U.S. Department
of Transportation
**Research and
Special Programs
Administration**

APR 13 2000

400 Seventh Street, S.W.
Washington, D.C. 20590

DOT-E 10637
(THIRD REVISION)

EXPIRATION DATE: March 31, 2002

(FOR RENEWAL, SEE 49 CFR § 107.109)

1. GRANTEE: Norris Cylinder Company
Longview, TX

2. PURPOSE AND LIMITATIONS:

a. This exemption authorizes the manufacture, mark, sale and use of a non-DOT specification fiber reinforced plastic (FRP) hoop wrapped (HW) cylinder conforming with all regulations applicable to DOT FRP-2 Standard, except as specified herein, for the transportation in commerce of the materials authorized by this exemption. This exemption provides no relief from any Hazardous Materials Regulation (HMR) other than as specifically stated herein.

b. The safety analyses performed in development of this exemption only considered the hazards and risks associated with transportation in commerce.

3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171- 180.

4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR §§ 173.302(a) and 175.3 in that the use of a non-DOT specification package is authorized.

5. BASIS: This exemption is based on the application of Norris Cylinder Company dated February 15, 2000, submitted in accordance with § 107.109.

6. HAZARDOUS MATERIALS (49 CFR § 172.101):

Proper Shipping Name/ Hazardous Material Description	Hazard Class/ Division	Identi-fication Number	Packing Group
Division 2.2 gases under specific commodity names (Compressed air, argon, helium, nitrogen, and oxygen)	2.2	As appro-priate	N/A
Division 2.3 gases under specific commodity names (Compressed hydrogen, methane, or natural gas)	2.1	As appro-priate	N/A

7. SAFETY CONTROL MEASURES:

a. PACKAGING - Packaging prescribed is a non-DOT specification fiber reinforced plastic (FRP) hoop wrapped (HW) cylinder made in accordance with the specification and data presented to and on file with the Office of Hazardous Materials Exemptions and Approvals (OHMEA), and in full compliance with DOT FRP-2 Standard, Revision 1 dated January 4, 1987 (Basic Requirements for Fiber Reinforced Plastic (FRP) Type 3HW Composite Cylinders)except as follows:

§ 178.BB.-2 Type size and service pressure.

Type 3HW cylinder consisting of resin impregnated continuous filament windings in the circumferential direction only over a seamless steel liner, made in compliance with § 178.BB-6(a) of this exemption; not over 350 pounds water capacity; and service pressure at least 900 PSIG but not greater than 5000 PSIG.

§ 178.BB-4 Duties of Inspector.

(a) * * *

(b) Verify the steel liner conforms with § 178.BB-6(a) of this exemption. Verify the filament and resin system components conform with the requirements specified in 178.BB-5 of the exemption.

(c) and (d) * * *

(e) Verify that the filament winding process and curing procedures are such as to assure that the composite material is uniform, of required thickness and pattern, and in accordance with the procedures described for the composite structures used in design qualification tests.

(f) and (g) * * *

§ 178.BB-5 Authorized material and identification of material.

(a) **Liner**

(1) Steel liner material must be 4130X chrome-moly steel conforming with the chemical composition prescribed in § 178.37(b).

(2) After heat treatment each liner must be hardness tested on the cylindrical portion at least two different locations. The average value of the hardness number may not exceed Rc 26.

(b), (c), (d), and (e) * * *

§ 178.BB-6 Manufacture.

(a) **Liner:** Liner without overwrap must be suitable for a marked service pressure of at least 50 percent of the service pressure marked on the composite cylinder, and must be in full compliance with DOT 3AA (§ 178.37) except as follows. Liner final heat treatment must be such that the tensile strength not exceed 125,000 PSI, corresponding to a hardness Rc 26.

(1) * * *

(2) * * *

(b) **Composite Cylinder:** The composite cylinder must be fabricated from a steel liner circumferentially wrapped over the entire cylindrical portion with resin impregnated continuous filament winding. Winding pattern to be "hoop wrap", applied under controlled tension to develop design composite thickness. After winding is complete, the composite must be cured by a

controlled temperature profile, and then autofrettaged by pressurizing to not less than 105 and not greater than 115 percent of the prescribed minimum test pressure. No defect is acceptable that is likely to weaken the finished cylinder appreciably.

(c) * * *

(d) * * *

(e) * * *

§ 178.BB-7 Wall thickness.

(a) Minimum wall thickness of the liner must be at least equal to the minimum design thickness (§178.BB-18(h)) and be such that after auto-frettage, the compressive stress in the sidewall of the liner at zero pressure will not exceed 50 percent of the minimum yield strength of the material as determined in § 178.37(k) or 50 percent of the minimum design yield strength shown in § 178.BB-18(h). The maximum tensile stress of the liners at operating pressure may not exceed 60 percent of the minimum yield strength.

(b) The maximum filament stress at service pressure may not exceed 40 percent of the filament stress at the virgin burst pressure of the lot test cylinder.

(c) * * *

(d) Stresses must be computed by the same procedure as presented in the application for the exemption which is the PARTRAN System Solver (P/FEA) Version 2.5, later versions, or other suitable analyses provided such analyses are verifiable and/or bench marked for the type analysis required for the design.

§ 178.BB-8 Openings.

