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SPECIAL PERMIT 2502 REVISION NO. 1

This Special Permit is issued pursuant to the terms of Section 71.6(a) of the "Canadian Transport Commission Regulations for the Transportation of Dangerous Commodities by Rail" to authorize the shipment by rail in Canada of Methane and Natural Gas in filament-wound reinforced plastic (FRP) seamless, steel lined cylinders under conditions prescribed herein, and does not relieve any shipper or carrier from compliance with any requirement of the said Regulations except as specifically stated.

1. BASIS

Telex dated December 23, 1987 from Faber Industrie SPA, Italy.

2. COMMODITY CLASSIFICATION

Flammable gas 2.1

3. COMMODITY NAME

Methane or Natural Gas

4. IDENTIFICATION NUMBER

1971

5. REGULATION AFFECTED

73.302

6. AUTHORIZED SHIPPER

Faber Industrie SPA, its agents, distributors and customers.

7. PACKAGING DESCRIPTION

- a) Non CTC Specification fiber reinforced plastic hoop wrapped steel lined cylinder made of definitely prescribed materials.
  - i) Design must be in compliance with Faber Industrie SPA drawings 355-345/70 CAN/COMP, 355-345/80 CAN/COMP, 355-345/90 CAN/COMP, 355-345/100 CAN/COMP, 390-345/90 CAN/COMP Rev. 2, 390-345/100 CAN/COMP Rev. 2, 390-345/110 CAN/COMP/Rev. 2, and 390-345/120 CAN/COMP/Rev. 2 and additional design and performance data on file with the Director of Operation.
- b) In addition, the cylinders shall be in full compliance with DOT FRP-2 Standard dated January 15, 1982 (178.BB) except as follows:

- i) 178.BB-2 Type size and service pressure. Type 3HW cylinder consisting of resign impregnated continuous filament windings in the circumferential direction only over a seamless steel liner made in compliance with 178.BB-6(a); not over 350 pounds water capacity; and service pressure at least 900 PSI but not greater than 5000 PSI.
  
- ii) 178.BB-3 Inspection by whom and where  
  
By competent and independent inspector approved by the Canadian Transport Commission.
  
- iii) 178.BB-4 Duties of Inspector
  - a) \*\*\*
  
  - b) Verify compliance of steel liner with 178.BB-6(a). Verify compliance of filament and resin system components with the requirements specified in 178.BB-5.
  
  - c) \*\*\*
  
  - d) \*\*\*
  
  - e) \*\*\*
  
  - f) \*\*\*
  
  - g) Furnish complete inspector's report (178.BB-16) to the maker of the cylinder, to the Director of Operation and upon request, to the purchaser (see 178.BB-17).
  
- iv) 178.BB-5 Authorized material and identification of material
  - a) Liner material must be as prescribed in CTC Specification 3AA.
  
  - b) \*\*\*
  
  - c) Resin system must be flexible isophthalic polyester type. Resin system shall be tested on a sample coupon representative of the composite overwrap in accordance with ASTM D-2344-76 for water boil shear test, and have a minimum shear strength of 5,000 psi.

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v) 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 CTC Special Permit 2361.

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- 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 windings. Winding pattern to be "hoop" wrapped, applied under controlled tension to develop the design composite thickness. After winding is complete, the composite must be cured by a controlled temperature profile, and 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.

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vi) 178.BB-7 Wall thickness

- a) Minimum thickness of the liner must be at least equal to the minimum design thickness 178.BB-18 (h) and be such that after autofrettage, the compressive stress in the sidewall of the liner at zero pressure will not exceed 50 percent of the minimum yield strength of the steel as determined in the physical tests or 50 percent of the minimum design yield strength shown in 178.BB-18 (h). The maximum tensile stress of the liner at operating pressure must not exceed 60% of the yield strength.

vii) 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) \*\*\*

viii) 178.BB-13 Acceptable results of tests

a) \*\*\*

b) Physical test applies to steel liner only.

1) Elongation must be at least 20 percent for 2 inch gauge length or at least 10 percent in other cases.

2) \*\*\*

3) \*\*\*

c) \*\*\*

d) \*\*\*

ix) 178.BB-14 Rejected liners and cylinders

Change "aluminum" to "steel" whenever the word aluminum is found in these paragraphs.

x) 178.BB-15 Marking

a) \*\*\*

b) Required markings are as follows:

1) CTC SP 2502 followed by the service pressure.

2) A serial number and an identifying symbol (letters); location of number to be just below or immediately following the CTC mark; location of symbol to be just below or immediately following the number. The symbol and numbers must be those of the maker.

3) the Inspector's official mark must be placed near the serial number.

c) \*\*\*

d) Change "aluminum" to "steel".

e) \*\*\*

xi) 178.BB-16 Inspector's report

Change "aluminum" to "steel" whenever the word aluminum is found in these paragraphs.

xii) 178.BB-18 Design qualification tests

- a) General - Except as authorized in 178.BB-10(a), qualification tests as prescribed in this paragraph shall have been performed on representative cylinders of each specific design prior to the initial shipment. All cylinders used for design qualification tests must be fabricated on the same equipment and subjected to the same processes as is used to produce cylinders intended for charging and shipment. All tests must be witnessed by an independent inspector. Test reports must be kept on file by the cylinder maker and made available to the independent inspector and the Director of Operation upon request.
- b) Revoked.
- c) Revoked.
- d) \*\*\*
- e) \*\*\*
- f) \*\*\*
- g) \*\*\*
- h) Qualification test results - A report of all tests for each design describing test setup, procedure and results must be submitted to the Director of Operation. This report must include at least the following basic information on each cylinder tested: \*\*\*

8. SPECIAL REQUIREMENTS

- a) Shippers may use the packaging covered by this exemption pursuant to section 73.22(a) of the CTC regulations.
- b) Cylinder service life shall not exceed 15 years.
- c) Use of these cylinders for underwater breathing is not authorized.
- d) Each cylinder must be reinspected and hydrostatically retested every three years in accordance with section 73.34(e) of the CTC regulations as prescribed for CTC 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 imbedded in the epoxy coating in a permanent manner other than stamping. Retest dates may be steel stamped on the

shoulder of the top head in accordance with 178.BB-15(d). Reheat treatment or repair of rejected cylinders not authorized.

e) A cylinder which has been subjected to the action of fire shall not be returned to service.

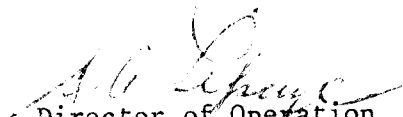
f) The special filling provisions of section 73.302(c) is not allowed.

9. REPORTING REQUIREMENTS

The Director of Operation shall be advised of any incident involving loss of contents and shall be provided with a summary of experience before the expiration date of this Special Permit.

10. EXPIRY DATE

January 22, 1989.

  
Director of Operation  
Rail Safety Branch

Issued at Hull, Quebec  
this 22nd day of January, 1988

Address all inquiries to:

Director of Operation, Rail Safety Branch  
National Transportation Agency  
25 Eddy Street, 14th Floor  
Hull, Quebec  
K1A 0N9