

July 17, 2019



U.S. Department
of Transportation

East Building, PHH-30
1200 New Jersey Avenue S.E.
Washington, D.C. 20590

**Pipeline and Hazardous
Materials Safety Administration**

DOT-SP 20395
(FIRST REVISION)

EXPIRATION DATE: 2023-06-30

(FOR RENEWAL, SEE 49 CFR 107.109)

1. GRANTEE: Carleton Technologies, Inc.
Westminster, MD
2. PURPOSE AND LIMITATIONS:
 - a. This special permit authorizes the manufacture, mark, sale and use of non-DOT specification fully wrapped carbon-fiber reinforced, aluminum-lined composite cylinders conforming to ISO Standard 11119-2, except as specified herein, for the transportation in commerce of Division 2.1 and 2.2 hazardous materials. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.
 - b. The safety analyses performed in development of this special permit only considered the hazards and risks associated with transportation in commerce. The safety analyses did not consider the hazards and risks associated with consumer use, use as a component of a transport vehicle or other device, or other uses not associated with transportation in commerce.
 - c. In accordance with 49 CFR 107.107(a) party status may not be granted to a manufacturing permit. These packaging may be used in accordance with 49 CFR 173.22a.
3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.

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4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR § 173.302(a), and § 180.207 in that non-DOT specification cylinders are not authorized, except as specified herein.
5. BASIS: This special permit is based on the application of Carleton Technologies, Inc. dated July 01, 2019, submitted in accordance with § 107.109.
6. HAZARDOUS MATERIALS (49 CFR 172.101):

Hazardous Material Description			
Proper Shipping Name	Hazard Class/ Division	Identification Number	Packing Group
Air, compressed	2.2	UN1002	N/A
Carbon dioxide	2.2	UN1013	N/A
Compressed gas, n.o.s	2.2	UN1956	N/A
Compressed gas, oxidizing, n.o.s.	2.2	UN3156	N/A
Helium, compressed	2.2	UN1046	N/A
Nitrogen, compressed	2.2	UN1066	N/A

7. SAFETY CONTROL MEASURES:

a. PACKAGING:

(1) Prescribed packagings are non-DOT specification fully wrapped, carbon-fiber reinforced 6161-T6 aluminum lined cylinders. Cylinders are limited to a maximum water volume of 100 Liters (6102 cubic inches), and a service pressure of 227 bar (3,295 psig).

(2) Cylinders must be manufactured and marked in conformance with ISO 11119-2 Standard: 2002 ("Gas cylinders - refillable composite gas cylinders and tubes - Design, construction and testing - Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners"), except as follows:

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8.2.1 A minimum of 22 cylinders representative of the new design shall be made available for prototype testing. Spares may be included in lot at the manufacturer's discretion. Upon successful completion of all prototype tests, the remaining untested cylinders from the prototype qualification batch can be used for service. A change consisting of only a change to the cylinder threads requires prototype testing of 1 cylinder.

8.2.7 (d) Environmental cycle test is waived.

8.4.1 No change except that 8.4.1 (a) reads: "the nominal length of the cylinder has changed by more than 5%."

8.4 Table 2: Use Table 1 from ISO 11119-2:2012 in place of Table 1 from ISO 11119-2:2002.

8.5.6 Environmental cycle test is waived.

8.5.7 Flaw test

8.5.7.1 Procedure -

Two cylinders shall be tested. One longitudinal flaw shall be cut into each cylinder, in the mid-length of the cylindrical wall of the cylinder in accordance with Figure 1. The flaw shall be made with a 1 mm thick cutter to a depth equal to at least 50 % of the composite thickness but no greater than 2.5 mm deep, and to a length between the centers of the cutter equal to five times the composite thickness.

A second transverse flaw of the same dimensions shall be cut into each cylinder in the mid-length of the cylindrical wall approximately 120° around the circumference from the other flaw in accordance with Figure 1 of ISO 11119-2:2012.

One cylinder shall be subjected to the burst test specified in 8.5.4. The other cylinder shall be subjected to the pressure cycling test in 8.5.5, but the upper cyclic pressure shall be $0.67 \times p_h$ and the test shall be suspended after 5,000 cycles if the cylinder has not failed.

