November 06, 2023



Pipeline and Hazardous Materials Safety Administration 1200 New Jersey Avenue, SE Washington, DC 20590

DOT-SP 21575

# EXPIRATION DATE: 2025-10-31

## (FOR RENEWAL, SEE 49 CFR 107.109)

1. <u>GRANTEE</u>: Luxfer Inc. dba Luxfer Gas Cylinders Riverside, CA

#### 2. <u>PURPOSE AND LIMITATIONS</u>:

a. This special permit authorizes the manufacture, mark, sale, and use of non-DOT specification fully wrapped carbon fiber reinforced composite cylinder with a seamless aluminum liner. The cylinders may be used for the transportation in commerce of the hazardous materials listed in paragraph 6. 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 special permit. These packagings may be used in accordance with 49 CFR 173.22a.

- 3. <u>REGULATORY SYSTEM AFFECTED</u>: 49 CFR Parts 106, 107 and 171-180.
- 4. <u>REGULATIONS FROM WHICH EXEMPTED</u>: 49 CFR §§ 173.302(a)(1) and 173.304(a) in that a non-DOT specification cylinder is authorized.

5. <u>BASIS</u>: This special permit is based on the application of Luxfer Inc. dba Luxfer Gas Cylinders dated May 12, 2023, submitted in accordance with § 107.105 and the public proceeding thereon.

# 6. <u>HAZARDOUS MATERIALS (49 CFR 172.101)</u>:

Hazardous Material Description			
Proper Shipping Name	Hazard Class/ Division	Identi- fication Number	Packing Group
Air, compressed	2.2	UN1002	N/A
Argon, compressed	2.2	UN1006	N/A
Carbon dioxide	2.2	UN1013	N/A
Compressed gas, n.o.s.	2.2	UN1956	N/A
Helium, compressed	2.2	UN1046	N/A
Compressed gas, oxidizing, n.o.s.	2.2	UN3156	N/A
Hydrogen, compressed	2.1	UN1049	N/A
Krypton, compressed	2.2	UN1056	N/A
Neon, compressed	2.2	UN1065	N/A
Nitrogen, compressed	2.2	UN1066	N/A
Nitrous oxide	2.2	UN1070	N/A
Oxygen, compressed	2.2	UN1072	N/A
Sulfur hexafluoride	2.2	UN1080	N/A
Xenon, compressed	2.2	UN2036	N/A

#### 7. <u>SAFETY CONTROL MEASURES</u>:

a. <u>PACKAGING</u>: Packaging prescribed is a non-DOT specification fully wrapped fiber reinforced composite gas cylinder with seamless aluminum alloy 6061-T6 liner as described in Luxfer Inc. dba Luxfer Gas Cylinders' application on file with the Office of Hazardous Materials Safety (OHMS). Each cylinder must meet all the design and construction requirements for composite cylinders specified in ISO Standard 11119-2:2020 (Gas Cylinders of Composite Construction-Specification and Test Methods –Part 2: (Fully wrapped fiber reinforced composite gas cylinders with aluminum liner)). Additionally, the cylinders must meet the following:

(1) Service pressure may not exceed 517 bar (7500 psi).

(2) Water capacity must be greater than 10 liters and less than or equal to 350 liters.

(3) All batch cycling performance testing must meet the requirements of ISO 11119-2 for a 20-year service life.

(4) Each cylinder must be fitted with a pressure relief device in accordance with § 173.301(g).

## b. <u>MARKING</u>:

(1) Each cylinder must be permanently marked (other than by stamping) in the composite on the sidewall. The marking must be easily visible and must be protected from external damage due to the environment and handling.

(2) The marking must contain the following:

(i) DOT special permit number (DOT-SP 21575) followed by service pressure expressed in bar (psi).

(ii) A serial number and the manufacturer's identification number or a symbol as obtained from the Associate Administrator for Hazardous Materials Safety, located just below or immediately following the DOT marking above.

(iii) The DOT inspector's official mark must be placed near the serial number. The marking must contain date the (month and year) of the manufacturing date test for that cylinder.

(iv) The size of the letters and numbers used must be at least 0.64 cm (1/4 inch) high if space permits.

