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

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

NOV 30 2010

Mr. Gilbert de Chauvigny de Blot
I4Safety B.V.
Pimpelmees 3
1423 NX Uithoorn
The Netherlands

Ref. No.: 10-0215

Dear Mr. Chauvigny de Blot:

This responds to your October 8, 2010 email requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Specifically, you ask for clarification of the regulations pertaining to the packaging for transportation of oxygen cylinders and chemical oxygen generators by cargo only aircraft. Your questions are paraphrased and answered as follows:

Q1) If an outer packaging for an oxygen cylinder is successfully tested in accordance with the "Thermal Resistance Test," specified in Appendix D to Part 178 of the HMR, would it be a compliant outer packaging for oxygen cylinders under the HMR?

A1) Yes, provided: both the cylinder and the outer packaging are capable of passing both the Flame Penetration Test (Appendix E to part 178; attached) and Thermal Resistance Test (Appendix D to part 178; attached); the outer packaging conforms to the requirements of either part 178, subparts L and M at the packing group I or II performance level, or the performance criteria in Air Transport Association (Air Transport Association) Specification No. 300 for a Category I Shipping Container (ATA 300); prior to each shipment, the outer packaging passes a visual examination to ensure that the packaging and its features (i.e., latches, hinges, seams, and other features) are in good condition; and the packaging and its contents otherwise satisfy the requirements in § 173.302(f) (attached).

Q2) If an outer packaging for a chemical oxygen generator is successfully tested in accordance with the "Thermal Resistance Test," specified in Appendix D to Part 178 of the HMR, would it be a compliant outer packaging for oxygen cylinders under the HMR?

A2) Yes, provided the packaging and its contents meet the conditions described in A1 and otherwise satisfy the requirements of § 173.168 (attached).

Q3) How are the drop test requirements for ATA Specification No. 300 for Category I Shipping Containers different than the drop tests for non-bulk performance oriented packagings under

the UN Recommendations on the Transport of Dangerous Goods - Model Regulations (UN Recommendations)?

A4) There are several differences, some of which are provided below. ATA 300 requires a series of drops to be conducted on the face, edge, and corner of the prototype package and at least one other container of that design selected at random from the first production lot. The drop test requirements in § 173.603, which are harmonized with the UN Recommendations, require the drop test to be conducted on five samples for a box: flat on bottom; flat on top; flat on long side; flat on short side; and, on a corner. Under ATA 300, the drop height and number of drops conducted on the packaging are dependent upon the gross weight of the package and the dimensions of the outer packaging. Under § 173.603, the drop height is a minimum of 1.8 meters for packing group I packages and 1.2 meters for packing group II packages and is not a function of package weight. We recommend you review ATA 300 for more specific details regarding the drop test requirements and how they differ from drop test criteria under the UN Recommendations.

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

Sincerely,

for Ben Supko
Acting Chief, Standards Development
Office of Hazardous Materials Standards

(Attachments)

(g) *Composite cylinders in underwater use.* A composite cylinder certified to ISO–11119–2 or ISO–11119–3 may not be used for underwater applications unless the cylinder is manufactured in accordance with the requirements for underwater use and is marked "UW" as prescribed in §178.71(o)(17) of this subchapter.

[71 FR 33882, June 12, 2006, as amended at 71 FR 54395, Sept. 14, 2006]

§ 173.302 Filling of cylinders with non-liquefied (permanent) compressed gases.

(a) *General requirements.* A cylinder filled with a non-liquefied compressed gas (except gas in solution) must be offered for transportation in accordance with the requirements of this section and §173.301. In addition, a DOT specification cylinder must meet the requirements in §§173.301a, 173.302a and 173.305, as applicable. UN pressure receptacles must meet the requirements in §§173.301b and 173.302b, as applicable. Where more than one section applies to a cylinder, the most restrictive requirements must be followed.

(b) *Aluminum cylinders in oxygen service.* Each aluminum cylinder filled with oxygen must meet all of the following conditions:

(1) Metallic portions of a valve that may come into contact with the oxygen in the cylinder must be constructed of brass or stainless steel.

(2) Except for UN cylinders, each cylinder opening must be configured with straight threads only.

