

# Developing a Policy for Auto Transportation of Medical Oxygen in High Pressure Cylinders and Cryogenic Vessels





Since 1993, Applied Home Healthcare Equipment LLC has published numerous publications, videos, and seminars on the dangers of transporting oxygen in vehicles. During the last fifteen years we have found that failure to follow safety guidelines and unsafe practices with oxygen will often lead to regulatory violations and even accidents. Please use this guide along with other oxygen safety information from your supplier and / or trade organizations to help develop policies and procedures to fit your unique application.

The following information should be considered general guidance only and may not explain all relevant safety, regulatory, hazards, and /or requirements for your application. Please see Applied's web-site [www.applied-inc.com](http://www.applied-inc.com) for more information and links to FDA, CGA, GAWDA, and other useful web-sites.

- I. **BACKGROUND:** First oxygen is not flammable, however it will cause almost any material to ignite at very low temperatures, burn rapidly, violently, and in some cases seem explosive like. It is critical that oxygen not be allowed to leak especially inside an enclosed vehicle trunk, passenger, or cargo compartment. Common accidents with oxygen in vehicles have occurred from:

1. **LEAKING:** Oxygen can leak or vent in variety ways including partially open valves, damaged safety relief devices or valves, damaged gauges, etc., caused from the shifting or movement of the container in the vehicle. Every oxygen container (cylinder or cryogenic vessel) must be secured from movement, shifting, or ejection during normal transportation. Valves, safety relief devices, and / or gauges should be protected from even slight impacts. Cylinder racks, straps, & securing devices can help prevent leaks from occurring.



PN# 1100-1795

2. **CONTAINER MOVEMENT:** In the event of abrupt or sudden stop, or accident, an unsecured cylinder or cryogenic vessel can become a flying object which can seriously injure the driver and/or passengers. For example, if a vehicle comes to sudden stop from 30 mph, an unsecured cylinder or cryogenic vessel will continue to travel at 30 mph until it impacts something. This "something" could be the back of a car seat,



driver, passenger or a person. A cylinder or cryogenic vessel striking someone at 30 mph can cause serious, possibly irreversible, injuries or even death. Every gas container must be secured against shifting, movement, or ejection during normal transportation.

3. VENTING OF THE SAFETY RELIEF DEVICE: Every gas container whether it is a high pressure oxygen cylinder or cryogenic vessel has one more safety relief devices which will vent the gas in the event of over pressurization. Over pressurization can be caused from rising temperatures in the vehicle or in case of cryogenics excessive movement. Also, safety relief devices can eventually fail and allow venting of oxygen in the vehicle enriching the atmosphere. As mentioned above, an enriched oxygen atmosphere can lead to a serious, rapid, extremely hot, violent, explosive like fire that is difficult to extinguish. Gas containers again must be secured and either transported with the windows partially down in an enclosed vehicle, never in trunk, or in an open truck.
  
  4. FALLING OVER: Cryogenic or liquid oxygen vessels can spill or vent their contents if they tipped or fall over. Liquid oxygen will expand 800 times when it is exposed to atmospheric temperatures and pressures. This can create a high risk of fire and eye and skin injuries from cryogenic or liquid oxygen which is -297 degrees F. Cryogenic or liquid oxygen vessels typically vent a portion of the contents (1 to 2% or more) during normal conditions (never interfere with this normal venting process or the vessel could rupture). Cryogenic or liquid oxygen vessels must be secured upright and transported in an open or vented (windows partially down) vehicle.
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- A photograph showing a woman with blonde hair, wearing a white shirt, sitting in the driver's seat of a white vehicle. She is looking down at a clipboard she is holding in her lap. The vehicle's window is partially rolled down. The background shows a brick wall and a window.

5. WAIT THERE'S MORE...: The major hazards are shown above, however there are more hazards and regulations for transporting oxygen and it is not possible to list all of them in this policy guide. Use Applied's web site



for updates, changes, and for more information / links, see [www.applied-inc.com](http://www.applied-inc.com). Also, sign up for Applied's regulatory updates from mailers, e-mails, and / or faxes.

