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Doc Custodian: Safety Supervisor		EQ-1 Compressed Gas Cylinders	Refinery Safe Work Procedure
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1.0 Purpose

The purpose of this HESS procedure is to prevent injury to personnel and damage to property caused by the mishandling of compressed gas cylinders.

2.0 Scope

This HESS Practice shall apply to all personnel who handle compressed gas cylinders. This practice does not apply to self-contained breathing apparatus (SCBA), cylinders stored on emergency response vehicles or emergency escape respirators.

- 2.1 Compressed gas cylinders are inherently dangerous regardless of the contents due to the internal pressure of the cylinder. An abrupt rupture of such cylinders can create high speed projectiles with considerable mass. Additionally the contents can create an unsafe atmosphere due to fire or poisonous gas. The intent of this practice is to provide guidance to prevent damaging compressed gas cylinders.
- 2.2 The manufacturer and transport of all compressed gas cylinders are regulated by the U.S. Department of Transportation (DOT). It is critical for public safety that cylinders are manufactured, maintained, and transported in compliance with all applicable DOT regulations.

3.0 Procedure

3.1 Roles and Responsibilities

3.1.1 User

- 3.1.1.1 Shall visibly inspect the equipment and ensure that there are no leaks or damaged components.
- 3.1.1.2 Ensure that cylinders retain all DOT hazardous material labels until cleaned and purged of all hazardous material residue and vapor.
- 3.1.1.3 Shall inspect, use, handle and store compressed gas cylinders in accordance with this procedure.

3.1.2 Procurement

- 3.1.2.1 Communicate requirements to suppliers of gas cylinders.

3.1.3 Supplier

- 3.1.3.1 Deliver requested inventory safely and in timely fashion.
- 3.1.3.2 Provide gas in cylinders that meet all DOT requirements including, but not limited to, marking, labeling and periodic re-qualifications.
- 3.1.3.3 Provide product that meets or exceeds expectation.

3.2 General Requirements

3.2.1 General Transportation Requirements

- 3.2.1.1 Valves shall be closed and valve caps shall be placed on the compressed gas cylinders whenever regulators are removed. Compressed gas cylinders shall be stored and transported with valve caps securely in place.
- 3.2.1.2 Cylinders must be transported in a vertical position with the valve caps in place and secured to prevent shifting and falling. Cylinders shall be handled carefully. Rough handling, knocks or falls are liable to damage the cylinder, valve or safety devices and cause leakage.

