March 20, 2025

U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

DOT-SP 21491
(SECOND REVISION)

EXPIRATION DATE: 2027-07-31

(FOR RENEWAL, SEE 49 CFR 107.109)

1. GRANTEE: Hanwha Cimarron LLC
Opelika, AL

2. PURPOSE AND LIMITATIONS:

a. This special permit authorizes the manufacture, mark, sale, and use of a non-DOT specification fully wrapped carbon fiber reinforced composite cylinder with a non-load sharing plastic liner for the purpose of transporting certain non-liquefied compressed gases in commerce. This cylinder meets all the requirements of the UN/ISO 11515 Standard except for the design water capacity and minimum required burst pressure. 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 packaging may be used in accordance with 49 CFR 173.22a.

3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR § 173.302(a) in that non-DOT specification cylinders are not authorized, except as specified herein.

5. BASIS: This special permit is based on the application of Hanwha Cimarron LLC dated January 25, 2025, submitted in accordance with § 107.105 and the public proceeding thereon.

6. HAZARDOUS MATERIALS (49 CFR 172.101):

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 monoxide, compressed	2.3	UN1016	N/A
Ethane	2.1	UN1035	N/A
Helium, compressed	2.2	UN1046	N/A
Hydrogen, compressed	2.1	UN1049	N/A
Methane, compressed *or* Natural gas, compressed *(with high methane content)*	2.1	UN1971	N/A
Neon, compressed	2.2	UN1065	N/A
Nitrogen, compressed	2.2	UN1066	N/A

Note: See paragraph 7.d. for cylinder service limitations.

7. SAFETY CONTROL MEASURES:

a. PACKAGING: Packaging prescribed is a non-DOT specification fully wrapped fiber reinforced composite cylinder with a non-load sharing polymer liner as described in Hanwha Cimarron, LLC's application on file with the Office of Hazardous Materials Safety (OHMS). Each cylinder must meet all the design and construction requirements for UN composite cylinders specified in § 178.71(l) and ISO Standard 11515 (Gas Cylinders - Refillable composite reinforced tubes of water capacity between 450 L and 3,000 L – Design, construction and testing) except as follows:

(1) § 1 Scope: Composite tubes manufactured under this special permit are limited to a minimum water volume of 450 Liters and a maximum water volume of 4,080 Liters, and a working pressure up to 300 bar (4,350 psi).

(2) § 8.1 Type approval procedure, General requirements:

(i) A DOT Independent Inspection Agency (IIA), approved in writing by the Associate Administrator for Hazardous Materials Safety (AAHMS) must, in accordance with 49 CFR Part 107, Subpart I, review the results of the design qualification testing that was submitted in the application for special permit. The IIA must either verify that the cylinder design meets the requirements of the special permit based on the test results and other documentation submitted in the application for special permit, or the IIA may require additional testing and/or information from the manufacturer in order to verify the cylinder design meets all requirements of the special permit. Prior to cylinder production, the IIA's verification of the cylinder design must be submitted to and be acknowledged in writing by OHMS.

(ii) Prior to any manufacture of cylinders under this special permit, an IIA, approved in writing by the AAHMS, must provide inspections and verifications of all batch testing and all new design qualification testing in accordance with the requirements of this special permit.

(3) § 8.2 Prototype tests: Cylinders that are manufactured for prototype testing must be representative of production units.

(4) § 8.5 Type approval test procedures and criteria.

§8.5.4 Tube burst test – The burst pressure or pressure at failure, P_b, must be not less than 1.6 times the test pressure, P_h, of the composite cylinder.

(5) §8.5.9 Fire Resistance Test: The cylinder or cylinder assembly must be fire resistance tested in accordance with the ISO Standard 11515:2013 (Gas cylinders — Refillable composite reinforced tubes of water capacity between 450 L and 3,000 L — Design, construction and testing) except that the acceptance criteria for the fire resistance test is the cylinder or cylinder assembly must resist 20 minutes in the fire without rupturing as described in Hanwha Cimarron, LLC's, Fire Resistance Test dated November 29, 2022.

(6) § 9 Batch inspection and testing:

(i) § 9.2.4 Liner batch inspection & testing, Criteria: The supplier's certification of the liner and liner boss properties may serve as verification of compliance with the design specifications.

(ii) § 9.4 Overwrap materials: The supplier's certification of the fiber and resin matrix properties may serve as verification of compliance with the ISO 11515 Standard.

(iii) § 9.5.6 Composite tube, Batch inspection: A batch test shall be conducted on one cylinder out of 2 batches or one year of cylinder production, whichever comes first. A batch here is defined by the production quantity of up to 200 finished cylinders successively produced (plus finished cylinders required for destructive testing), of the same nominal diameter, thickness and design. The batch of finished cylinders may contain different batches of liners, fibers and matrix materials.