II. DRIVER'S RESPONSIBILITIES: Your policy should include the following driver's responsibilities for transporting any quantity of oxygen up to 150 cubic feet. For passenger cars CGA standards (CGA P-1) and other regulations recommend transporting not more than 150 cubic feet of oxygen (about six "E" cylinders) .

1. Make sure the cylinder is secured in the vehicle not the trunk, either vertically or horizontally so that it will not move relative to the vehicle. Cryogenic cylinders must be transported in a vertical position. If the patient or care giver's vehicle is used frequently to pick-up oxygen cylinders, consider equipping with cylinder rack designed to be used in passenger car or van (i.e., attaches securely in the back seat) such as the Clinician's Cylinder Carrier (see [www.applied-inc.com](http://www.applied-inc.com), Applied PN #1100-1750, 1753, or 1758)



PN# 1100-1750

2. Keep the auto or van well ventilated by keeping windows open or at least partially open.
3. Drive directly to your destination — no intermediate stops. Oxygen cylinders and cryogenic vessels should not remain in the vehicle longer than necessary for transportation.
4. Take a route which is most direct. If possible, avoid routes with heavy traffic. If a choice has to be made, take a longer route and avoid the traffic (less chance of an accident that would involve more of the general public).



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5. When destination is reached turn off the engine, set parking brake, put transmission into "park" or "first" (with manual transmission) and get assistance in removing the cylinder cryogenic vessels from the auto or van depending on its size and weight.
  
6. Follow the providers instructions for proper use of the cylinder to be used. If not available obtain a copy of Safe Handling of Compressed Gases in Containers, pamphlet P-1, from Applied or the Compressed Gas Association.
  
7. If returning the cylinder by auto or van, follow directions that apply to pick-up and transportation of a full cylinder or cryogenic vessel.
  
8. Do not operate any spark or flame producing devices or smoke within 25 feet of oxygen.



PN# 1109-0081

- III. SAMPLE RELEASE AND ASSUMPTION OF RISK: Please see the attached sample release form. It is designed to remind the vehicle driver of his responsibilities to their passenger(s) and/or the public. In addition, it may or may not reduce your risk of liability for an accident.



## SAMPLE RELEASE AND ASSUMPTION OF RISK

The undersigned is buying industrial, specialty, or medical gases from \_\_\_\_\_

\_\_\_\_\_ (the "Company") which he/she will move by car or closed van. Company has told the undersigned that:

1. Putting gas cylinders in cars or vans can be dangerous and should be avoided.
2. It is the driver's responsibility to transport the cylinders or cryogenic vessels in a safe manner and in compliance with U. S. DOT, Transport Canada, and State / Provincial regulations.
3. Gas cylinders **must never** be moved in **closed spaces** such as car trunks.— It is **EXTREMELY DANGEROUS** and could cause **EXPLOSION OR FIRE**.
4. Federal law prohibits smoking within 25 feet of oxygen, or other oxidizing or flammable gases. Of course, this means no one can smoke in or within 25 feet of the vehicle when it is transporting oxygen.
5. Gas cylinders should secured and upright position, with windows open for ventilation. A cylinder or cryogenic vessel rack which is designed for this purpose is recommended.
6. If cylinders must moved on their side, they **must be fastened** so they can't move, shift, roll around, or be ejected and transported with the windows open for ventilation.
7. It would be safer to wait and move the cylinder(s) by open truck.

The undersigned still wants to carry the gas cylinder(s) by car or van now and for himself/herself and his/her employer (if any), the undersigned: ASSUMES THE RISK of **bodily injury** to the undersigned or others in the car or van, or of **loss** of or **damage** to the **vehicle** or other **property**, and RELEASES the Company and its employees, officers and directors from any liability for bodily injury or loss or damage to any property resulting from his/her transporting any gas cylinder(s) by car or van.

