



U.S. Department of Transportation  
**Pipeline and Hazardous Materials  
Safety Administration**

1200 New Jersey Ave, SE  
Washington, D.C. 20590

**APR 18 2011**

Mr. Dan Bricker  
Chart Industries  
2800 Airwest Blvd.  
Plainfield, In. 46168

Reference No.: 11-0046

Dear Mr. Bricker:

This responds to your letter concerning the transport of cryogenic liquids under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Specifically, you ask how the definition of the term “service pressure” and the exceptions for cryogenic liquids provided in § 173.320 of the HMR apply to specification DOT-4L welded insulated cylinders used to transport medical oxygen. In your incoming letter, you state that you wish to transport medical oxygen in a 46 Liter insulated liquid oxygen (LOX) container. Your questions have been paraphrased and answered as follows:

- Q1: What is the definition of the term “Service Pressure” as it applies to the specification for DOT 4L welded insulated cylinders specified in § 178.57?
- A1: As specified in § 173.115, the term “service pressure,” as it is used throughout the HMR, means the authorized pressure marking on the packaging. For example, for a cylinder marked “DOT 3A1800,” the service pressure is 12,410 kPa (1,800 psig). The 46 Liter insulated LOX container you describe in your incoming letter cannot be considered a DOT-4L cylinder unless it has a water capacity (nominal) not over 1,000 pounds water capacity, a marked service pressure of at least 40 psig but not greater than 500 psig, and the cylinder conforms to all other specifications required in § 178.57.
- Q2: Does the 46 Liter insulated liquid oxygen (LOX) container described in the incoming letter meet the exceptions provided in § 173.320?
- A2: The packaging exceptions for cryogenic liquids are found in § 173.320 and allow for alternative packaging methods. In accordance with § 173.320(a), atmospheric gases and helium, cryogenic liquids, in Dewar flasks, insulated cylinders, insulated portable tanks, insulated cargo tanks, and insulated tank cars, designed and constructed so that the pressure in such packagings will not exceed 25.3 psig under ambient temperature conditions during transportation are not subject to the requirements of this subchapter

when transported by motor vehicle or railcar except as specified in paragraphs (a)(1), (a)(2), and (a)(3) of § 173.320. Provided your container meets the requirements of § 173.320, it may be transported in the 46 Liter insulated liquid oxygen (LOX) container you describe. It should be noted, however, that the 25.3 psig referred to in § 173.320(a) is not the service pressure.

Q3: If the 46 Liter insulated liquid oxygen (LOX) container described in the incoming letter does not meet exceptions provided in § 173.320, what packaging specifications would the container need to satisfy in order to transport cryogenic liquids?

A3: The general requirements for cryogenic liquids in cylinders are found in § 173.316. If the medical oxygen packaged in insulated LOX containers does not conform to the exceptions provided in § 173.320, it must be packaged in accordance with § 173.316 and transported in a cylinder marked as a specification DOT-4L cylinder.

I hope this satisfies your inquiry. Please contact us if we can be of further assistance.

Sincerely,

A handwritten signature in black ink, appearing to read "T. Glenn Foster". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

T. Glenn Foster  
Chief, Regulatory Review and Reinvention Branch  
Standards and Rulemaking Division



Benedict  
§ 173.320  
§ 178.57  
Cylinders  
11-0046

MEMORANDUM

TO: Mr. Duane Cassidy  
D.O.T. Chief of Approvals Group  
FROM: Dan Bricker  
DATE: 02/21/2011  
SUBJECT: Request for Guidance and Interpretation

**Mr. Cassidy; Thanks** for meeting with Ben Kadrluk and me on Friday. As you suggested I am making my request in writing. Please provide us with your guidance and interpretation with respect to the following:

1. I would like a definition and better understanding of the term "Service Pressure" as it applies to 49 CFR 178.57 **specifications for DOT 4L welded insulated cylinders.**
2. Secondly, I would like to know the impact and intent of **173.320 Cryogenic Liquids; Exceptions** under the Requirements for Shipments and Packaging's.

I am working on a 46 Liter insulated LOX container for providing medical oxygen to respiratory patients. In an effort to keep the service pressure under the 40 PSIG level which would place it within the 4L requirements I need to know specifically what is meant by the term "service pressure." I have attached plumbing schematics of this unit in its Standby Mode and both oxygen delivery modes. When the unit is being used by the patient, its normal operating pressure is 22 psig which is controlled by an "economizer" valve. If it is not being used by the patient such as when the patient is away with the mating portable unit, the system pressure is controlled by a primary relief valve. As a safety back-up to the primary relief valve, we then have a secondary relief valve. I am assuming that the "Service Pressure" relates to the primary relief valve.

