentration of the toxic gas is below the standard concentration level (TLV-TWA). ○ Major Toxic Gas Standard Concentrations (TLV-TWA) Ammonia: 25 ppm / Chlorine: 0.1 ppm / Carbon monoxide: 25 ppm	
Operation prohibition	▶ Before starting repairs, make sure the valves before and after the gas facility are closed. Install a blind plate on the valve or pipe joint, and clearly mark that the valve must not be operated and the blind plate must not be removed. ▶ Take measures such as locking or sealing the relevant part, or placing a watchman.	
After completion of work	▶ Confirm whether or not there is leakage at the repair work area. ▶ Confirm normal operation of various instruments and safety devices.	



Fifth: Safety Rules for Welding and Cutting Work

- ☑ For welding/cutting equipment using flammable gas (such as LPG) and oxidizing gas (O_2), install a "flashback arrestor," and after work ends, the gas valves must always be locked.

Leakage check	▶ Use gas hoses and torches that are not at risk of gas leakage due to damage or wear. ▶ Frequently check for gas leakage.	
Modification prohibited	▶ Do not adjust, alter, modify, or use for other purposes the original form of gas cylinders, regulators, torches, and other welding equipment parts. ▶ To prevent the risk of flashback, check the presence and normal condition of the flashback arrestor.	
Safe valve operation	▶ When performing welding/cutting work, to prevent burns from excessive release of oxygen from the torch, operate the valve slowly. ▶ When interrupting or finishing work and leaving the workplace, relieve the gas pressure in the regulator and hose, and be sure to lock the valve or cock of the gas supply port.	
Prevention of misoperation	▶ To prevent misoperation, attach a label with the name of the person using the gas to the valve or hose connected to the gas supply port in use.	
Prevention of poor fastening	▶ For hoses and connectors, use gas-specific connectors. ▶ Use connectors that do not connect with each other. ▶ Prevent poor fastening with other gas pipes by using different colored piping/hoses and attaching tags.	

Sixth: Provision and Use of Protective Equipment

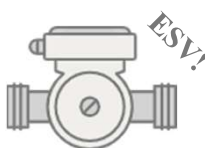
- ✓ In the case of hazardous work, "protective equipment must always be available in the workplace," and workers must receive "protective equipment usage training at least once every 6 months" to make them familiar with usage methods.

Gas mask, air-supply mask	Protective clothing, gloves, safety shoes	Face shield	+ Gas concentration measuring instrument
			
For handling toxic gas, confined space work, etc.	For places handling toxic/flammable gas, etc.	For welding/cutting work, etc.	For handling toxic gas, confined space work, etc.

Seventh: Response Guidelines in Case of Toxic Gas Leakage

- ✓ The person who first discovers the situation must immediately raise the alarm, evacuate to a safe location, and promptly report it to the fire department and Korea Gas Safety Corporation.

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- 1) In the event of a leakage accident, **shut off the nearest valve and notify other works** so they can recognize it.

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- 2) Check the spread status and wind direction of the gas, then **evacuate** in the upwind direction.

3



- 3) When taking on-site measures, **wear protective equipment** such as a gas mask or air respirator, and **deploy at least two people**.

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- 4) If the risk is expected to escalate, promptly request assistance from related agencies such as the **fire department and Korea Gas Safety Corporation**.