



U.S. Department  
of Transportation

**Pipeline and Hazardous  
Materials Safety  
Administration**

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

**NOV 13 2013**

Ms. Sarah Gedrich  
Chief, LOGSA Packaging, Storage, and Containerization  
Center (AMXLS-AT-L)  
Department of the Army  
11 Hap Arnold Boulevard  
Tobyhanna, PA 18466-5097

Ref. No. 11-0274R

Dear Ms. Gedrich:

This responds to your October 13, 2011 letter requesting clarification of the package testing requirements for composite or combination packagings that contain compressed oxygen and other oxidizing gases in cylinders or chemical oxygen generators under the Hazardous Materials Regulations (HMR; 49 CFR Part 171-180). In general terms, these articles are required to be placed in a rigid outer packaging that conforms to the testing provisions in Part 178, Subpart M of the HMR or the performance criteria of Airlines for America (A4A), formerly the Air Transport Association of America, Inc. (ATA), Specification No. 300 ("Spec 300") for a Category I shipping container. See §§ 173.168(d), 173.302(f)(3) and 173.304(f)(3). You specifically request clarification of the testing and performance criteria and determination of successful test results.

Your questions regarding Part 178, Subpart M testing are paraphrased and answered as follows:

Q1. The HMR outline package preparation criteria for testing. For example, inner receptacles for liquid material must be at least 98% filled (see § 178.602(b)). However, there is no criterion for gases. How would cylinders be filled to 98% with a gas?

A1. The physical properties of a gas would not allow for a cylinder to be filled to 98%. The filling criteria for inner receptacles intended to contain liquid or solid material do not apply to gases. Bear in mind that these drop tests should not be conducted with filled cylinders because of the inherent safety risks associated with a compressed gas.

Q2. Following drop tests of composite or combination packaging, the absence of leakage of filling material from the inner receptacles signifies a successful test (see § 178.603(f)(4)). If the drop test were to be conducted with empty cylinders, how would it be determined if the material leaked?

A2. The cylinder should be filled after the drop test to determine whether there is any leakage as a result of damage occurring during the drop test.

Q3. If damage to the outer packaging affects the flame penetration resistance, is this considered an unsuccessful test?

A3. Yes. This would be considered damage likely to adversely affect safety during transport.

Q4. Would the same criteria apply to the stacking test and the vibration standard?

A4. Yes. The responses to questions 1 thru 3 hold true for both the stacking test and the vibration standard.

Your questions regarding A4A Spec 300 and testing are paraphrased and answered as follows, however, we note that the guidance we present in this letter relative to A4A Spec 300 was offered from consultation with A4A and we recommend that you contact A4A for further guidance regarding this standard:

Q1. Regarding the drop test of a Category I shipping container (that can be handled manually in transportation), are the drops conducted on each side, edge, or corner, in sequence or only on one selected side, corner, and edge?

A1. The drop test is to be performed in sequence for the required number of drops for each side and repeated for the required number of drops for each edge and each corner. The combination of 160 side (face) drops distributed among the six (6) sides, 80 edge drops distributed among the twelve (12) edges, and 40 corner drops distributed among the eight (8) corners must total 280 drops. Care should be taken under the test plan to address worst case scenarios (e.g., unevenly loaded boxes) when distributing the drops in each case.

Q2. Regarding the cause for rejection, if the cylinders are considered the contents, how is it determined that the contents do not show any changes that affect their utility.

A2. The determination of any "changes affecting the utility of the contents" would be similar to determination of successful testing under the HMR. That is, the cylinder should be filled after the drop test to determine whether there is any leakage.

Q3. Are the required tests to be performed in series?

A3. No. Each test type (e.g., drop, vibration, etc.) must be completed independent of the others.

Q4. Should the utility of the packaging be determined after each test type (e.g., drop, vibration, etc.)?

A4. Yes. The contents of the packaging are to be inspected after the testing procedure for each test type is complete to determine whether they show any changes that affect their utility.

I hope this answers your inquiry. If you need additional assistance, please contact this Office at (202) 366-8553.

Sincerely,

A handwritten signature in black ink, appearing to read "Charles Betts", written in a cursive style.