(3) Each UN pressure receptacle must be cleaned in accordance with the requirements of ISO 11621 (IBR, see §171.7 or this subchapter). Each DOT cylinder must be cleaned in accordance with the requirements of GSA Federal Specification RR–C–901D, paragraphs 3.3.1 and 3.3.2 (IBR, see §171.7 of this subchapter). Cleaning agents equivalent to those specified in Federal Specification RR–C–901D may be used provided they do not react with oxygen. One cylinder selected at random from a group of 200 or fewer and cleaned at the same time must be tested for oil contamination in accordance with Federal Specification RR–C–901D, paragraph 4.3.2, and meet the specified standard of cleanliness.

(4) The pressure in each cylinder may not exceed 3000 psig at 21 °C (70 °F).

(c) Notwithstanding the provisions of §§173.24(b)(1) and paragraph (f) of this section, an authorized cylinder containing oxygen continuously fed to tanks containing live fish may be offered for transportation and transported.

(d) Shipment of Division 2.1 materials in aluminum cylinders is authorized for transportation only by motor vehicle, rail car, or cargo-only aircraft.

(e) *DOT 3AL cylinders manufactured of 6351–T6 aluminum alloy.* Suitable safeguards should be provided to protect personnel and facilities should failure occur while filling cylinders manufactured of aluminum alloy 6351–T6 used in self-contained underwater breathing apparatus (SCUBA), self-contained breathing apparatus (SCBA) or oxygen service. The cylinder filler should allow only those individuals essential to the filling process to be in the vicinity of the cylinder during the filling process.

(f) *Compressed oxygen and oxidizing gases by aircraft.* A cylinder containing oxygen, compressed; compressed gas, oxidizing, n.o.s.; or nitrogen trifluoride is authorized for transportation by aircraft only when it meets the following requirements:

(1) Only DOT specification 3A, 3AA, 3AL, 3E, 3HT, and 39 cylinders, and UN pressure receptacles ISO 9809–1, ISO 9809–2, ISO 9809–3 and ISO 7866 cylinders are authorized.

(2) Cylinders must be equipped with a pressure relief device in accordance with §173.301(f) and, for DOT 39 cylinders offered for transportation after October 1, 2008, for the other DOT specification cylinders with the first requalification due after October 1, 2008, or for the UN pressure receptacles prior to initial use:

(i) The rated burst pressure of a rupture disc for DOT 3A, 3AA, 3AL, 3E, and 39 cylinders, and UN pressure receptacles ISO 9809–1, ISO 9809–2, ISO 9809–3 and ISO 7866 cylinders must be 100% of the cylinder minimum test pressure with a tolerance of plus zero to minus 10%; and

(ii) The rated burst pressure of a rupture disc for a DOT 3HT cylinder must be 90% of the cylinder minimum test

pressure with a tolerance of plus zero to minus 10%.

(3) The cylinder must be placed in a rigid outer packaging that—

(i) Conforms to the requirements of either part 178, subparts L and M of this subchapter at the Packing Group I or II performance level or the performance criteria in Air Transport Association (ATA) Specification No. 300 for a Category I Shipping Container;

(ii) After September 30, 2009, is capable of passing, as demonstrated by design testing, the Flame Penetration Resistance Test in Appendix E to part 178 of this subchapter; and

(iii) Prior to each shipment, passes a visual inspection that verifies that all features of the packaging are in good condition, including all latches, hinges, seams, and other features, and that the packaging is free from perforations, cracks, dents, or other abrasions that may negatively affect the flame penetration resistance and thermal resistance characteristics of the packaging.

(4) After September 30, 2009, the cylinder and the outer packaging must be capable of passing, as demonstrated by design testing, the Thermal Resistance Test specified in Appendix D to part 178 of this subchapter.

(5) The cylinder and the outer packaging must both be marked and labeled in accordance with part 172, subparts D and E of this subchapter. The additional marking "DOT31FP," is allowed to indicate that the cylinder and the outer packaging are capable of passing, as demonstrated by design testing, the Thermal Resistance Test specified in Appendix D to part 178 of this subchapter.

(6) A cylinder of compressed oxygen that has been furnished by an aircraft operator to a passenger in accordance with 14 CFR §§121.574, 125.219, or 135.91 is excepted from the outer packaging requirements of paragraph (f)(3) of this section.

[67 FR 51646, Aug. 8, 2002, as amended at 67 FR 61289, Sept. 30, 2002; 68 FR 75745, Dec. 31, 2003; 71 FR 33883; June 12, 2006; 71 FR 51127, Aug. 29, 2006; 72 FR 55098, Sept. 28, 2007]

§173.302a Additional requirements for shipment of nonliquefied (permanent) compressed gases in specification cylinders.