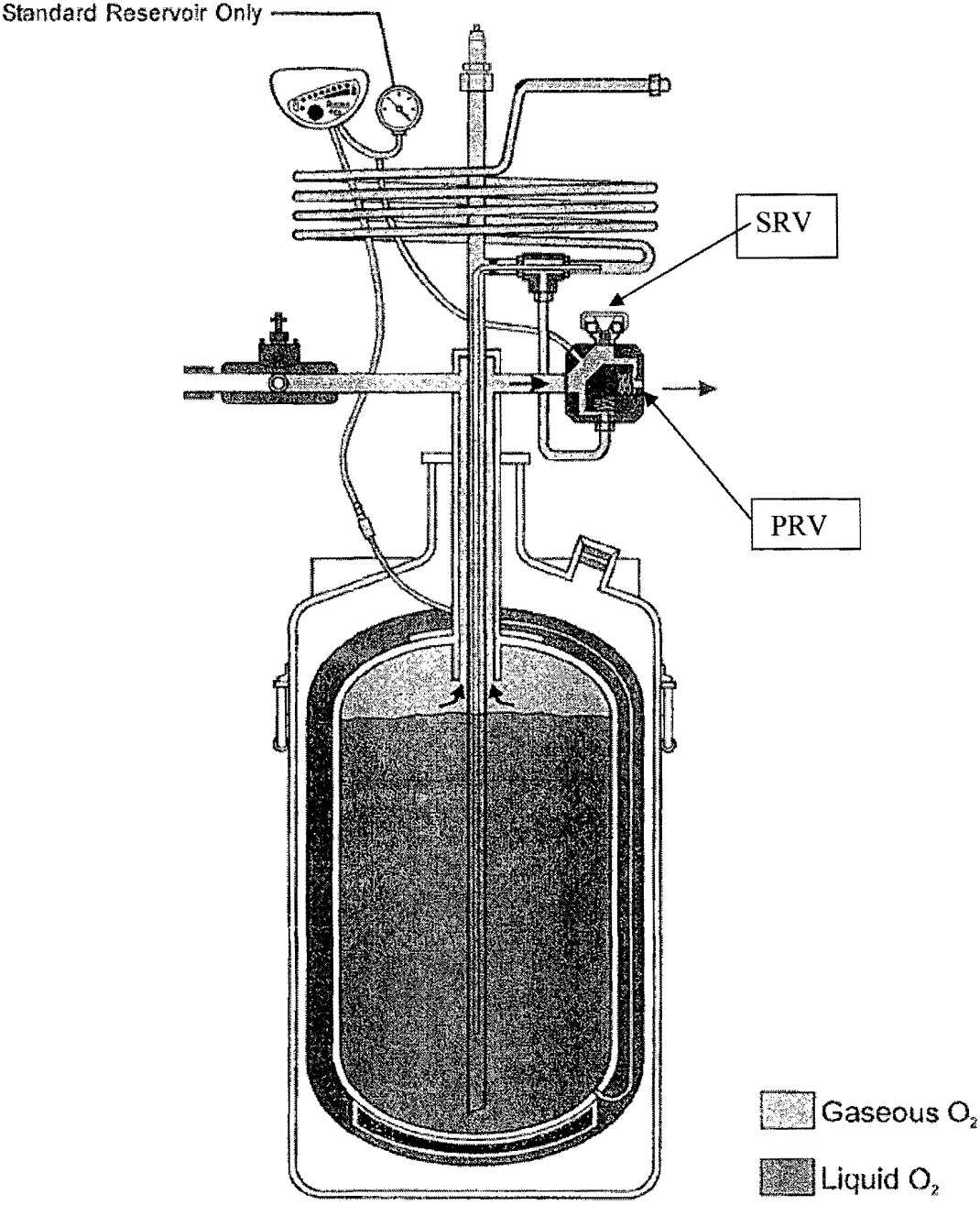
My thought is to have a service pressure under the 40 psig, and then consistent with CGA S-1.1 paragraph 5.9.3, I would determine the primary relief valve setting as:

Set pressure <  $(1.25 \times 40) - 15$ , or 35 psig.