(v) The following are examples of an authorized format for marking:

DOT-SP 21575-517 bar (7500psi) 1234-MMI (or symbol) II—MM/YY

(vi) Additional markings are permitted in the composite, provided the additional markings do not obscure the required marking and are not detrimental to the integrity of the cylinder.

(vii) Provisions for marking of the required requalification dates and RIN information must be made near the cylinder markings.

c. <u>REQUALIFICATION</u>: Each cylinder must be requalified once every 5 years by a qualified person holding a valid DOT RIN using a hydraulic proof pressure test or pneumatic proof pressure test as follows:

(1) Hydraulic proof pressure test:

(i) Procedure: This test requires that the hydraulic pressure in the cylinder be increased gradually and regularly until the test pressure equal to 1.5 times the marked service pressure is reached. The cylinder test pressure shall be held for a sufficiently long period (at least 30 s) in order to ascertain that there are no leaks and no failure. If leakage occurs in the piping or fittings, the cylinders may be retested after repairing such leakages. Where cylinders are subjected to autofrettage, the hydraulic proof pressure test may be part of or immediately follow the autofrettage process.

(ii) Criteria: The cylinder shall be rejected if there are leaks, failure to hold pressure or visible permanent deformation after the cylinder is depressurized. NOTE: Cracking of resin is not necessarily a sign of permanent deformation.

(2) Pneumatic proof pressure test:

(i) Procedure: A valid DOT RIN holder may alternatively perform a pneumatic proof pressure test for cylinders that are fixed in a frame (e.g., ISO frame) or packaging subject to the following conditions:

A. Prior to pneumatic proof pressure testing, a complete visual examination as described in this special permit must be completed and all cylinders in the frame must pass the visual inspection.

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B. The testing facility has prepared and approved pneumatic proof pressure testing based on a documented risk assessment and failure mode and effect analysis.

C. Each cylinder is pressurized to 1.25 times the marked service pressure. The pressure must be held for 10 consecutive minutes.

(ii) Criteria: The loss of pressure during the hold must not exceed 5% of the original test pressure.

(3) A cylinder may be requalified at any time during or before the month and year that the requalification is due. However, a cylinder filled before the requalification becomes due may remain in service until it is emptied. A cylinder with a specified service life may not be refilled and offered for transportation after its authorized service life has expired

(4) Each cylinder must be visually inspected in accordance with CGA Pamphlet C-6.2 Guidelines for Visual Inspection and Re-qualification of Fiber Reinforced High Pressure Cylinders, except as specifically noted herein:

(i) 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 10 considered to have Level 2 damage:

A. Depth: Damage that upon inspection 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.

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

B. Length: Damage that has a maximum allowable length of:

(ii) Cylinders with damage that meet the Level 2 criteria must be rejected. Requalifiers 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.

(iii) Cylinders that have direct fiber damage of 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.

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

(v) 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.

(vi) Requalification date (month/year) must be permanently marked on the cylinder as specified in § 180.213. The marking of the RIN symbol on the cylinder certifies compliance with all of the terms and conditions of this special permit.

## d. <u>OPERATIONAL CONTROLS</u>:

(1) Cylinders manufactured under this special permit are authorized for a maximum service life of 20 years from the date of manufacture provided the manufacturer meets the service life extension requirements specified under paragraph 8.a. of this special permit.

(2) For cylinders that are permanently mounted inside of a structural frame during transportation, the frame must have an appropriate engineering calculation (e.g., Finite Element Analysis (FEA)). The report must be submitted to the OHMS. The calculation must demonstrate the framework's ability to protect the cylinders from catastrophic damage (rupture) due to front, rearm or side impact, and rollover. As a minimum, the frame must be designed to meet the following: (i) All the requirements of § 173.301(i).

(ii) All the requirements of CGA TB-25.

(iii) Cylinders/Tubes may be mounted horizontally or vertically.

(iv) For MEGCs, all requirements of § 178.75 except § 178.75(d)(3) must be met.

(3) Cylinders may not be used for underwater breathing purposes.

(4) Cylinders used in oxygen service must conform to § 173.302(b)(1) through (4). Cylinders used in nitrous oxide service must conform to § 173.304a(e).

(5) A cylinder that has been subjected to fire may not be returned to service.

(6) Transportation of Division 2.1 (flammable gas) materials is not authorized aboard cargo vessel and aircraft unless specifically authorized.

