COMPRESSED GAS CYLINDERS PROCEDURE

V:2023.1

Compressed Gas Cylinders Procedure

January 2023

Purpose

The purpose of this safety policy and procedure is to establish guidelines for the protection and safety of IPS★ITCS employees who handle and use compressed gases. Compressed gases are typically stored under pressure in metal cylinders. These cylinders are designed and constructed to withstand high pressures. Improper handling and use of compressed gases can result in devastating consequences.

This safety policy and procedure provides guidelines for the safe handling and use of compressed gases. It includes provisions for training and presents safe handling guidelines. It also presents the types, uses, inspection, and marking requirements of compressed gas cylinders. Additionally, this safety policy and procedure presents transportation and storage requirements for compressed gas cylinders.

Reference

Occupational Safety and Health Standards for General Industry (29 CFR 1910.101-104).

Definitions

Compressed Gas (Nonliquefied) - A gas, other than a gas in solution, which under the charging pressure is entirely gaseous at a temperature of 70 o F.

Cylinder - A portable compressed gas container, fabricated to or authorized for use by the U.S. Department of Transportation (DOT), or fabricated to Transport Canada (TC) or the “Rules for the Construction of Unfired Pressure Vessels,” Section VIII, ASME *Boiler & Pressure Vessel Code.*

Flammable Gas - A gas that is flammable in a mixture of 13 percent or less (by volume) with air, or the flammable range with air is wider that 12 percent regardless of the lower limit, at atmospheric temperature and pressure.

Handling - Moving, connecting, or disconnecting a compressed or liquefied gas cylinder.

Inside Diameter (I.D.) - Inside cylinder diameter.

Liquefied Gas - A gas, which under charging pressure, is partially liquid at a temperature of 20^{o} C (70^{o} F).

Nonflammable Gas - A gas that does not meet the definition of a flammable gas.

Outside Diameter (O.D.) - Outside cylinder diameter.

Oxidizing Gas - A gas that can support and accelerate combustion of other materials.

Safety Relief Device - A device intended to prevent rupture on a cylinder under certain conditions of exposure.

Standard Cubic Foot (SCF) - One cubic foot of gas at 70° F (21° C) and 14.7 psia (an absolute pressure of 101 kilo pascals [kPa]).

Storage - An inventory of compressed or liquefied gases in containers that are not in the process of being examined, serviced, refilled, loaded, or unloaded.

Toxic Gas - A gas having a health hazard rating of 3 or 4 defined in NFPA 704, *Standard System for the Identification of the Fire Hazards of Materials.*

Valve Protection Device - A device attached to the neck ring or body of the cylinder for the purpose of protecting the cylinder valve from being struck or damaged from impact resulting from a fall or an object striking the cylinder.

Valve Protective Cap - A rigid, removable cover provided for compressed gas container valve protection.

Responsibilities

Managers - Managers are responsible for ensuring that adequate funds are available and budgeted for the purchase of compressed gas cylinder equipment and related supplies. They will also be responsible for identifying the employees affected by this safety policy and ensure required training is accomplished.

Supervisors - Supervisors will not allow any employee who has not received the required training to handle any compressed gas cylinders. Supervisors will also note defective cylinders and tag them for repair.

Employees - Employees shall comply with all applicable guidelines contained in this safety policy and procedure. They shall report any defective or damaged cylinders to their supervisor.

Safety Department - Safety Department provide prompt assistance to managers, supervisors, or others as applicable on any matter concerning this safety policy and procedure. Safety will assist in developing the required training. Safety will also work with Purchasing to ensure that all newly purchased compressed gas cylinders equipment and supplies comply with current safety regulations and this safety policy and procedure.

Training

Employees who use and handle compressed gas cylinders will be trained before initial job assignment and/or job reassignment. Employees will be trained in the safe use, inspection, handling, and storage of compressed gas cylinders. Refresher training shall be provided at the discretion of the supervisor.

