

# Triumvirate Environmental Services, Inc.

## Gas Cylinder De-Valving Process

### 1 GENERAL

#### 1.1 PURPOSE

This Standard Operating Procedure (SOP) establishes requirements that need to be adhered to by all Triumvirate personnel engaged in any aspect of this procedure at 10100 Rocket Boulevard, Orlando, FL.

#### 1.2 SCOPE AND APPLICATION

This procedure applies to all Triumvirate personnel who perform emptying and de-valving of cylinders received at the 10100 Rocket Boulevard facility. Triumvirate personnel will only perform this procedure on cylinders used to hold mixtures of the following gases:

- Mixtures of Breathable Air
- Helium
- Argon
- Nitrogen
- Xenon
- Krypton
- Neon
- Carbon Dioxide
- Oxygen mixtures containing less-than or equal to 22% oxygen and one or more gases listed in this section
- Carbon Monoxide mixtures containing less-than or equal to 50ppm and one or more of the gases listed in this section
- Calibration gases containing less-than or equal to 50ppm hydrogen sulfide, with a balance of nitrogen and/or argon

*Note: The procedure may only be performed under the supervision of the Facility Manager or designee.*

#### General

When emptying and de-valving compressed gas cylinders, Triumvirate personnel shall perform the operation safely and in a manner consistent with all federal state and local laws and regulations and in adherence to this SOP.

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### 2 RESPONSIBILITIES

Triumvirate personnel must receive 12 hours of hands-on training prior to conducting this procedure. Personnel who perform cylinder de-valving activities must review and adhere to the requirements in this procedure. The Facility Manager shall ensure that employees who perform cylinder de-valving activities adhere to these requirements.

Any activities that are different in the scope of the task described in this SOP (example: different cylinder types/concentrations) must be reported to the Facility Manager before proceeding.

### 3 PROCEDURES

#### 3.1 PREPARATION

3.1.1. Prior to conducting cylinder de-valving activities, a complete inventory of all discarded cylinders, including a detailed description of cylinder sizes and contents (gases and concentrations), shall be reviewed and approved by the Facility Manager. Only cylinders that contain gases referenced in section 1.2 (above) will be processed.

3.1.2. A work station will be established the Truck-To-Truck Transfer Area loading dock or in the Lower Warehouse (North Warehouse). The work station area shall be free of any hazardous waste containers and include the following pieces of equipment:

- A flat surface equipped with a vice or other device designed to hold cylinders in a horizontal, secure, stationary position. This will ensure the cylinder will remain in a secure position and not roll away from the work area.
- A manifold with the following features:
  - A fitting used to connect discarded cylinders to the manifold system. A high-pressure gauge capable of reading pressures from 500 to 4,000 psi. A low-pressure gauge capable of reading pressures from 0 to 500 psi
  - An inlet fitting used to connect a backfill cylinder to the manifold system and. pressurize the discarded cylinder
  - A valve-operated outlet vent used to depressurize and release gas from the manifold system
  - A set of hand tools (including adjustable wrenches) to be used for attaching cylinders to the manifold, tightening fittings and removing valves from cylinders

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- 3.1.3. One technician will conduct the testing. The Facility manager or designee will be notified before work begins. A multi-gas meter (detecting Oxygen, Carbon Monoxide, LEL and Hydrogen Sulfide) will be placed in the breathing area and left running at all times during the work. The technician will periodically check the meter to ensure that gas levels are appropriate for work to continue and do not present a hazard (i.e. oxygen levels not below 19.5%).
- 3.1.4. The Facility Manager or designee will produce a list of discarded cylinders that will be emptied and de-valved.

The Technician will compare the label on the discarded cylinders to be de-valved to the list provided by the Facility Manager or designee. If the gas mixture indicated on the label includes gases or concentrations other than those listed on the Facility Manager's reviewed/approved list, the technician will STOP and immediately contact the Facility Manager or designee for further instructions.

### 3.2 TESTING OF DISCARDED CYLINDERS

- 3.2.1. No more than 8 cylinders will be tested and emptied at a time. The technician will pressure test each cylinder to determine if full or empty. If full the technician will place each discarded cylinder on a flat surface on which the cylinder will be secured, in a horizontal/upright position. The technician will then attach the cylinder to the manifold and verify that all valves are closed. Now the valve(s) of the discarded cylinder(s) will be opened slowly.
- 3.2.2. Once the discarded cylinders are pressure tested, they will be correctly secured and attached to the manifold system. The discarded cylinder pressure will be checked through a high pressure gauge (500 to 4000 psi). If the gauge indicates that the manifold system is pressurized above 500 psi, the outlet vent valve will be opened slowly to begin removing gas from the cylinder. Once the gauge reading drops to 500 psi, the first technician will turn his attention to the low-pressure gauge and confirm that the pressure of the system continues to drop below 500 psi.

The contents of the cylinder will continue to be bled through the outlet vent until the low pressure gauge indicates that the pressure has dropped.

A reading of **0 psi** will indicate that the cylinder is now "empty" per 40 CFR 261.7[b][2], and then the outlet vent valve and the discarded cylinder valve will be closed.

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#### 3.3 DE-VALVING EMPTY CYLINDERS

- 3.3.1. No more than 8 cylinders may be emptied at a time. Once each cylinder is confirmed to be at 0 psi they are assumed to be empty. Only then can the “now empty” cylinder be de-valved. A multi-gas meter will be employed during de-valving operations to monitor for emissions.
- 3.3.2. Each empty cylinder will then be placed in horizontal position on the flat surface in the de-valving area and secured by means of a vice or similar device. The technician will use an adjustable wrench or similar hand tool to slowly spin the valve in a counter-clockwise motion. The technician will continue to apply pressure and spin the valve until the valve has detached from the cylinder.

#### 3.4 DOCUMENTING AND DISPOSING OF EMPTIED/DE-VALVED CYLINDERS

- 3.4.1. Each cylinder that has been emptied and de-valved shall be documented and logged by the Facility Manager or designee. The Facility Manager or designee will maintain a log of all processed cylinder for three (3) years from when a discarded cylinder is emptied and de-valved. The log will include the following information:
- Barcode
  - Cylinder Contents (including full chemical names and concentrations as indicated on the manufacturer's label)
  - Cylinder Type ("Lecture" or "Small")
  - Cylinder Pressure
  - Cylinder Emission
  - Weight
  - Processing Date (date that cylinder was emptied at Triumvirate).
- 3.4.2. All emptied/de-valved cylinders are managed as non-hazardous waste and shipped offsite to appropriate disposal or recycling facilities