Commission canadienne des transports | Canadian Transport Commission

SPECIAL PERMIT NO. 2597

This Special Permit is issued pursuant to the terms of Section 71.6(a) of the Canadian Transport Commission's "Regulations for the Transportation of Dangerous Commodities by Rail" to authorize the shipment of non-CTC Specification 3AA cylinders by rail in Canada, under conditions prescribed herein, and does not relieve any shipper or carrier from compliance with any requirement of the Commission's Regulations, except as specifically stated.

1. BASIS

Letter dated February 13, 1985 from Safety Supply Canada, 214 King St. E, Toronto, Ontario, M5A 1J8

2. COMMODITY CLASSIFICATION

Non-Flammabale gas 2.2.

3. COMMODITY NAME

Air, compressed or Oxygen, compressed.

4. IDENTIFICATION NUMBER

1002, 1072.

5. REGULATION AFFECTED

73.302

6. AUTHORIZED SHIPPER

Safety Supply Canada and its customers.

7. PACKAGING DESCRIPTION

The cylinders shall be manufactured to the following specification:

1. Compliance:

   (a) Required in all details.

2. Type, size and service pressure: The cylinders shall be manufactured to the type, size and service pressure indicated on drawings 16294 or B241 on file with the Director of Operation.

3. Inspection by whom and where: By competent and independent Inspector approved in writing by the Canadian Transport Commission. For cylinders manufactured by IWKA in Homburg, West Germany, the inspection shall be performed by the German Organization TÜV and the manufacturing reports certified by Mr. Werner Brüning.

Canada

4. Duties of Inspector:

(a) Inspect all material and reject any not complying with requirements; for cylinders made by billet-piercing process, billets to be inspected after parting and shown to be free from pipe, cracks, excessive segregation and other injurious defects.

(b) Verify chemical analysis of each heat of material by analysis or by obtaining certified analysis: Provided, That a certificate from the manufacturer thereof, giving sufficient data to indicate compliance with requirements, is acceptable when verified by check analyses of samples taken from one cylinder out of each lot of 200 or less.

(c) Verify compliance of cylinders with all requirements including markings; inspect inside before closing in both ends; verify heat treatment as proper; obtain samples for all tests and check chemical analyses; witness all tests; verify threads by gauge; report tare weight (see report form) and minimum thickness of wall noted.

(d) Render complete report (para. 22) to the Canadian Transport Commission.

5. Authorized steel:

(a) Open-hearth, basic oxygen, or electric steel of uniform quality. The following chemical analyses are authorized (See Note 1):

Designation	4130X (per cent) (See note 2)
Carbon	0.25/0.35
Manganese	0.40/0.90
Phosphorus	0.04 max.
Sulphur	0.05 max.
Silicon	0.20/0.35
Chromium	0.80/1.10
Molybdenum	0.15/0.25
Zirconium	.....
Nickel	.....

Note 1: A heat of steel made under the above specifications, check chemical analysis of which is slightly out of the specified range, is acceptable if satisfactory in all other respects, provided the tolerances shown in the following table are not exceeded except as approved by the Commission.

Note 2: This designation shall not be restrictive and the commercial steel is limited to analysis as shown in the table.

CHECK ANALYSIS TOLERANCES

Element	Limit or maximum specified (per cent)	Tolerance (per cent) over the maximum limit or under the minimum limit: Under minimum limit	Tolerance (per cent) over the maximum limit or under the minimum limit: Over maximum limit
Carbon	To 0.15 incl.	0.02	0.03
	Over 0.15 to 0.40 incl.	0.03	0.04
Manganese	To 0.60 incl.	0.03	0.03
	Over 0.60 to 1.15 incl.	0.04	0.04
	Over 1.15 to 2.50 incl.	0.05	0.05
Phosphorus[1]	All ranges		0.01
Sulphur	All ranges		0.01
Silicon	To 0.30 incl.	0.02	0.03
	Over 0.30 to 1.00 incl.	0.05	0.05
Nickel	To 1.00 incl.	0.03	0.03
Chromium	To 0.90 incl.	0.03	0.03
	Over 0.90 to 2.10 incl.	0.05	0.05
Molybdenum	To 0.20 incl.	0.01	0.01
	Over 0.20 to 0.40 incl.	0.02	0.02
Zirconium	All ranges	0.01	0.05

[1] Rephosphorized steels not subject to check analysis for phosphorus.