Dated: \_\_\_\_\_

(Sign here): \_\_\_\_\_ Printed Name \_\_\_\_\_

Witness (company employee) \_\_\_\_\_

## U. S. DOT REGULATIONS APPLYING TO AUTO TRANSPORTATION OF CYLINDERS (Part of Notice to Customers):



The following are pertinent Department of Transportation regulations that apply to transportation by vehicle. They have been taken from Part 49 Code of Federal Regulations.

**177.834 General requirements. (a) Packages secured in a motor vehicle.** Any package containing any hazardous material (includes medical oxygen) not permanently attached to a motor vehicle, must be secured against shifting, including relative motion between packages, within the vehicle on which it is being transported, under conditions normally incident to transportation. Packages having valves or other fittings must be loaded in a manner to minimize the likelihood of damage during transportation. **(h) Precautions concerning containers in transit;** fueling road units. Reasonable care should be taken to prevent undue rise in temperature of containers and their contents during transit. There must be no tampering with such container or the contents thereof nor any discharge of the contents of any container between point of origin and point of billed destination. Discharge of contents of any container, other than a cargo tank or IM portable tank, must not be made prior to removal from the motor vehicle. Nothing contained in this paragraph shall be so construed as to prohibit the fueling of machinery or vehicles used in road construction or maintenance.

**177.840 Class 2 (gases) materials (such as medical oxygen): (a) Floors or platforms essentially flat.** Cylinders containing Class 2 (gases) materials shall not be loaded onto any part of the floor or platform of any motor vehicle which is not essentially flat; cylinders containing Class 2 (gases) materials may be loaded onto any motor vehicle not having a floor or platform only if such motor vehicle be equipped with suitable racks having adequate means for securing such cylinders in place therein. Nothing contained in this section shall be so construed as to prohibit the loading of such cylinders on any motor vehicle having a floor or platform and racks as herein before described. **(a)(1) Cylinders.** Cylinders containing Class 2 gases must be securely restrained in an upright or horizontal position, loaded in racks, or packed in boxes or crates to prevent the cylinders from being shifted, overturned or ejected from the motor vehicle under normal transportation conditions. **(b) Portable tank containers containing Class 2 (gases) materials shall be loaded on motor vehicles only as follows:** (b)(1) Onto a flat floor or platform of a motor vehicle. (b)(2) Onto a suitable frame of a motor vehicle. (b)(3) In either such case, such containers shall be safely and securely blocked or held down to prevent shifting relative to each other or to the supporting structure when in transit, particularly during sudden starts and stops and changes of direction of the vehicle. (b)(4) Requirements of paragraphs (1) and (2) of this paragraph (b) shall not be construed as prohibiting stacking of containers, provided the provisions of paragraph (3) of this paragraph (b) are fully complied with.



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## References

- CGA Pamphlet G-4 “Oxygen” (PN OF-1039)
- CGA Pamphlet G-4.1 “Cleaning Equipment for Oxygen Service” (PN OF-1040)
- CGA Pamphlet P-1 “Safely Handling Compressed Gases in Containers” (PN OF-1024)
- CGA Pamphlet P-2 “Characteristics and Safe Handling of Medical Gases” (PN OF-1027)
- CGA Video AV-8, “Characteristics and Safe Handling of Cryogenic Liquid Gaseous Oxygen” (PN OF-1030)
- CGA Pamphlet SB-9 “Recommended practice for outfitting and operation of vehicles used in the transportation and transfilling of liquid oxygen used for respiration” (PN OF-1049)
- EIGA 8/76/E “Prevention of Accidents Arising from Enrichment of Deficiency of Oxygen in the Atmosphere (PN OF-1082)
- NFPA 55 Standard for Storage, Use and Handling of Compressed Gases and Cryogenic Fluids in Portable & Stationary Containers, Cylinders and Tanks (PN OF-1083)
- Oxygen Pocket Reference Guide v 2.0 (Available on [www.applied-inc.com](http://www.applied-inc.com))
- Sample Release and Assumption Form; adapted from GAWDA Policy on Auto Transportation of Compressed Gas Cylinders, 2005

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