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The parameters that shall be monitored and recorded are:

- a) Dimensions of flaws;
- b) The temperature of the cylinder;
- c) Number of cycles achieving upper cyclic pressure;
- d) Minimum and maximum cyclic pressures;
- e) Cycle frequency;
- f) Test medium used; and
- g) Mode of failure, if appropriate.

8.5.8 Drop test -

8.5.8.1 For cylinders up to and including 50 liters water capacity.

8.5.8.1.1 Procedure - No change except second cylinder is cycled to only 5,000 cycles to Pw.

8.5.8.1.2 Criteria - No Change except:

First cylinder burst pressure, shall be equal to or greater than 90% of Pb.

Second cylinder shall satisfy the requirements of the ambient cycle test up to 5,000 total cycles to Pw.

9.4.5 - No change except:

Test cycles shall be limited to only one lifetime at Pmax or Ptest.

For 15 year life this would be 3,750 cycles to Ptest or 7,500 cycles to Pmax.

9.5.3 (b) The batch shall be rejected if no root cause is identified; however, at the manufacturer's discretion, when a cylinder fails a test, five additional cylinders selected randomly may be subjected to the same test. If all five

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cylinders pass, the lot may be accepted. If one or more of the cylinders fails, the lot must be rejected.

b. REQUALIFICATION: Cylinders must be reinspected and hydrostatically retested at least once every five years. Testing must be performed in accordance with § 180.205, tested to 1.5 times the marked service pressure and the latest edition of CGA Pamphlet C-6.2 "Guidelines for Visual Inspection and Re-qualification of Fiber Reinforced High Pressure Cylinders", except as specifically noted herein:

(1) Cylinders must be volumetrically tested by the water jacket method suitable for the determination of the cylinder expansion for a minimum test time of one minute.

(2) Reinspection markings must be applied on a label securely affixed to the cylinder and over-coated with epoxy, near the original test date. Metal stamping of the composite is prohibited. Reheat treatment of rejected cylinders is not authorized.

(3) Cylinders with fiber damage (cuts, abrasions, etc.) that exceeds Level 1 type damage as defined in CGA Pamphlet C-6.2 and meet the following depth and length criteria are considered to have Level 2 damage:

(i) Depth - Damage that upon visual inspection is seen to penetrate the outer fiberglass layer but does not expose the carbon layer beneath, or that has a measured depth of greater than 0.005 inch and less than 0.045 inch for cylinders with an outside diameter greater than 7.5 inches or less than 0.035 inch for cylinders 7.5 inches or less in outside diameter;

(ii) Length - Damage that has a maximum allowable length of:

Region	Direction of fiber damage	Maximum length of damage
Cylinder sidewall and domes	Transverse to fiber direction (longitudinal direction)	20% of the straight sidewall section length
Cylinder sidewall and domes	In fiber direction (circumferential direction)	20% of the straight sidewall section length

(4) Cylinders with damage that meets the Level 2 criteria must be rejected. Retesters must contact the cylinder manufacturer in the event that the damage cannot be clearly interpreted based on these criteria. Repair of rejected cylinders is authorized for Level 2 type damage. Repairs must be made in accordance with CGA Pamphlet C-6.2 prior to the hydrostatic pressure test. Repairs must be evaluated after the hydrostatic test.

(5) Cylinders that have direct fiber damage that penetrates through the outer fiberglass layer and into the carbon layer or that have a measured damage depth of greater than the Level 2 maximum are considered to have Level 3 type damage. Cylinders that have damage with depth meeting Level 2, but length exceeding the Level 2 maximum, are considered to have Level 3 type damage. Cylinders with Level 3 type damage are not authorized to be repaired and must be condemned.

(6) Persons who perform inspection and testing of cylinders subject to this special permit must comply with § 180.205(b) and with all the terms and conditions of this special permit.

(7) Hydrostatic retest may be repeated as provided for in § 180.205(g); only two such retests are permitted. Pressurization prior to the official hydrostatic test for the purpose of a systems check must not exceed 85% of the minimum required test pressure.

c. OPERATIONAL CONTROLS:

(1) Cylinders manufactured under this special permit are not authorized for use in underwater applications.

