



COMPRESSED GAS ASSOCIATION, INC.

SAFETY BULLETIN

SB-9—2011

14501 GEORGE CARTER WAY, SUITE 103
CHANTILLY, VA 20151
703-788-2700
cga@cganet.com

RECOMMENDED PRACTICE FOR THE OUTFITTING AND OPERATION OF VEHICLES USED IN THE TRANSPORTATION AND TRANSFILLING OF LIQUID OXYGEN USED FOR RESPIRATION

The increased use of liquid oxygen in the home respiratory care market has greatly increased the frequency of transporting and transfilling activities. Transporting and transfilling liquid oxygen takes place in the cargo compartment of vans or similar vehicles using containers that are either permanently installed and filled in place or temporarily affixed (restrained) and filled in place or removed for filling. Vehicles used to transport and transfill liquid oxygen containers have been involved in incidents that resulted in property damage, personal injury, and death. In many cases, vehicle design or transportation practices were unsafe. The practices recommended in this safety bulletin include excerpts from CGA P-2.6, *Transfilling of Liquid Oxygen Used for Respiration*, and are intended to prevent or lessen the consequences of any incidents involving vehicles used to transport and transfill liquid oxygen [1].

1. Transporting and transfilling liquid oxygen should only be performed by trained and qualified personnel familiar with the hazardous properties of oxygen, required safety precautions, and applicable regulations. Personnel transporting or transfilling liquid oxygen should also be familiar with the procedures necessary to comply with applicable regulations.
2. A trained and qualified person shall attend any filling or transfilling process.
3. Compartments used for transporting and transfilling shall be separated from the driving compartment by a sealed, noncombustible bulkhead to prevent accumulation of an oxygen-enriched atmosphere in the driving compartment. Fixed windows are permitted in the bulkhead.
4. Tanks shall be mounted so they are protected from damage that can be caused by other cargo. The tank may be placed in a separate compartment or in the same compartment as other equipment, but fill lines and connections shall be protected from rupture or accidental release of cargo.
5. Multiple vents shall be provided in the cargo compartment. There shall be a minimum of three vents, two in the forward portion of the cargo compartment (one on each side) and one in the rear portion of the cargo compartment. Vents should be fixed, open, at or near the floor line, and unobstructed. The total free area of the vents shall be at least 1 ft² (0.09 m²).
6. Combustible materials such as paneling, plywood, carpeting, etc., shall not be used in the finishing or sub-floor of the cargo compartment.
7. When transporting absorbent combustible equipment (such as mattresses) with either liquid or compressed oxygen, it shall either be located in the vehicle away from the oxygen source or protected so it does not become enriched with oxygen if an oxygen leak occurs. Consideration should be given to transporting this type of equipment in a separate compartment.
8. Containers used to transport liquid oxygen shall be manufactured, filled, maintained, and shipped in accordance with Title 49 of the U.S. *Code of Federal Regulations* (49 CFR) and the *Transportation of Dangerous Goods Regulations* [2, 3]. Containers shall be manufactured to U.S. Department of Transportation (DOT) (e.g., DOT-4L, MC-338, or CGA 341) or shall be constructed so the pressure does not exceed 25.3 psig (174 kPa) during transportation, exempting them from some provisions of DOT regulations in-

cluding the design specifications of 49 CFR Part 178 [2].¹ In Canada, containers shall be manufactured to Transport Canada (TC) specifications (e.g., TC-4LM, TC-341).

9. The container vent lines and pressure relief valves from containers filled in the cargo compartment including permanently mounted or temporarily affixed containers shall be piped outside the vehicle. Vent lines shall be designed to prevent discharge onto oil, asphalt surfaces, other combustible materials, or the vehicle's exhaust system. Vent lines shall be designed and installed to prevent blockage due to weather conditions, line crimping, or other obstructions. Vent lines shall be designed and installed to ensure the normal operation of the container vent. Vent lines include hose drains and full trycocks. Secondary pressure relief devices set to operate only if primary vent lines are blocked can relieve inside the vehicle compartment.
10. All cargo shall be secured during transportation. Containers not permanently mounted shall be suitably supported or restrained while in use to prevent tipping or excessive movement. Tank restraints shall provide solid attachment, directly or indirectly, to the vehicle chassis or substructure. Restraining devices used in the cargo area shall be appropriate for the load carried.
11. All system components including but not limited to valves, valve seats, lubricants, fittings, gaskets, and all interconnecting equipment including hoses shall be compatible with oxygen under the required operating temperature and pressure conditions and shall be cleaned for oxygen service. All pressurized components shall be protected by a pressure relief device (PRD) that limits the container pressure to a value permitted by applicable regulations.
12. The vehicle shall remain stationary with the engine turned off while transfilling is performed. A system shall be in place to manage the control of the vehicle so it is not driven away or moved during loading or unloading operations, for example, use of wheel chocks.
13. All cargo compartment doors shall be left open and the vent gas shall be directed outside during any filling or transfilling process conducted in the cargo compartment. Filling connections shall be positioned to prevent the accumulation of oxygen in the cargo compartment as well as to prevent contact of the vented liquid or gas with combustible materials or with the vehicle's fuel tank connection.
14. All filling operations shall be conducted in a way that prevents the contact of vented liquid or gas with asphalt or other combustible materials.
15. Signs stating that smoking and open flames are prohibited shall be clearly posted in the compartment, on the outside of the vehicle, and near any filling or transfilling in process. No source of ignition shall be allowed within 10 ft (3 m) of the transfilling process.
16. Oxygen vapors from the filling process including draining of transfer lines shall disperse before the vehicle's engine is started.
17. The liquid supply valve shall remain closed except when filling containers while the vehicle is parked in a safe location. Fill hoses and connections shall be properly secured. Hoses and connections shall be vented after each use and before the next fill to prevent pressure buildup in the fill line.
18. Vehicles should be equipped with the minimum safety equipment as follows:
 - fire extinguisher;
 - road safety triangles (in case of breakdown); and
 - first aid kit.
19. In the United States, vehicles shall be marked, placarded, and operated in accordance with DOT regulations and all other federal, state, and local regulations [2]. In Canada, vehicles shall be marked, placarded, and operated in accordance with TC regulations and all other federal, provincial/territorial, and local regulations [3].

¹ kPa shall indicate gauge pressure unless otherwise noted as (kPa, abs) for absolute pressure or (kPa, differential) for differential pressure. All kPa values are rounded off per CGA P-11, *Metric Practice Guide for the Compressed Gas Industry* [4].