(iv) § 9.5.7 Batch testing criteria: The burst test may be conducted on the first unit of the batch. After reaching the minimum required burst pressure, and holding for 5 seconds, the cylinder shall have passed the test.

(7) § 10 Cylinder/tube marking: The marking must contain the following:

(i) The DOT special permit number followed by working pressure expressed in bar (psi). The marking may be on a label permanently attached to the outside of the cylinder.

(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. The serial number and the manufacturer's identification number may be placed on the boss provided the markings are accessible for inspection.

(iii) The DOT Independent Inspection Agency (IIA) official mark must be placed near the serial number. The marking must contain the date (month and year) of the initial hydraulic proof pressure 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 AAAAA-YYYY
(Where AAAAA is the special permit number and YYYY is the working pressure)

CCCC MMI
(Where CCCC is the serial number and MMI is the manufacturer's mark or symbol)

DDD - MM/YY
(Where DDD is the inspector's mark and MM/YY is the month and year of the hydraulic proof pressure test).

Additional markings are permitted, provided the additional markings do not obscure the required marking and are not detrimental to the integrity of the cylinder. Provisions for marking of the required requalification dates and RIN information must be made near the cylinder markings.

b. Additional Requirements For Each New Design: High Velocity Impact Test: The cylinders must be tested in accordance with the ISO Standard 11119-3 (Gas Cylinders - Refillable composite gas cylinders and tubes – Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 L with non-load sharing metallic or non-metallic liners) with the exception that the cylinder must be impacted by a 7.62 millimeter (.308 caliber) armor-piercing projectile, as described in Hanwha Cimarron LLC's, Gunfire Test, dated August 1, 2022 and on file with OHMS.

c. Requalification: Each cylinder must be requalified once every 5 years by using one of the two methods described in this special permit. The Facility that performs requalification of these composite cylinders (tubes) must be a RIN holder for requalification of this type of composite cylinder (tubes) as described in § 180.205(b) or have a valid special permit for requalification of this type of composite cylinders/tubes using Modal Acoustic Emission (MAE) testing.

(1) Method 1: Hydraulic Proof Pressure Testing and Visual Inspections. The requalification facility must hold a RIN for requalification performing hydraulic proof pressure testing and visual inspections and meet the following requirements:

(i) Knowledge, documentation, equipment and instrumentation for performing the external and internal visual inspection of cylinders manufactured in accordance with the provisions of DOT-SP 21491;

(ii) Knowledge, documentation and equipment for performing the proof-pressure testing of cylinders manufactured in accordance with the provisions of DOT-SP 21491;

(iii) Adequate facilities, handling equipment, and skills to ensure cylinders manufactured in accordance with the provisions of DOT-SP 21491 will not be subject to impact or other damage during disassembling and reassembling;

(iv) Acknowledgment the requalifier understands the specific operational controls of DOT-SP 21491, paragraph 7.d.(8) that state "cylinder must be rejected if it is dropped or impacted during requalification.";

(v) Availability to document that during the requalification process, the structural integrity of frame design is not compromised and remains equal to or greater than the requirements specified in DOT-SP 21491, paragraph 7.d.(4);

(vi) Visual Inspections: The external and internal visual inspection must be in accordance with CGA pamphlet C-6.2 or ISO 11623:2015(E); and with the requalification facility standard operating procedure (SOP) for this type of composite overwrapped pressure vessel (COPVs) on file with OHMS. Following the internal visual inspection, each cylinder must be leak tested in accordance with ISO 11623 Clause 10; and

(vii) Hydraulic proof pressure test as described in CGA Pamphlet C.1 which the test pressure is equal to 1.5 times the marked working pressure and hold the pressure for a minimum of 3 minutes without a loss of pressure. The testing facility for proof pressure test must be equipped with protection system (e.g. water jacket well or concrete barrier) to avoid injury during requalification process.

(2) Method 2: Modal Acoustic Emission (MAE) Testing and External Visual Inspection. Each organization seeking a RIN for requalification for performing MAE and external Visual Inspection must meet and prove the following requirements:

(i) Holder of a special permit in performing MAE testing on composite cylinders (tubes).

(ii) MAE testing must in accordance with the Modal acoustic emission (MAE) Examination Standard for Periodic Inspection and Testing (Requalification) of Composite Overwrapped Pressure Vessels (COPVs), posted on the PHMSA website:

https://www.phmsa.dot.gov/technical-resources/hazmat-technical-resources/technical-reports

(iii) External visual inspection must be in accordance with CGA pamphlet C-6.2, referenced in the HMR.