(a) *Detailed filling requirements.* Nonliquefied compressed gases (except gas in solution) for which filling requirements are not specifically prescribed in §173.304a must be shipped subject to the requirements in this section and §§173.301, 173.301a, 173.302, and 173.305 in specification cylinders, as follows:

(1) DOT 3, 3A, 3AA, 3AL, 3B, 3E, 4B, 4BA and 4BW cylinders.

(2) DOT 3HT cylinders. These cylinders are authorized for aircraft use only and only for nonflammable gases. They have a maximum service life of 24 years from the date of manufacture. The cylinders must be equipped with frangible disc type pressure relief devices that meet the requirements of §173.301(f). Each frangible disc must have a rated bursting pressure not exceeding 90 percent of the minimum required test pressure of the cylinder. Discs with fusible metal backing are not permitted. Specification 3HT cylinders may be offered for transportation only when packaged in accordance with §173.301(a)(9).

(3) *DOT 39 cylinders.* When the cylinder is filled with a Division 2.1 material, the internal volume of the cylinder may not exceed 1.23 L (75 in^3).

(4) DOT 3AX, 3AAX, and 3T cylinders are authorized for Division 2.1 and 2.2 materials and for carbon monoxide. DOT 3T cylinders are not authorized for hydrogen. When used in methane service, the methane must be a nonliquefied gas with a minimum purity of 98.0 percent methane and commercially free of corroding components.

(5) Aluminum cylinders manufactured in conformance with specifications DOT 39 and 3AL are authorized for oxygen only under the conditions specified in §173.302(b).

(b) *Special filling limits for DOT 3A, 3AX, 3AA, 3AAX, and 3T cylinders.* A DOT 3A, 3AX, 3AA, 3AAX, and 3T cylinder may be filled with a compressed gas, other than a liquefied, dissolved, Division 2.1, or Division 2.3 gas, to a pressure 10 percent in excess of its marked service pressure, provided:

(1) The cylinder is equipped with a frangible disc pressure relief device

delamination, resin ignition, and time of occurrence of each event.

6.3 Record the temperature and time history of the cylinder temperature during the entire test for each thermocouple location. Temperature measurements must be recorded at intervals of not more than five (5) minutes. Record the maximum temperatures achieved at all three thermocouple locations and the corresponding time.

7. *Requirements.*

7.1 For a cylinder, the outer package must provide adequate protection such that the outer surface of the cylinder and valve does not exceed a temperature of 93 °C (199 °F) at any of the three points where the thermocouples are located.

7.2 For an oxygen generator, the generator must not actuate.

[72 FR 4457, Jan. 31, 2008, as amended at 72 FR 55099, Sept. 28, 2007]

APPENDIX E TO PART 178—FLAME PENETRATION RESISTANCE TEST

(a) *Criteria for Acceptance.* (1) At least three specimens of the outer packaging materials must be tested;

(2) Each test must be conducted on a flat 16 inch x 24 inch test specimen mounted in the horizontal ceiling position of the test apparatus to represent the outer packaging design;

(3) Testing must be conducted on all design features (latches, seams, hinges, etc.) affecting the ability of the outer packaging to safely prevent the passage of fire in the horizontal ceiling position; and

(4) There must be no flame penetration of any specimen within 5 minutes after application of the flame source and the maximum allowable temperature at a point 4 inches above the test specimen, centered over the burner cone, must not exceed 205 °C (400 °F).

(b) *Summary of Method.* This method provides a laboratory test procedure for measuring the capability of cargo compartment lining materials to resist flame penetration with a 2 gallon per hour (GPH) #2 Grade kerosene or equivalent burner fire source. Ceiling and sidewall liner panels may be tested individually provided a baffle is used to simulate the missing panel. Any specimen that passes the test as a ceiling liner panel may be used as a sidewall liner panel.

(c) *Test Specimens.* (1) The specimen to be tested must measure 16 ±⅛ inches (406 ±3 mm) by 24+⅛ inches (610 ±3 mm).

(2) The specimens must be conditioned at 70 °F. ±5 °F. (21 °C. ±2 °C.) and 55% ±5% humidity for at least 24 hours before testing.

(d) *Test Apparatus.* The arrangement of the test apparatus must include the components described in this section. Minor details of the apparatus may vary, depending on the model of the burner used.