Safe Handling Guidelines

Serious accidents can result from the misuse, abuse, or mishandling of compressed gas cylinders. Employees assigned to the handling of cylinders under pressure should follow general safe handling guidelines.

Compressed gas cylinders are used for a variety of gases in IPS★ITCS.
These gas cylinders fall into the following categories:

- Flammable
- Toxic and Poison
- Liquid

Use - Compressed gas cylinders are used for variety of purposes in IPS★ITCS. Compressed gas cylinders in IPS★ITCS are commonly used in metal cutting operations. Cylinders should be handled carefully and only used for their designated purpose. See the Welding Safety Program for additional related information.

Inspection - Compressed gas cylinders should be visually inspected daily for leaks, cracks, etc. This visual inspection will include the cylinder, safety relief devices, valves, protection caps and stems. If a cylinder is thought to be defective, it should be returned to the supplier for replacement. Under no circumstances should employees attempt to repair defective cylinders. Gages should be checked to ensure that the gas under pressure is not left in hoses when operations are completed.

Marking - For the purpose of identifying the gas content, compressed gas cylinders shall be legibly marked with either the chemical or trade name of the gas. Such marking shall be by means of stenciling, stamping, or labeling, and shall not be readily removable. Whenever practical, the marking shall be on the shoulder of the cylinder for easy identification.

Transportation - Transporting gas cylinders require careful consideration and appropriate precautions. These considerations and precautions include:

- Motor vehicle transport of cylinders
- Flammable gas and oxidizer cylinders transport
- Hand truck (dolly) transport of cylinders
- Cylinder transport precautions

  Motor vehicle transport of cylinders shall only be done with vehicles equipped with racks or other means of securing the cylinders. Cylinders containing liquefied hydrogen or toxic gases shall be transported in open body vehicles.

  Flammable gas and oxidizer cylinders transport must not be done together nor with poisons or corrosives. However, oxygen and acetylene cylinder joint transport is allowed if:
  - The cylinders are transported in the rear truck bed below the cab level
  - A roll bar is installed over the rear truck bed to prevent the cylinders from falling out of the truck bed in the event of the vehicle overturning

Red label, yellow label, white label, green label, or poison label materials are not to be transported on the same load. Poison label materials are not to be transported with food or other items intended for human consumption.

Hand truck (dolly) transport of cylinders shall be used for the transfer of compressed gas cylinders from loading area to shop or laboratory or other within-building transfers.

Cylinder transport precautions include:

- Cylinders having the valve protection cover in place while being transported (inter- and intra-building transport)
- Cylinders not being rolled or lifted by the valve or valve cap for moving
- Cylinder valves being shut off and valve caps in place during transit from location to location
- Cylinders that are dropped during transit being taken out of service and returned to the supplier for inspection
- Cylinders being securely always supported during transport
- Smoking being prohibited during loading, unloading, and hand transportation of flammable gas cylinders

Storage - The storage of compressed gas cylinders requires some basic precautions and guidelines. These include:

- General cylinder storage precautions
- Specific gas cylinder storage guidelines
- Cylinder storage room guidelines

General cylinder storage precautions include**:**

- Cylinders being secured in an upright position in a safe, dry, well-ventilated place prepared and reserved for the purpose
- Cylinders not being kept in unventilated enclosures such as lockers
- Cylinders not being stored in the same area as flammable substances, such as oil and volatile liquids or near sources of heat, such as radiators or furnaces
- Cylinders not being stored near elevators, gangways, stairwells, or other places where they can easily be knocked down or damaged
- Cylinders being stored on a level fireproof floor
- Cylinders stored in the open being protected from contact with the ground and against extremes of weather
- Cylinder storage being planned so that cylinders are used in the order that they are received from the supplier
- Empty and full cylinders being stored separately, with empty cylinders being plainly identified as such to avoid confusion
- Empty cylinders being grouped together that have held the same contents

Specific gas cylinder storage guidelines include additional precautions and guidelines for oxygen, hydrogen, and acetylene and liquefied fuel gas cylinders.