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- 3.2.1.3 Compressed gas cylinders shall only be hoisted in compressed gas cylinder racks and are never to be lifted by their caps or by magnets.
- 3.2.1.4 Compressed gas cylinders shall not be transported or suspended by means of choker slings, ropes or chains, unless lifting attachments, such as lugs, are added at the time the cylinder was manufactured. Never weld attachments to a cylinder.
- 3.2.1.5 When transporting cylinders, regulators shall be removed and cylinder caps installed. Exceptions to this would be manually moving cylinders in a vertical position on a two-wheeled bottle cart to a nearby work area or transporting a manifolded bottle rack where cylinders are connected to a cluster manifold. In these exceptions, before cylinders are moved, they shall be secured by shutting the valve and depressurize the regulator and downstream equipment
- 3.2.1.6 In certain instances, employees can transport flammable and non-flammable gases in cylinders on public roads without having a bill of lading, SDS, or placards on the transport vehicle. For example: a pipefitter can transport an argon cylinder from the Refinery to the Docks; an analyzer technician can transport a nitrogen cylinder from the Refinery to the Docks; and a laboratory technician can transport a sample bomb from the Docks to the Lab. All cylinders must be marked and labeled as required by DOT. Contact the Refinery DOT Coordinator before transporting any manifolded cylinder packs to verify the DOT requirements.
- 3.2.1.7 Never ship cylinders that have been exposed to fire without consulting with the gas supplier.
- 3.2.2 General Storage Requirements
 - 3.2.2.1 Compressed gas cylinders shall be secured with chain or no. 9 wire in an upright position to prevent damage due to being knocked over or from falling or passing objects. (Cylinders shall not be secured to scaffolding)
 - 3.2.2.2 All valves shall be closed and caps in place when cylinder is not in use.
 - 3.2.2.3 Compressed gas cylinders shall be stored in a well-ventilated area. They shall not be stored in unventilated enclosures such as lockers and cupboards.
 - 3.2.2.4 Compressed gas cylinders must be kept away from locations where they may be subjected to high temperatures, sparks or flames (including contact with electrical circuits). Keep temperature exposure of cylinders below 125 degrees F ambient.
 - 3.2.2.5 Cylinders stored outside shall be protected from prolonged moisture on the ground to prevent corrosion on the bottom of the cylinder.
 - 3.2.2.6 Compressed gas cylinders should be stored outside process facilities when not in use.
 - 3.2.2.7 Compressed gas cylinders shall be separated into composition groups and identified by legibly marked labels or stencils (e.g., oxygen with oxygen, acetylene with acetylene, nitrogen with nitrogen). Post signs showing cylinder storage area with the name of gasses to be stored.
 - 3.2.2.8 Oxidizer (e.g., oxygen, chlorine, etc.) cylinders in storage (regulators removed and caps installed) shall be separated from fuel-gas cylinders or combustible materials by a minimum of 20' or by a non-combustible barrier, at least 5' high, having a fire resistance rating of at least one-half hour (e.g.,

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a cinder block wall; two ¼-inch thick steel plates separated by an air barrier; or a ½-inch thick steel plate). Storage area shall be stocked only to a point where at least 1' of horizontal wall protects the cylinders.

- 3.2.2.9 Full compressed gas cylinders shall be stored in a designated area, separate from empty compressed gas cylinders.
- 3.2.2.10 Empty compressed gas cylinders shall be marked or tagged with "empty or MT" and placed in a marked rack designated for empty cylinders.
 - 3.2.2.10.1 Compressed gas cylinders should not be depressured below 25 psi to prevent contamination of residual contents. Keep valves closed on empty cylinders.
 - 3.2.2.10.2 Depressurized cylinders are considered to be hazardous material until they have been cleaned and purged of all residue and vapor. DOT hazard labels shall be retained on all empty cylinders.
- 3.2.2.11 A fire extinguisher shall be near storage area of cylinders containing flammable material.
- 3.2.2.12 Cylinders delivered in pre-assembled clusters shall not be removed from the cluster.
- 3.2.2.13 Storage should be arranged, as best as possible, so cylinders are used in the order in which they are received from the supplier.
- 3.2.3 General Use Requirements
 - 3.2.3.1 A cylinder cart or rack with chains or #9 wire shall be used to keep compressed gas cylinders secure while in use.
 - 3.2.3.2 Compressed gas cylinders must not be taken into confined spaces.
 - 3.2.3.3 Repairing or altering of compressed gas cylinders is strictly prohibited. Only persons that have completed the required DOT training shall install or remove valves in cylinders
 - 3.2.3.4 Before use, the cylinder shall be visually inspected for damage such as corrosion, pitting, cuts, gouges, dents, leaks, bulges, neck defects, fire damage and weld defects. If cylinder is damaged, place a 'do not use' tag on the cylinder noting the concern and return it to the supplier for repair.
 - 3.2.3.5 Personnel shall not tamper with safety devices or valves on compressed gas cylinders.
 - 3.2.3.6 Compressed gas cylinders shall not be used as rollers, supports, or for any purpose other than to contain gas.
 - 3.2.3.7 At all times use the proper manifold and regulators designed for the compressed gas cylinders. Inspect all connections and seating surfaces of the regulators before use.
 - 3.2.3.8 Minimum personal protective equipment recommended while connecting or disconnecting gas cylinder are leather gloves and safety glasses.
 - 3.2.3.9 If a cylinder protective cap is difficult to remove, do not apply excessive force or pry the cap loose. Attach a tag identifying the issue and return it to the supplier.
 - 3.2.3.10 Cylinder valve connections that do not fit shall not be forced.
 - 3.2.3.11 Compressed gas containers should not be attached to a process where the

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container can be contaminated by the backflow of other process materials. In cases where such a possibility can exist, design consideration shall include the use of check valves to prevent backflow.