(1) *Specimen Mounting Stand.* The mounting stand for the test specimens consists of steel angles.

(2) *Test Burner.* The burner to be used in tesing must—

(i) Be a modified gun type.

(ii) Use a suitable nozzle and maintain fuel pressure to yield a 2 GPH fuel flow. For example: An 80 degree nozzle nominally rated at 2.25 GPH and operated at 85 pounds per square inch (PSI) gauge to deliver 2.03 GPH.

(iii) Have a 12 inch (305 mm) burner extension installed at the end of the draft tube with an opening 6 inches (152 mm) high and 11 inches (280 mm) wide.

(iv) Have a burner fuel pressure regulator that is adjusted to deliver a nominal 2.0 GPH of #2 Grade kerosene or equivalent.

Burner models which have been used successfully in testing are the Lenox Model OB–32, Carlin Model 200 CRD and Park Model DPL.

(3) *Calorimeter.* (i) The calorimeter to be used in testing must be a total heat flux Foil Type Gardon Gage of an appropriate range (approximately 0 to 15.0 British thermal unit (BTU) per ft.^{2} sec., 0–17.0 watts/cm^2). The calorimeter must be mounted in a 6 inch by 12 inch (152 by 305 mm) by ¾ inch (19 mm) thick insulating block which is attached to a steel angle bracket for placement in the test stand during burner calibration as shown in Figure 2 of this part of this appendix.

(ii) The insulating block must be monitored for deterioration and the mounting shimmed as necessary to ensure that the calorimeter face is parallel to the exit plane of the test burner cone.

(4) *Thermocouples.* The seven thermocouples to be used for testing must be 1/16 inch ceramic sheathed, type K, grounded thermocouples with a nominal 30 American wire gage (AWG) size conductor. The seven thermocouples must be attached to a steel angle bracket to form a thermocouple rake for placement in the test stand during burner calibration.

(5) *Apparatus Arrangement.* The test burner must be mounted on a suitable stand to position the exit of the burner cone a distance of 8 inches from the ceiling liner panel and 2 inches from the sidewall liner panel. The burner stand should have the capability of allowing the burner to be swung away from the test specimen during warm-up periods.

(6) *Instrumentation.* A recording potentiometer or other suitable instrument with an appropriate range must be used to measure and record the outputs of the calorimeter and the thermocouples.

(7) *Timing Device.* A stopwatch or other device must be used to measure the time of flame application and the time of flame penetration, if it occurs.

(e) *Preparation of Apparatus.* Before calibration, all equipment must be turned on and allowed to stabilize, and the burner fuel flow

must be adjusted as specified in paragraph (d)(2).

(f) *Calibration.* To ensure the proper thermal output of the burner the following test must be made:

(1) Remove the burner extension from the end of the draft tube. Turn on the blower portion of the burner without turning the fuel or igniters on. Measure the air velocity using a hot wire anemometer in the center of the draft tube across the face of the opening. Adjust the damper such that the air velocity is in the range of 1550 to 1800 ft./min. If tabs are being used at the exit of the draft tube, they must be removed prior to this measurement. Reinstall the draft tube extension cone.

(2) Place the calorimeter on the test stand as shown in Figure 2 at a distance of 8 inches (203 mm) from the exit of the burner cone to simulate the position of the horizontal test specimen.

(3) Turn on the burner, allow it to run for 2 minutes for warm-up, and adjust the damper to produce a calorimeter reading of 8.0 ±0.5 BTU per ft.^{2} sec. (9.1 ±0.6 Watts/cm^2).

(4) Replace the calorimeter with the thermocouple rake.

(5) Turn on the burner and ensure that each of the seven thermocouples reads 1700 °F. ±100 °F. (927 °C. ±38 °C.) to ensure steady state conditions have been achieved. If the temperature is out of this range, repeat steps 2 through 5 until proper readings are obtained.

(6) Turn off the burner and remove the thermocouple rake.

(7) Repeat (1) to ensure that the burner is in the correct range.

(g) *Test Procedure.* (1) Mount a thermocouple of the same type as that used for calibration at a distance of 4 inches (102 mm) above the horizontal (ceiling) test specimen. The thermocouple should be centered over the burner cone.

(2) Mount the test specimen on the test stand shown in Figure 1 in either the horizontal or vertical position. Mount the insulating material in the other position.