Charles Betts,

Director,

Standards and Rulemaking Division



REPLY TO  
ATTENTION OF

**DEPARTMENT OF THE ARMY**

USAMC LOGISTICS SUPPORT ACTIVITY  
REDSTONE ARSENAL, ALABAMA 35898-7466

October 13, 2011

Der Kinderen

§ 173.304

§ 171.8

§ 173.168

Applicability

11-0274

Logistics Testing and Applications Division

Mr. Charles E. Betts  
Director, Office of Hazardous Materials Standards  
U.S. DOT/PHMSA (PHH-10)  
1200 New Jersey Avenue  
SE East Building, 2nd Floor  
Washington, DC 20590

Dear Mr. Betts:

This letter of inquiry for interpretation is written on behalf of the US Army Materiel Command Logistics Support Activity Packaging, Storage, and Containerization Center (USAMC LOGSA PSCC), Tobyhanna, PA. It is being written for clarification/interpretation of the HM-224B, Hazardous Materials Regulations (HMR): Transportation of Compressed Oxygen, Other Oxidizing Gases and Chemical Oxygen Generators on Aircraft.

The Title 49 Code of Federal Regulations (CFR) §171.8 defines an outer packaging as "the outermost enclosure of a composite or combination packaging together with any absorbent materials, cushioning and any other components necessary to contain and protect inner receptacles or inner packagings." In order to meet the "integrity standards," the HM-224B requires that the cylinder or the generator

"must be placed in a rigid outer packaging that –

- (1) Conforms to the requirements of either:
  - (i) Part 178, subparts L and M, of this subchapter at the Packing Group I or II performance level; or
  - (ii) The performance criteria in Air Transport Association (ATA) Specification No. 300 for a Category I shipping container." (49 CFR §173.168 and §173.304)

As written, subparts L and M do not clearly address criteria for passing a drop test, if one was to designate the cylinder or generator as the inner packaging and the HM-224B specification packaging as the outer packaging. Specifically for a composite or combination packaging states that the outer packaging "must not exhibit any damage likely to affect safety during transport. Inner receptacles, inner packagings, and articles must remain completely within the outer packaging and there must be no leakage of filling substance from the inner receptacle or inner packagings." For the packaging being discussed, this could be 115 cubic feet of oxygen compressed to pressures greater than 3,000 pounds per square inch (psi) inside an HM-224B outer packaging. The 49 CFR addresses filling procedures for packages subjected to the drop in relation to liquids and



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solids only. Compressed gas has a behavior different from either a liquid or a solid, and the safety risks involved with testing pressurized cylinders are extreme.

- How would the cylinder be filled to 98%?
- If the cylinder were tested empty, how would you know if the filling substance leaked?
- If the damage to the outer packaging effects the flame penetration resistance, is that considered a fail?
- Would the same criteria apply to vibration and stack test?

ATA Specification No. 300 Category I requires 160 face drop tests, 80 edgewise drop tests, and 40 cornerwise drop tests.

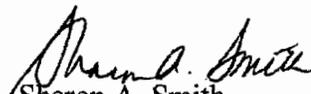
- Are the drop tests conducted on consecutive sides, edges, or corners, or is one selected and the required number of drops only performed on that side, edge, or corner?

ATA Specification No. 300 Category I states the cause for rejection: "At the conclusion of the testing, the contents of the container, its interior shock-absorbing materials and devices shall not show any changes that affect their utility. The interior or exterior of the container shall not reveal any failure of the container or shifting of the part."

- If a cylinder were considered the contents, how would its unaffected utility be determined?
- Are the tests conducted in series?
- Should the utility be tested after each test – drop, vibration, etc.?

Point of contact for this matter is Miss Sarah R. Gedrich, DSN 795-7649, (570) 615-7649, FAX (570) 615-7823, or e-mail sarah.gedrich@us.army.mil. All correspondence responding to this memorandum should be sent to Chief, LOGSA Packaging, Storage, and Containerization Center (AMXLS-AT-L/Sarah Gedrich), 11 Hap Arnold Boulevard, Tobyhanna, PA 18466-5097.

Sincerely,

  
Sharon A. Smith  
Chief, Logistics Testing and  
and Applications Division