- 3.2.3.12 Do Not connect/install compressed gas cylinders with an expired hydrostatic test dates. See section IX.C. of this procedure for additional information concerning hydrostatic testing intervals.
- 3.2.3.13 After connecting the regulator and before initial use, perform a tightness test on the connection and fittings. The cylinder valve should be opened just enough to indicate pressure on the regulator gauge (no more than one full turn).
- 3.2.3.14 When checking for leaks, connections shall be checked with a soap solution for leaks, never a flame.
- 3.2.3.15 Cylinders shall not be placed where they might become part of an electrical circuit. When compressed gas cylinders are used in conjunction with electric welding, they shall not be grounded or used for grounding.
- 3.2.3.16 Before the regulator is connected, the compressed gas cylinder valve must be opened slightly and closed immediately. This action is called "cracking" and is intended to clear the valve of dust and dirt. The person cracking the valve shall stand to one side of the outlet, not in front of it and shall ensure others are not directly in front of the outlet.

3.3 Special Rules for Oxygen Cylinders

- 3.3.1 Compressed oxygen shall not be used for breathing air.
- 3.3.2 Never permit oil or grease to come in contact with oxygen cylinders, valves, regulators, gauges, fittings, hoses, pipelines, blowpipes, and any connections.
- 3.3.3 Open up the oxygen cylinder valve stem just a crack. Once the needle on the high pressure gauge has stopped, open up the valve all the way. This back-seats the valve. The cylinder valve shall remain fully open while the cylinder is in use.
- 3.3.4 Never use oxygen in place of compressed air as a pressure medium to blow out obstructed pipelines.
- 3.3.5 Use only oxygen compatible threading compound, such as Teflon tape, on valve threads for oxygen service.

3.4 Special Rules for Anhydrous Ammonia Cylinders and Tanks

- 3.4.1 Reference [RSP-1717-000 Safe Handling of Anhydrous Ammonia Cylinders and Use of Temporary Ammonia Vaporization Tank.](#)
- 3.4.2 Anhydrous Ammonia is used in GBR Alky units in both Bay Plant and East Plant for equipment neutralization during the decon process. It is used in the SRU's and ULC following catalyst changeouts to control catalyst activity. For planned events, the anhydrous ammonia is supplied and administered by a specialty vendor who has been trained in the safe use of the material. If vendor availability is a constraint in responding to an unplanned usage event, MPC administration of Anhydrous Ammonia may be considered. For any such event, a specific operating procedure must be developed and involved personnel must be trained on the procedure.

3.5 Special Rules for Acetylene Cylinders

- 3.5.1 Acetylene cylinders should never be used at a pressure exceeding 15 psig at the regulator.
- 3.5.2 Flashback arrestor check valve shall be installed at the regulator during all oxy-acetylene

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operations.

- 3.5.3 Do not open an acetylene cylinder valve more than one full turn. This permits the valve to be closed immediately, in case of an emergency. A T-handle or wrench must be attached to the valve at all times.
- 3.5.4 In the event of a leaking acetylene cylinder that cannot be isolated by closing the bottle valve assistance shall be requested from the emergency response team by sounding the emergency alarm.
- 3.5.5 Never test for acetylene leaks with an open flame. Use a gas detector or soapy water.
- 3.5.6 Acetylene cylinders must be in an upright position or tilted to an angle no more than 45° from the upright position while being used.
- 3.5.7 Nothing (e.g., rags, gloves, tools, etc.) shall be placed on top of an acetylene cylinder when in use that may damage the safety device or interfere with the quick closing of the valve.
- 3.5.8 Indoor storage of acetylene will be limited to 200ft³ per storage area.
- 3.5.9 Do not supply acetylene by a system of shop piping without consulting the acetylene supplier and engineering for recommendations.