(3) Position the burner so that flames will not impinge on the specimen, turn the burner on, and allow it to run for 2 minutes. Rotate the burner to apply the flame to the specimen and simultaneously start the timing device.

(4) Expose the test specimen to the flame for 5 minutes and then turn off the burner. The test may be terminated earlier if flame penetration is observed.

(5) When testing ceiling liner panels, record the peak temperature measured 4 inches above the sample.

(6) Record the time at which flame penetration occurs if applicable.

(h) *Test Report.* The test report must include the following:

(1) A complete description of the materials tested including type, manufacturer, thickness, and other appropriate data.

(2) Observations of the behavior of the test specimens during flame exposure such as delamination, resin ignition, smoke, etc., including the time of such occurrence.

(3) The time at which flame penetration occurs, if applicable, for each of the three specimens tested.

[72FR55099, Sept. 28, 2007]

PART 179—SPECIFICATIONS FOR TANK CARS

Subpart A—Introduction, Approvals and Reports

Subpart B—General Design Requirements

Subpart C—Specifications for Pressure Tank Car Tanks (Classes DOT-105, 109, 112, 114, and 120)

Eichenlaub
§173.168
Chemical Oxygen Generators
10-0215

Drakeford, Carolyn (PHMSA)

From: Betts, Charles (PHMSA)
Sent: Monday, October 04, 2010 9:57 AM
To: Drakeford, Carolyn (PHMSA)
Subject: FW: Questions Packagings Oxygen compressed / chemical oxygen generators

Please log this in as a new request for interpretation and assign for handling.

From: Janet.McLaughlin@faa.gov [mailto:Janet.McLaughlin@faa.gov]
Sent: Monday, October 04, 2010 9:46 AM
To: Betts, Charles (PHMSA)
Subject: Fw: Questions Packagings Oxygen compressed / chemical oxygen generators

Charles,

I think this question is more appropriate to PHMSA.

Janet McLaughlin
Federal Aviation Administration
Hazardous Material Office
Division Manager, International and Outreach Division
Phone 202-385-4897
Cell 202-437-7651

----- Forwarded by Janet McLaughlin/AWA/FAA on 10/04/2010 09:41 AM -----

"i4safety" <gilbert@i4safety.nl>

10/04/2010 09:20 AM

To Janet McLaughlin/AWA/FAA@FAA
cc
Subject Questions Packagings Oxygen compressed / chemical oxygen generators

Dear Ms. Janet McLaughlin,

Many years ago I used to attend ICAO panel meetings, together with your ex-colleague Mr. Frits Wiebenga.
He always offered me help, whenever we would not be clear on North American Transport regulations for Hazardous Materials (Dangerous Goods) in Europe.

I am aware of the fact that Mr. Wiebenga has left the organization and is now working for IMO, and therefore would like to address our questions to you, or maybe to one of your knowledgeable colleagues.

We would like to be clarified on the US regulations concerning the packaging requirements for the transport of Oxygen bottles, and to extend the question, for the transport of Chemical Oxygen Generators.

- We are clear on requirements mentioned in the CFR49 Part 178 Appendix D and E .

- In addition the flame penetration test on 3 specimen. (205 degrees Celsius or less, without flame penetration , and without flame development...)

- **If the heat resistance test would also have been successfully tested, would that imply that we would comply with the HM224B doc?**

We have found many rules and regulations on the internet, but want to be absolutely clear on the criteria, and would like to have the official document references, or even better copies of the text in digital files.

Would it be possible to receive a short list of references for compliance of packages for:

a) **Packagings intended for the transport of Oxygen Bottles as flight case?**
b) **Packagings intended for the transport of Chemical Oxygen Generators as cargo?**

Another clarification needed is for the ATA 300 cat 1 criteria.

In what way would the performance standards for the packaging be different, looking at the criteria for drop tests given in the ATA 300 doc, compared with standard UN performance drop test mentioned in the UN orange book?

We hope for a soon response, and would like to thank you for your kind assistance.

With kind regards,

Gilbert de Chauvigny de Blot

i4Safety B.V.
Pimpelmees 3
1423 NX Uithoorn
The Netherlands

Ph: +31-(0)6-53643411

Info@i4safety.nl
www.i4safety.nl

Bank ABN-AMRO 60 18 96 599
K.v.K. Amsterdam 34 31 59 58
BTW (VAT) nummer NL8200.50.027.B01