(2) Any cylinder exhibiting evidence of fire or excessive heat damage may not be retested under the terms of this special permit.

(3) Cylinders manufactured under this special permit are not authorized for use fifteen (15) years after the date of manufacture.

(4) Transportation of oxygen is only authorized when in accordance with § 175.501.

(5) Cylinders must be packaged in accordance with § 173.301(a)(9).

(6) Cylinders manufactured under this special permit may only be used in aircraft slide inflation systems.

8. SPECIAL PROVISIONS:

a. In accordance with the provisions of Paragraph (b) of § 173.22a, persons may use the packaging authorized by this special permit for the transportation of the hazardous materials specified in paragraph 6, only in conformance with the terms of this special permit.

b. A person who is not a holder of this special permit, but receives a package covered by this special permit, may reoffer it for transportation provided no modification or change is made to the package and it is offered for transportation in conformance with this special permit and the HMR.

c. A current copy of this special permit must be maintained at each facility where the package is offered or reoffered for transportation.

d. Each packaging manufactured under the authority of this special permit must be either (1) marked with the name of the manufacturer and location (city and state) of the

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facility at which it is manufactured or (2) marked with a registration symbol designated by the Office of Hazardous Materials Safety Approvals and Permits for a specific manufacturing facility.

- e. A current copy of this special permit must be maintained at each facility where the packaging is manufactured under this special permit. It must be made available to a DOT representative upon request.
9. MODES OF TRANSPORTATION AUTHORIZED: Motor vehicle, rail freight, cargo vessel, passenger-carrying aircraft and cargo aircraft.
10. MODAL REQUIREMENTS: A current copy of this special permit must be carried aboard each cargo vessel, aircraft or motor vehicle used to transport packages covered by this special permit. The shipper must furnish a copy of this special permit to the air carrier before or at the time the shipment is tendered.
11. COMPLIANCE: Failure by a person to comply with any of the following may result in suspension or revocation of this special permit and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. 5101 et seq:
- o All terms and conditions prescribed in this special permit and the Hazardous Materials Regulations, 49 CFR Parts 171-180.
 - o Persons operating under the terms of this special permit must comply with the security plan requirement in Subpart I of Part 172 of the HMR, when applicable.
 - o Registration required by § 107.601 et seq., when applicable.

Each "Hazmat employee", as defined in § 171.8, who performs a function subject to this special permit must receive training on the requirements and conditions of this special permit in addition to the training required by §§ 172.700 through 172.704.

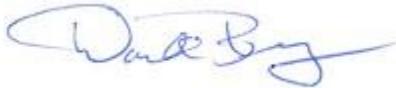
No person may use or apply this special permit, including display of its number, when this special permit has expired or is otherwise no longer in effect.

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Under Title VII of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)–“The Hazardous Materials Safety and Security Reauthorization Act of 2005” (Pub. L. 109-59), 119 Stat. 1144 (August 10, 2005), amended the Federal hazardous materials transportation law by changing the term “exemption” to “special permit” and authorizes a special permit to be granted up to two years for new special permits and up to four years for renewals.

12. REPORTING REQUIREMENTS: Shipments or operations conducted under this special permit are subject to the Hazardous Materials Incident Reporting requirements specified in 49 CFR §§ 171.15 - Immediate notice of certain hazardous materials incidents, and 171.16 - Detailed hazardous materials incident reports. In addition, the grantee(s) of this special permit must notify the Associate Administrator for Hazardous Materials Safety, in writing, of any incident involving a package, shipment or operation conducted under terms of this special permit.

Issued in Washington, D.C.:



for William Schoonover
Associate Administrator for Hazardous Materials Safety

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, East Building PHH-30, 1200 New Jersey Avenue, Southeast, Washington, D.C. 20590.

Copies of this special permit may be obtained by accessing the Hazardous Materials Safety Homepage at http://hazmat.dot.gov/sp_app/special_permits/spec_perm_index.htm Photo reproductions and legible reductions of this special permit are permitted. Any alteration of this special permit is prohibited.

PO: Smith/SG