(iv) Tubes with severe impact damage rollover accident**:** For tubes that were subjected to severe impact damage from an event such as tube trailer collision or rollover accident, the pressurization of the MAE testing must be by hydraulic medium (e.g., water) rather than gaseous medium.

(3) Requalification Marking: 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 the terms and conditions of this special permit.

d. OPERATIONAL CONTROLS:

(1) Hanwha Cimarron LLC is not authorized to mark, sell, or use the cylinders manufactured under this special permit until a successful Gas Cycle test, conducted in accordance with the UN/ISO 11515: 2013 Standard, has been submitted to and acknowledged by the OHMS in writing.

(2) Cylinders manufactured under this special permit are not authorized for use 15 years from the date of manufacture, except as specified under paragraph 8.a. of this special permit.

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

(4) Cylinders/Tubes must be permanently mounted inside of framing that is designed, marked (approval plate), and approved in accordance with the requirements of 49 CFR Part 451 of International Convention for Safe Containers (CSC), ISO 1496-3:1995/Amd.1:2006 standard in accordance with the clauses below and the following. Verification (drawings and test results) demonstrating conformance of the frame design with the requirements as specified herein must be submitted to OHMS.

(i) ISO 1496-3:1995 Test No. 4 – External Restraint (longitudinal);

(ii) ISO 1496-3:1995 Test No. 5 – Internal Restraint (longitudinal);

(iii) ISO 1496-3:1995 Test No. 6 – Internal Restraint (lateral);

(iv) All requirements of § 173.301(i);

(v) All requirements of CGA C-29. Finite Element Analysis (FEA) shall demonstrate the ability of the frame assembly (FA) to meet all g-loading requirements of CGA C-29; and

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

(5) All tube trailer modules transporting CNG under the terms of this special permit must have the tube trailer chassis manufactured with or retrofitted with electronic roll stability control (RSC) systems or sway stability control systems (SSC). The RSC/SSC powered switch must be on when the ignition is on to ensure that the RSC/SSC is functioning during transportation.

(6) All new trailer modules, (COPV frame assembly and chassis) transporting CNG must have a minimum rigid body Static Rollover Threshold (SRT) of 0.375. The SRT calculation must be submitted to OHMS. The SRT calculation must account for susceptibility to rollover accident and the vehicle dynamics during transportation.

(7) The design and fabrication of the external piping and valves connecting the cylinders must be such that damage to a valve or to the piping does not result in discharge of the contents through piping, tubing, valve, or other components. Failure of one or more of these components, must result in no excess flow from a cylinder.

(8) A cylinder (tube) that drops from a height greater than 2’ during the manufacturing and/or prior to being mounted into the framing must be rejected.

(9) The cylinder/tube assembly must be equipped with a Fire Protection System (FPS), which meets the following criteria, and the design must be submitted to and acknowledged in writing by OHMS prior to first use:

(i) An FPS with pressure relief device (PRD), which includes sensors or pneumatic piping along the length of each tube to respond to a local or engulfed fire and release the internal pressure of each tube prior to rupture of any tube in the assembly. The FPS vent lines direct the released gas upwards and outside of the frame system. Standard Operating Procedures (SOP) for the FPS must include inspection of the entire FPS, all gauges, fittings, valves and vent system. The FPS design, fire resistance test results and relevant SOPs must be submitted to the OHMS before the deployment of the first production of the tube assembly; or

(ii) If the packaging (tube assembly) is not equipped with an FPS, one of the tubes must be fire resistance tested in accordance with procedure described in ISO Standard 11515 with the following acceptance criteria and the test results must be submitted and acknowledged in writing by OHMS prior to first use:

The tube, which is used for the fire resistance-testing, must be exposed to an engulfed fire for a minimum of 20 minutes without rupturing.

(10) Hanwha Cimarron LLC must develop a standard operating procedure (SOP) for the FPS Inspection. The SOP must be provided to each filling facility and it must apply prior to each filling. The SOP inspection must cover the entire FPS that includes all relevant valves, piping, fittings and gauges. The SOP must be submitted to OHMS.

(11) Cabinet Flammability Limit: The Lower Flammability Limit (LEL) of each gas or gas mixtures must be calculated for the highest pressure and temperature to ensure the cabinet of the cylinder assembly is equipped with proper ventilation to avoid a fire or explosion during transportation.

(12) Carbon monoxide (CO): Cylinders used for CO under this special permit must be in accordance with Hanwha Cimarron LLC Standard Operating Procedure (SOP) for the Safe Transport of Composite Overwrapped Pressure Vessels (COPV) containing Carbon Monoxide - General Procedures for the Filling and Transporting Tube Trailers and MEGCs with Carbon Monoxide on file with OHMS.