(7) Transportation of oxygen and oxidizing gases by aircraft must meet the pressure relief device and outer packaging requirements specified in \$\$ 173.302(f) and 173.304(f) and is only authorized when in accordance with \$ 175.501.

(8) Cylinders filled with a mixture of carbon monoxide and hydrogen must not contain a moisture content in excess of 50 parts per million.

(9) The maximum quantity authorized for cylinders containing mixture of carbon monoxide and hydrogen is 25 kilograms (kg).

#### 8 <u>SPECIAL PROVISIONS</u>:

a. Service Life Extension Program: Cylinders manufactured under this special permit are authorized for a maximum service life of 20 years from the date of manufacture provided the manufacturer meets the following requirements:

(1) For each cylinder design candidate that life extension is desired, at least 30 cylinders shall be randomly recalled from service after 11 years, but not more than 15 years.

(2) Proof pressure testing (ISO 11119-2 section 8.5.1) and volumetric expansion testing ISO 11119-2 section 8.5.2) shall be performed on all recalled cylinders. Any cylinders which fail the proof pressure test or the volumetric

expansion test shall be condemned, removed from service, and rendered incapable of retaining pressure. Eight of the cylinders must be tested in accordance with ISO 11119-2 2020 sections 8.5.4 (3 cylinders), 8.5.5 (2 cylinders), 8.5.6 (1 cylinder), and 8.5.7 (2 cylinders). An Independent Inspector must witness all tests.

Note 1: The required number of pressure cycles for the Ambient Cycle Testing of section 8.5.5 shall correspond to 9 years of remaining service life and not the minimum 15 year requirement as specified under ISO 11119-2 (2020) section 8.5.5.

Note 2: For the Environmental cycle testing requirement of section 8.5.6, the number of hot pressure cycles and cold pressure cycles shall each be 2500 and not 5000 as specified under ISO 11119-2 (2020) sections 8.5.6.2a and 8.5.6.2b.

(3) Any failed life extension tests shall be investigated to determine if there were (a) errors or inaccuracies during the testing process or (b) cylinder mishandling damage that occurred during performance of the life extension program including transit mishandling. Failed tests can be repeated in the event of testing errors or inaccuracies or if there was cylinder mishandling damage during the life extension program. Any such repeated testing shall be performed on recalled cylinders complying with paragraphs 8.a.(1) and (2) above. However, if there are no findings of testing errors or inaccuracies, nor of mishandling damage that occurred during the life extension program, test failures shall result in the cylinder design being restricted to a maximum service life of 15 years.

(4) Upon successful completion of life extension testing, the cylinder design shall be deemed as having a 20-year service life once the life extension report with the Independent Inspector's witness confirmation(s) is submitted to the Associate Administrator for Hazardous Material Safety (AAHMS), or if applicable, to any successor Federal regulatory authority for the AAHMS.

(5) Luxfer Inc. dba Luxfer Gas Cylinders shall retain a copy of the life extension report as witnessed and confirmed by the Independent Inspector for at least the service life of the cylinder design.

b. 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.

c. A person who is not a holder of this special permit who 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.

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

e. Each packaging manufactured under the authority of this special permit must be either (1) marked with the <u>name of the manufacturer and location (city and state) of the</u> <u>facility at which it is manufactured</u> or (2) marked with a <u>registration symbol</u> designated by the Office of Hazardous Materials Safety <u>for a specific manufacturing facility</u>.

f. 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.

g. Transportation of Division 2.1 (flammable gas) hazardous materials is not authorized aboard cargo vessel or aircraft unless specifically authorized in the Hazardous Materials Table (§ 172.101).

- 9. <u>MODES OF TRANSPORTATION AUTHORIZED</u>: Motor vehicle, rail freight, cargo vessel, passenger-carrying aircraft, and cargo aircraft.
- 10. <u>MODAL REQUIREMENTS</u>: 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. <u>COMPLIANCE</u>: 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 <u>et seq</u>:
  - 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 <u>et seq</u>., 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. Continuation of DOT-SP 21575

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. <u>REPORTING REQUIREMENTS</u>: 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.:

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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-13, 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 <u>https://www.phmsa.dot.gov/approvals-and-permits/hazmat/special-permits-search</u>. Photo reproductions and legible reductions of this special permit are permitted. Any alteration of this special permit is prohibited.

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