3.6 Acceptance from Supplier

- 3.6.1 Compressed gas cylinders shall not be accepted from the supplier if there are any signs of damage or leakage or if the valve caps are missing.
- 3.6.2 Compressed gas cylinders shall not be accepted if not properly marked and labeled in accordance with DOT regulations.
- 3.6.3 Compressed gas cylinders shall not be accepted if the periodic recertification date is not marked on the cylinder or if the test date has expired. . In general, cylinders require testing every five years. Steel cylinders with porous fillings for acetylene require testing every 10 years. When in doubt, contact the supplier to confirm the cylinder recertification interval.

3.7 Audit Requirements

- 3.7.1 Tier I audits shall be conducted in accordance with ADM-4 HES&S Tiered Auditing Program. The findings will be reported, communicated and corrected in accordance with ADM-4.

4.0 **Definitions**

- 4.1 **Cylinder** – A pressure vessel designed for pressures higher than 40psia and having a circular cross section. It does not include a portable tank, cargo tank or railroad tank car.
- 4.2 **Hazardous Material** – A substance or material that DOT has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce.
- 4.3 **In Use** – A cylinder is considered to be in use when gas is flowing from the cylinder, when the cylinder gas is maintaining pressure in a supply line or when it is reasonably anticipated that gas will be drawn from the cylinder within 24 hours (overnight hours included).
- 4.4 **In Storage** – A cylinder is considered to be in storage when it is not in use or is not being transported.
- 4.5 **Manifold** – Gas distribution system that transfers product through multiple outlets/inlets to compressed gas containers.
- 4.6 **Periodic Recertification** – The completion of a visual inspection and the tests required to be

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performed on a cylinder to determine its suitability for continued service.

- 4.7 **Pressure Regulator** – Mechanical device used to control the discharge pressure of a compressed gas from a container.
- 4.8 **Oxidizer (Oxidizing gas)** – Gas, that in the presence of an ignition source and a fuel, supports and can vigorously accelerate combustion.

5.0 References

- 5.1 29 CFR 1910 Subpart Q - OSHA General Industry Standard for Welding, Cutting and Brazing
- 5.1.1 1910.252 - General Requirements
- 5.1.2 1910.253 - Oxygen-fuel Gas Welding and Cutting
- 5.2 29 CFR 1926.350 - OSHA Construction Industry Standard for Gas Welding and Cutting
- 5.3 49 CFR Subchapter C, Parts 171-180 U.S. Department of Transportation, Hazardous Materials Regulations
- 5.4 CGA P-1 2008 Safe Handling of Compressed Gases in Containers Eleventh Edition
- 5.5 CGA G-1 2009 Acetylene Twelfth Edition
- 5.6 CGA C-6 2007 Standards for Visual Inspection of Steel Compressed Gas Cylinders Tenth Edition
- 5.7 MPC **RSP-1717-000 Safe Handling of Anhydrous Ammonia Cylinders and Use of Temporary Ammonia Vaporization Tank**

6.0 Attachments

None

7.0 Revision History

Revision Number	Description of Change	Written by	Approved by	Revision Date	Effective Date
0	Original issue. New integrated site procedure replaces GBR-HESS-EQ-01 under MOC 69408.	L. E. McCleave	V. J. Meeks	2/11/2020	3/31/2020
1	Updates references to RSP-1717-000, where anhydrous ammonia is used and clarifies how RSP requirements will be met.	H., L. Jackson	E. R. Kaysen	5/19/2021	5/25/2021