6. Identification of Material:

(a) Required; any suitable method except that plates and billets for hot-drawn cylinders shall be marked with heat number.

7. Defects:

(a) Material with seams, cracks, laminations, or other injurious defects, not authorized.

8. Manufacture:

(a) By best appliances and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defect acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required. If not originally free from such defects, the surface may be machined or otherwise treated to eliminate these defects. Cylinder shells shall be manufactured by cold drawing from flat plates.

9. Welding or Brazing:

(a) Welding or brazing for any purpose whatsoever is prohibited except as follows:

(1) Welding or brazing is authorized for the attachment of neckrings and footrings which are nonpressure parts, and only to the tops and bottoms of cylinders having a service pressure of 500 pounds per square inch or less. Cylinders, neckrings, and footrings must be made of weldable steel, carbon content of which must not exceed 0.25 per cent except in the case of 4130X steel which may be used with proper welding procedure.

(2) As permitted in sec. 8.

10. Wall Thickness: The minimum wall thickness shall be such that the wall stress at the minimum specified test pressure shall not exceed 75 per cent of the minimum tensile strength of the steel as determined from the physical tests required in secs. 16 and 17 and shall be not over 91500 psi.

(c) Calculation must be made by the formula:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{D^2 - d^2}$$

where:

S = wall stress in pounds per square inch;
P = 5/3 times the service pressure.
D = outside diameter in inches;
d = inside diameter in inches.

11. Heat Treatment:

(a) The completed cylinders must be uniformly and properly heat treated prior to tests. Heat treatment of cylinders of the authorized analyses shall be as follows:

(1) All cylinders must be quenched by oil, or other suitable medium except as provided in subparagraph (5) of this paragraph.

(2) The steel temperature on quenching shall be that recommended for the steel analysis, but in no case shall exceed 1750°F.

(3) All steels shall be tempered at a temperature most suitable for that steel.

(4) The minimum tempering temperature shall be not less than 1000°F. except as noted in paragraph (a)(6) of this section.

(5) Steel 4130X may be normalized at a temperature of 1650°F. instead of being quenched, and cylinders so normalized need not be tempered.

(6) All cylinders, if water quenched or quenched with a liquid producing a cooling rate in excess of 80 per cent of the cooling rate of water, must be inspected by the magnetic particle, dye penetrant or ultrasonic method to detect the presence of quenching cracks. Any cylinder designed to the requirements of this specification and found to have a quenching crack must be rejected and may not be requalified.

12. Openings in Cylinders and Connections (Valves, fuse plugs, etc.) for those openings:

(a) Threads required, to be clean cut, even, without checks, and to gauge.

(b) Taper threads, when used, to be of length not less than as specified for American Standard taper pipe threads.

(c) Straight threads having at least 6 engaged threads are authorized; to have tight fit and calculated shear strength at least 10 times the test pressure of the cylinder, gaskets required, adequate to prevent leakage.

13. Safety devices and Protection for Valves, Safety Devices, and other Connections, if applied:

(a) Must be as required by these regulations that apply (see SS 73.34(d) and 73.301(g)).

14. Hydrostatic Test:

(a) By water jacket, in accordance with CGA pamphlet C-1, operated so as to obtain accurate data. Pressure gauge must permit reading to accuracy of 1 per cent. Expansion gauge must permit reading of total expansion to accuracy either of 1 per cent or 0.1 cubic centimetre.

(b) Pressure must be maintained for 30 seconds and sufficiently longer to insure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test must not exceed 90 per cent of the test pressure. If, due to failure of the test apparatus, the test pressure cannot be maintained, the test may be repeated at a pressure increased by 10 per cent or 100 pounds per square inch, whichever is the lower.