(a) * * *

(b) * * *

(c) Taper threads when used must comply with one of the following:

(1) American Standard Pipe thread (NPT) standard must comply with the requirements of Federal Standard H 28/7 (1978).

(2) National Gas Taper Thread (NGT) Standard must comply with the requirements of Federal Standard H 28/7 and H 28/9 (1978).

(d) * * *

§ 178.BB-13 Acceptable results of tests.

(a) * * *

(b) Physical test. The test specimens must conform to the requirements in § 178.37(k)(2). Elongation must be at least 20 percent for a 2 inch gage length or at least 10 percent in other cases.

* * *

(c) * * *

(d) Burst pressure must be at least 2-1/2 times the service pressure and in no case less than the value necessary to meet the stress criteria of § 178.BB-7(b). Failure must initiate in cylinder side wall and the liner must remain in one piece in failed condition. Actual burst pressure must be recorded.

§ 178.BB-14 Rejected liners and cylinders.

(a) Reheat treatment of the steel liner is authorized subsequent thereto, acceptable liners must pass all prescribed tests.

(b), (c), and (d) * * *

§ 178.BB-16 Inspector's Report. Compliance required. Change "aluminum" to "steel" whenever the word aluminum is found in this paragraph.

§ 178.BB-18 Design Qualification tests. Compliance required except as follows:

(e) **Hydraulic burst test.**

(2) Burst pressure must be at least 2-1/2 times the service pressure, and in no case less than the value necessary to meet the stress criteria of § 178.BB-7(b). Failure must initiate in the side wall and the liner must remain in one piece in failed condition. Actual burst pressure must be recorded.

b. TESTING - Each cylinder must be reinspected and hydrostatically retested every three years in accordance with § 173.34(e) as prescribed for DOT 3HT cylinders, except that the rejection elastic expansion criteria does not apply, permanent volumetric expansion must not exceed 5 percent of total volumetric expansion at test pressure and retest dates must be steel stamped on the outer exposed metallic surface of the cylinder neck, or marked on a label securely affixed to the cylinder and over coated with epoxy. Reheat treatment or repair of rejected cylinders is not authorized.

8. SPECIAL PROVISIONS:

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

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

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

d. Each packaging manufactured under the authority of this exemption must be marked with a registration symbol designated by the Office of Hazardous Materials Exemptions and Approvals for a specific manufacturing facility.

e. A current copy of this exemption must be maintained at each facility where the package is manufactured under this exemption. It must be made available to a DOT representative upon request.

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

g. Use of these cylinders for underwater breathing is not authorized.

h. Special filling provisions in § 173-302(c) are not allowed.

g. Cylinders may be manifolded in accordance with § 173.301(d).

h. Transportation of flammable gas is not authorized aboard cargo vessel.

i. Prototype cylinders to be used solely for design qualification testing may be charged and shipped from the filling station to the test site, provided each cylinder is in conformance with the provisions of this exemption except for marking (§ 178.BB-15) and design qualification testing (§ 178.BB-18).

j. A cylinder that has been subjected to fire may not be returned to service.

k. Acceptable design qualification and first production lot test results must be submitted to the OHMEA prior to initial shipment.

l. The cylinders described in this exemption are authorized only for normal transportation as an article of commerce i.e., the movement of hazardous materials packages from consignor to consignee. No cylinder may be transported in a partially filled condition other than full or empty per § 173.29, unless it is equipped with a pressure relief device designed, manufactured and tested for partially filled cylinders.

m. Prior to the initial shipment of cylinders manufactured under this exemption, a report of test results specified in § 178.BB-11 and § 178.BB-13 must be submitted to the Office of Hazardous Materials Exemptions and Approvals (OHMEA).

9. MODES OF TRANSPORTATION AUTHORIZED: Motor vehicle, rail freight, cargo vessel (see paragraph 8(h)), cargo aircraft only.

10. MODAL REQUIREMENTS: A current copy of this exemption must be carried aboard each cargo vessel or aircraft used to transport packages covered by this exemption. The shipper shall furnish a copy of this exemption 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 exemption and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. 5101 et seq:

    - All terms and conditions prescribed in this exemption and the Hazardous Materials Regulations, Parts 171-180.

    - Registration required by § 107.601 et seq., when applicable.

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

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

12. REPORTING REQUIREMENTS: The carrier is required to report any incident involving loss of packaging contents or packaging failure to the Associate Administrator for Hazardous Materials Safety (AAHMS) as soon as practicable. (Sections 171.15 and 171.16 apply to any activity undertaken under the authority of this exemption.) In addition, the holder(s) of this exemption must also inform the AAHMS, in writing, as soon as practicable of any incidents involving the package and shipments made under this exemption.

Issued at Washington, D.C.

J. Suzanne Hedgepeth

Robert A. McGuire
Acting Associate Administrator for
Hazardous Materials Safety

APR 13 2000
(DATE)

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Research and Special Programs Administration, Department of Transportation, Washington, D.C. 20590. Attention: DHM-31.

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The original of this exemption is on file at the above office. Photo reproductions and legible reductions of this exemption are permitted. Any alteration of this exemption is prohibited.

Copies of exemptions may be obtained from the AAHMS, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590-0001, Attention: Records Center, 202-366-5046.

PO: KFW