Oxygen cylinders should not be stored within 20 feet (6 meters) of highly combustible materials, oil, grease, wood shavings, or cylinders containing flammable gases. (However, for IPS★ITCS operations, oxygen and acetylene are typically paired on a common transfer cart for use.) If closer than 20 feet, cylinders should be separated by a wall with a fire-resistance rating of at least 30 minutes.

Hydrogen cylinders storage locations shall be permanently placarded as follows: "HYDROGEN-FLAMMABLE GAS-NO SMOKING-NO OPEN FLAMES," or equivalent.

Acetylene and liquefied fuel gas cylinders should be stored with the valve end up. If storage is within 100 feet (30.5 meters) of each other and not protected by automatic sprinklers, the total capacity of acetylene cylinders stored and used inside the building should be limited to 2,500 cubic feet. Acetylene storage areas must be well ventilated and open flames must be prohibited. Acetylene storage rooms should have no other compressed gases.

Cylinder storage room guidelines include:
- Storage rooms for cylinders containing flammable gases being well ventilated to prevent the accumulation of explosive concentrations of gas
- No ignition sources being permitted
- Smoking being prohibited
- All permanent wiring being in conduit
- Electric lights (portable and fixed) being equipped with guards to prevent breakage
- Electric switches being located outside the room

Cylinder Protection
All gas cylinders with a water capacity of over 30 pounds shall be equipped with a valve protection cap or with a collar or recess to protect the valve. In addition, cylinders shall be always maintained with the protective cap in place unless in use.

Service
Cylinder service, modifications or repairs will be performed by an authorized individual other than an IPS★ITCS employee. Any damaged or faulty equipment will be repaired or replaced by the service representative. Cylinder valves that cannot be opened by hand will not be forced open with tools and will be returned to the supplier for service.

Compressed Gas Cylinders Safe Handling Guidelines

- Accept only cylinders approved for use in interstate commerce for transportation of compressed gases.
- Do not remove or change the marks and numbers stamped on the cylinders.
- Cylinders must never be dragged, pushed, or pulled across the floor.
- Transport cylinders weighing more than a total of 40 pounds (18.2 kg) on a hand or motorized truck, securing them from falling.
- Keep the cylinders clean and protect them from cuts or abrasions.
- Do not lift compressed gas cylinders with an electromagnet. Where cylinders must be handled by a crane or derrick, as on construction jobs, carry them in a cradle or suitable platform and take extreme care that they are not dropped or bumped. Do not use slings.
- Do not drop cylinders or allow them to strike each other violently.
- Do not use cylinders for rollers, supports, or any purpose other than to contain gas.
- Do not tamper with safety devices in valves or on cylinders.
- Consult the supplier of the gas when in doubt about the proper handling of a compressed gas cylinder or its contents.

- Clearly write EMPTY in chalk on empty cylinders that are to be returned to the vendor.
- Close cylinder valves and replace valve protection caps, if the cylinder is designed to accept a cap.
- Load cylinders to be transported to allow as little movement as possible. Secure them to prevent violent contact or upsetting.

- Always consider cylinders to be full and handle them with corresponding care.
- Securely always support compressed gas cylinders. Cylinders must not be left “free-standing” at any time, e.g., cylinders unloaded from truck to loading dock must be secured until placed on a hand truck for delivery within the building.
- Compressed gas cylinders should never be subjected to a temperature above 125 degrees F.
- Never place cylinders where they might become part of an electrical circuit.
- Do not re-paint cylinders.
- Never use a flame to detect flammable gas leaks. Always use soapy water.