(c) Permanent volumetric expansion must not exceed 10 per cent of total volumetric expansion at test pressure.

(d) Each cylinder must be tested to at least 5/3 times service pressure.

15. Flattening Test:

(a) Between knife edges, wedge shaped, 60° angle, rounded to 1/2" radius; test 1 cylinder taken at random out of each lot of 200 or less, after hydrostatic test.

16. Physical test:

(a) To determine yield strength, tensile strength, elongation, and reduction of area of material. Required on 2 specimens cut from 1 cylinder taken at random out of each lot of 200 or less.

(b) Specimens must be: Gauge length 8 inches with width not over 1 1/2 inches; or, gauge length 2 inches with width not over 1 1/2 inches: Provided, That gauge length at least 24 times thickness with width not over 6 times thickness is authroized when cylinder wall is not over 3/16 inch thick. The specimen, exclusive of grip ends, must not be flattened. Grip ends may be flattened to within one inch of each end of the reduced section. When size of cylinder does not permit securing straight specimens, the specimens may be taken in any location or direction and may be straightened or flattened cold, by pressure only, not by blows; when specimens are so taken and prepared, the inspector's report must show in connection with record of physical tests detailed information in regard to such specimens. Heating of specimen for any purpose is not authorized.

(c) The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 per cent of the gauge length.

(1) The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed in ASTM Standard E8-57T.

(2) In using the "extension under load" method, the total strain (or "extension under load") corresponding to the stress at which the 0.2 per cent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 per cent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram shall be plotted and the yield strength determined by the 0.2 per cent offset.

(3) For the purpose of strain measurement, the initial strain shall be set while the specimen is under a stress of 12,000 pounds per square inch, the strain indicator reading being set at the calculated corresponding strain.

(4) Cross-head speed of the testing machine shall not exceed 1/8 inch per minute during yield strength determination.

17. Physical and Flattening Tests:

(a) Acceptable results for physical and flattening tests; elongation at least 20 per cent for 2" gauge length or at leat 10 per cent in other cases; flattening required without cracking to 6 times wall thickness. The yield strength to tensile strength ratio shall not exceed 90 per cent.

18. Revoked.

19. Rejected Cylinders:

(a) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair by welding or spinning is not authorized.

20. Marking:

(a) Marking on each cylinder by stamping plainly and permanently on shoulder, top head, or neck as follows:

(1) CTC SP 2597 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 maker.

(3) Inspector's official mark near serial number and date of test, so placed that dates of subsequent tests can be easily added.

21. Size of Marks:

(a) At least 1/4" high if space permits.

22. Inspector's Report:

(a) Required to be clear, legible, and in the following form:

(Place)_____

(Date) _____

Gas Cylinders

Manufactured for _____ Company

Location at _____

Manufactured by _____ Company

Location at _____

Consigned to _____ Company

Location at _____

Quantity _____

Size _____ inches outside diameter by _____ inches long

Marks stamped into the shoulder of the cylinder are:

Specification CTC SP 2597

Serial numbers _____ to _____ inclusive.

Inspector's mark

Identifying symbol (registered) _____

Test date _____

Tare weights (yes or no) _____

Other marks (if any) _____

These cylinders were made by process of _____

_____

The cylinders were heat treated by the process of _____

The material used was identified by the following _____ numbers
(heat purchase order)

_____

The material used was verified as to chemical analysis and record thereof is attached hereto. The heat numbers _____ marked on
(were - were not)
the material.

All material, such as plates, billets and seamless tubing, was inspected and each cylinder was inspected both before and after closing in the ends; all that was accepted was found free from seams, cracks, laminations, and other defects which might prove injurious to the strength of the cylinder. The processes of manufacture and heat treatment of cylinders were supervised and found to be efficient and satisfactory.