(13) Prior to use in Offshore Service under the terms of this special permit, additional information justifying such use must be submitted to and be acknowledged in writing by the AAHMS.

(14) Low pressure/temperature prior to filling: The following procedure must be followed in case the pressure of a cylinder (tube) drops below 100 psig (7 bar) while the ambient temperature is below -12 °C: Prior to filling, either the tube must be held at or above 16 °C for 8 hours, or the tube must be filled to 435 psig (30 +/- 3 bar) from a compressor, and held for one hour, before returning to normal fill procedures.

(15) Transportation of Division 2.1 (flammable gas) or Division 2.3 (toxic gas) hazardous materials are not authorized aboard cargo vessel unless specifically authorized in the Hazardous Materials Table (§ 172.101).

(16) When transported by cargo vessel, the cylinders must be stowed on deck only and are prohibited from passenger ships (Stowage Category D).

(17) The special permit grantee must provide a detailed manual for the usage, inspection, and maintenance of components of the cylinder/tube assembly. The manual must include a Standard Operating Procedure (SOP) for each component of the assembly such as valves, fittings, Pressure Relief Devices (PRD) or Fire Protection System (FPS), piping, venting devices and other equipment used during charging and discharging of gases. All changes to the SOP must be clearly identified and recorded. The revised SOP, as well as the record of specific changes, must be submitted to OHMS and be made available to each of the end users. Filling and discharge operations must be carried out in accordance with the SOP.

(18) Cylinder (tube) exhibiting liner bulging: Liner bulge must be fixed as following:

(i) Pressurized the tube to 10% of its marked working (service) pressure and hold for a minimum of 4 hours. Then depressurize the tube, perform an internal visual inspection and ensure no liner bulge is exhibited.

(ii) If a liner bulge is still present after the first pressurization described above, take the following actions:

(A) Pressurize the tube to its marked working (service) pressure and hold for a minimum of 1 hour. Then depressurize the tube, perform an internal visual inspection and ensure no bulge is exhibited in the liner.

(B) If a liner bulge is still present after the second pressurization as described above, the tube must be rejected.

(C) For the rejected tube, contact the tube manufacturer for obtaining additional guidance in fixing the liner bulge prior to completing the requalification process and placing the requalification marking such as re-test date and RIN.

8. SPECIAL PROVISIONS:

a. Service Life Extension Program.

(1) Cylinders manufactured under this special permit are authorized for a maximum service life of 15 years from the date of manufacture in accordance with the Hanwha Cimarron (HC) service life extension program and the standard operating procedure (SOP) dated August 27, 2024, on file with the OHMS. The HC service life extension program must be implemented for each design type that

is intended for additional service life beyond 15 years to determine the additional years of service life. If cylinders are authorized for extended service life, the maximum service life of each cylinder under this special permit is 30 years from the date of manufacture.

(2) Under the service life extension program, the grantee must randomly recall a minimum of thirty cylinders of each design type which have been in service for 10 and 13 years. Cylinders recalled after 10 years shall be designated "Group A" and cylinders recalled after 13 years shall be designated "Group B". All recalled cylinders must be subjected to design requalification as specified Sections 8.5.4, 8.5.5, 8.5.7 and 8.5.8 of ISO 11515 as described in HC SOP, dated August 27, 2024 that includes Table 1 and Table 2. Acceptance criteria shall be as defined in ISO 11515 and the design life (y) must be greater than or equal to 20 years. All cylinders that fail to meet the requalification requirements must be condemned, removed from service and rendered incapable of retaining pressure. In the case that some units from the initial minimum lot size are condemned, an additional 30 cylinders must be selected and subjected to the same design requalification as specified above (Sections 8.5.4, 8.5.5, 8.5.7 and 8.5.8 of ISO 11515 and HC SOP, dated August 27, 2024 that includes Table 1 and Table 2. An Independent Inspection Agency must witness all testing of Table 1 and Table 2.

(3) The complete test report including original test data must be submitted to the Associate Administrator for Hazardous Materials Safety for assessment within 30 days of completion. Failure to meet the acceptance criteria specified in this section shall result in the design being restricted to a maximum life of 15 years.

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 packaging is manufactured under this special permit. It must be made available to a DOT representative upon request.

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

9. MODES OF TRANSPORTATION AUTHORIZED: Motor vehicle, rail freight, and cargo vessel.

10. MODAL REQUIREMENTS: A current copy of this special permit must be carried aboard each cargo vessel or motor vehicle used to transport packages covered by this special permit.

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:

- All terms and conditions prescribed in this special permit and the Hazardous Materials Regulations, 49 CFR Parts 171-180.
- 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.
- 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.

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

PO: MT/MN