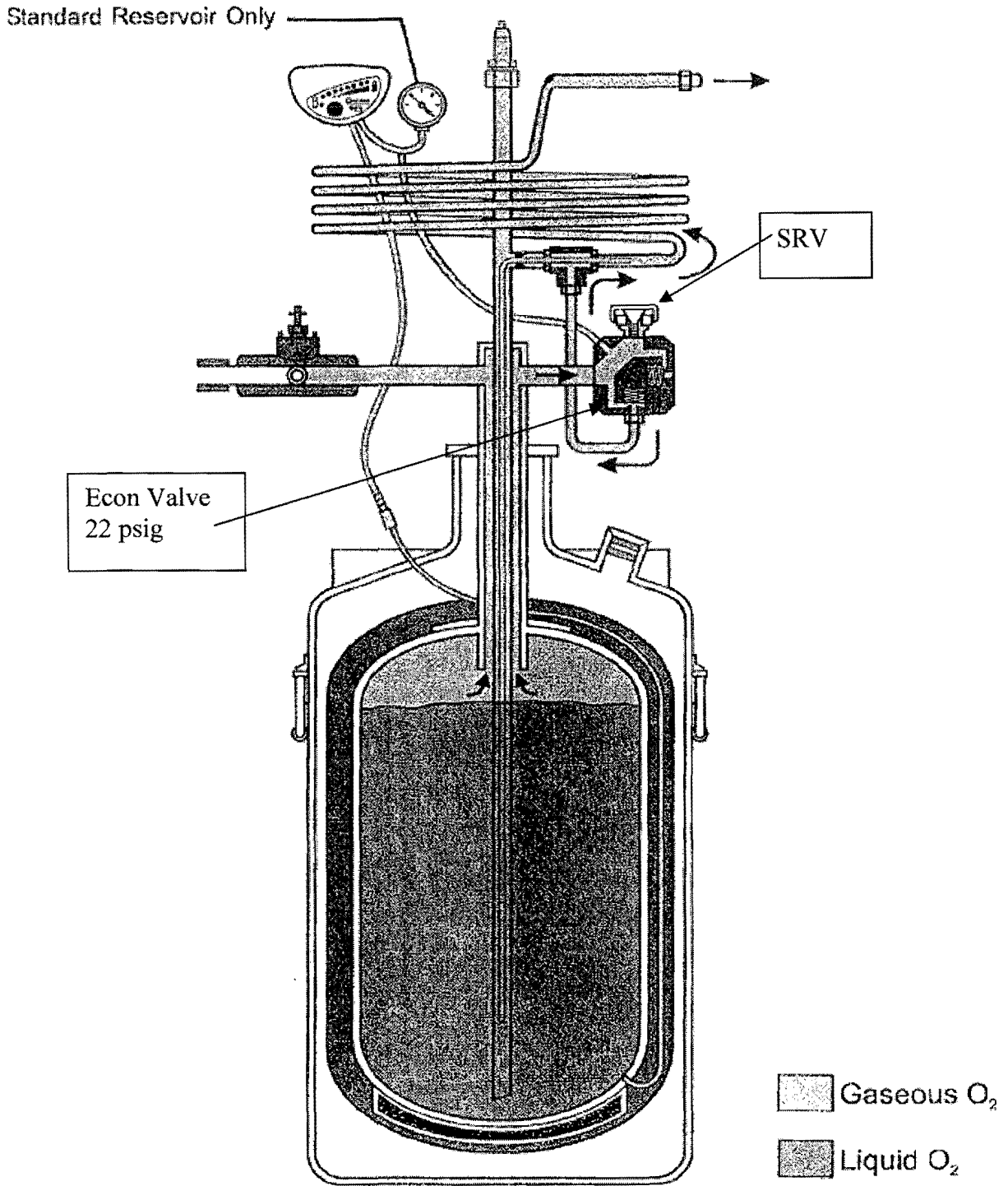
Another way to look at this may be that the normal operating pressure is 22 psig and if the vacuum loading of 14.7 is added, then the service pressure would be 36.7 psia. This does not make sense because 178.57 defines the service pressure limit as 40 psig.

The second question is related to the Requirements for Shipments and Packaging's, specifically part **173.320 Cryogenic Liquids; Exceptions** paragraph (a). This states that cryogenic liquids in cylinders designed and constructed so that the pressure will not exceed 25.3 psig during transportation are not subject to the requirements of this subchapter. In the case of the unit described above my assumption is that since the pressure is in excess of the 25.3 psig (35 psig) then the it is subject to the requirements of the subchapter which for a liquid oxygen cylinder would be specifically, **173.316 Cryogenic liquids in cylinders.**

Since the DOT 4L relates to the specification for the welded cylinders with service pressures > 40 psig and the requirements for shipments and packagings has requirements for pressures exceeding 25.3 psig am I correct to assume that cylinders with pressures between these two references can be used to ship liquid oxygen without being DOT 4L stenciled providing that the requirements of 173.316 are met?



*Standby*



*Oxygen Flow Through Economizer Circuit*