The cylinder walls were measured, and the minimum thickness noted _____ inch. The outside diameter was determined by a close approximation to be _____ inches. The wall stress was calculated to be _____ pounds per square inch under an internal pressure of _____ pounds per square inch.

Hydrostatic tests, flattening tests, tensile tests of material, and other tests, as prescribed in Special Permit 2597 were made in the presence of the inspector and all material and cylinders accepted were found to be in compliance with the requirements of that specification. Records thereof are attached hereto.

I hereby certify that all of these cylinders proved satisfctory in every way and comply with the requirements of Special Permit No. 2597 except as follows:

Exceptions _____

_____

_____

(Signed) _____
Inspector

(Place)_____

(Date) _____

RECORD OF CHEMICAL ANALYSIS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.

Size _____ inches outside diameter by _____ inches long.

Made by _____ Company

For _____ Company

NOTE: Any omission of analyses by heats, if authorized, must be accounted for by notation hereon reading "The prescribed certificate of the manufacturer of material has been secured, found satisfactory, and placed on file," or by attaching a copy of the certificate.

Test No.	Test No.	Check analysis No.	Cylinders represented (Serial Nos.)	Chemical analysis C	P	S	Si	Mn	Ni	Cr	Mo	Zr

The analyses were made by

(Signed)
(Place)
(Date)

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDERS

Numbered _____ to _____ inclusive.

Size _____ inches outside diameter by _____ inches long.

Made by _____ Company

For _____ Company

Test No.	Cylinders represented by test (Serial Nos.)	Yield Strength at 0.2 per cent offset (pounds per square inch)	Tensile strength (pounds per square inch)	Elongation (per cent)	Reduction of area (per cent)	Flattening Test

_____

(Signed)
(Place)
(Date)

RECORD OF HYDROSTATIC TESTS ON CYLINDERS

Numbered _____ to _____ inclusive.

Size _____ inches outside diameter by _____ inches long.

Made by _____ Company

For _____ Company

Serial numers of cylinders tested arranged numerically	Actual test pressure (pounds per square inch	Total expansion (cubic centi-metres)[1]	Permanent expansion (cubic centi-metres)[1]	Per cent ratio of permanent expansion to total expansion[1]	Tare weight (pounds)[2]	Volu-metric capacity

1 If the tests are made by a method involving the measurement of the amount of liquid forced into the cylinder by the test pressure, then the basic data, on which the calculations are made, such as the pump factors, temperature of liquid, coefficient of compressibility of liquid, etc., must also be given.

2 Do not include removable cap but state whether with or without valve. These weights must be accurate to a tolerance of 1 per cent.

_____

(Signed)

8. SPECIAL REQUIREMENTS

(a) Lots of cylinders shall be limited to a maximum of 200.

(b) The cylinders within a lot shall be manufactured from material of the same heat.

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 the Special Permit.

10. EXPIRY DATE

April 23, 1987

Director of Operation
Railway Transport Committee

Issued at Hull, Quebec
this 23rd day of April 1986

Address all inquiries to:

Director of Operation, RTC
Canadian Transport Commission
25 Eddy Street, 14th Floor
Hull, Quebec
K1A 0N9

Office national des transports du Canada
National Transportation Agency of Canada

SPECIAL PERMIT 2597, REVISION NO. 2

In accordance with Section 71.6(a) of the Regulations for the Transportation of Dangerous Commodities by Rail, Special Permit 2597 is hereby extended by changing the following:

10. **EXPIRY DATE**

August 9, 1989.

This extension applies only to the party(s) listed below based on the application(s) dated August 3, 1988 in accordance with Section 71.6(b) (3) of the said Regulations. All other terms of the Special Permit remain unchanged. This extension forms part of the Special Permit and must be attached to it.

Party(s): Safety Supply Canada and its customers.

Director of Operation
Rail Safety Branch

Issued at Hull, Quebec
this 9th day of August, 1988

Address all inquiries to:

Director of Operation
Rail Safety Branch
Operations Directorate
National Transportation Agency
Hull, Quebec
K1A 0N9

Canada