Revision History

Rev	Rev Date	Rev By	Approved By	Description
1.0	1.3.2022	Shayne Torrans	Shayne Torrans	Initial Procedure Document
1.1	12.20.2022	Shayne Torrans	Shayne Torrans	Format Revision

Approvals:

Procedure Owner

_____ _____
Print Name Date

_____
Signature

Competency Assessment

No.	Questionnaire	C/NYC
Q1		
A1		
Q2		
A2		
Q3		
A3		
Q4		
A4		
Q5		
A5		

Enclosed Attachments	
Risk Assessment	☑
Environmental Aspect and Impact	☑
Training and Competency	☑
Measure and Evaluation Tools	☑

Competency Checklist

To be filled out by Trainer and signed by Employee, Assessor and Supervisor before being returned to the HSEQT Manager for recording purposes.

Procedure	Competency	Date	Competent YES / NO	Employee Signature

(Please tick appropriate box)

This employee is competent in performing the job. ☐

This employee has not attained the competency level. ☐ *

* *If the employee has not attained all competency levels, the General Manager must assess the action to be taken, provide an extension of training or alternative action as listed below.*

Alternate action to be taken: _____

Signed By Employee: _____ Date: _____

Trainer: _____ Date: _____

Assessor: _____ Date: _____

Regional Manager: _____ Date: _____

Environmental Aspects and Impacts

Identified Environmental Aspects and Impacts

The following table is a summary of the likely environmental aspects and impacts that may be identified during site inspections. The significance of each impact needs to be assessed using the Risk Assessment Model.

Activity	Aspect	Impact
Purchasing & Administrative Work	Consumption of goods	Conservation of natural resources
	Consumption of energy (eg. Electrical equipment and facilities)	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Habitat loss
	Generation of waste (eg. Paper)	Consumption of space for waste disposal; Habitat loss
Climate Control	Consumption of energy	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Habitat loss
	Generation of noise	Disturbance to community; Habitat loss
Cleaning of – offices / vehicles	Storage, use and release of chemicals	Contamination of air, water or soil; Risk to human health
Transport (Fleet vehicles / staff travel)	Consumption of energy	Release of greenhouse gases and atmospheric pollution; Consumption of natural resources; Loss of habitat at all stages of generation; Light pollution
	Consumption of goods (eg. Oil)	Consumption of natural resources; Generation of waste; Habitat loss; Biodiversity impacts
	Generation of waste (eg. Oil)	Consumption of space for waste disposal; Potential contamination of water or soil; Habitat loss
	Exhaust emission	Release of greenhouse gases and atmospheric pollution
	Use of dangerous goods (eg. Batteries)	Potential contamination of air, water or soil; Risk to human health
	Generation of noise	Disturbance to community; Habitat degradation
Operations		

Risk Assessment

Risk Assessment // insert name here					
Step No: Logical sequence	**Sequence of Basic Job Steps documented in the Procedure, Work Instruction and project plans. Break down Job into steps.** Each step should be logical and accomplish a major task.	**Potential Safety & Environmental Hazards/Impacts at the site of the Job** Identify the actual and potential health and safety hazards and the environmental impacts associated with each step of the job.	**Risk Rating** Refer to the risk matrix or HSEQT.PRO. Risk Mgt	**Recommended Corrective Action or Procedure** ***Determine the corrective actions necessary to reduce the risk to as low as reasonably practical (ALARP) refer to HSEQ.PRO.Risk Mgt. The risk must be rediced or controlled to ALARP before work commences.*** Document who is responsible for implementing the controls to manage each hazard identified.	**Risk Rating** refer to the risk matrix or HSEQT.PRO.Risk Mgt
1.					
2.					
3.					
4.					
5.					

Audit

Process: insert// **Procedure**: Insert //	Date:	Audited by:
	Location of Audit:	Area Mgr/Supervisor:

Item	Question	Evidence Sited	Comments	Conformance Score 0,3,5
1.				
2.				
3.				
4.				
5.				
6.				
7.				

AUDITOR'S SIGNATURE: SAFETY REP'S SIGNATURE:	CONFORMANCE SCORE: / 25 CONFORMANCE %:	0 – Non-Conformance 3 – Continuous Improvement Opportunity 5 – Total Conformance