



Transportation of Dangerous Goods Directorate
L'Esplanade Laurier
300 Laurier Avenue West
Ottawa, Ontario
K1A 0N5

Direction générale du transport des marchandises dangereuses
L'Esplanade Laurier
300, avenue Laurier Ouest
Ottawa (Ontario)
K1A 0N5



Equivalency Certificate (Approval issued by the competent authority of Canada)

Certificate No.: SU 4221 (Ren. 11)
Template Number: N/A
Certificate Holder: Certified Cylinder Services Inc.
Mode of Transport: Road, Rail, Air, Marine
Issue Date: June 21, 2021
Expiry Date: June 30, 2026

LEGEND

For the purposes of this equivalency certificate, documents referred to by an abbreviation have the following meaning:

TDG Act: *Transportation of Dangerous Goods Act, 1992*

TDG Regulations: *Transportation of Dangerous Goods Regulations*

CSA B339: *CSA Standard B339, "Cylinders, spheres, and tubes for the transportation of dangerous goods", published by the Canadian Standards Association (CSA), as amended from time to time*

CSA B340: *CSA Standard B340, "Selection and use of cylinders, spheres, tubes, and other containers for the transportation of dangerous goods, Class 2", published by the Canadian Standards Association (CSA), as amended from time to time*

NOTES

Note 1: Subsection 31(4) of the *TDG Act* stipulates that any non-compliance with the conditions of this equivalency certificate will result in the provisions of the *TDG Act* and *TDG Regulations* to apply as though this equivalency certificate did not exist.

Note 2: This equivalency certificate provides no regulatory relief other than specifically stated herein. Therefore, all other requirements of the *TDG Act* and the *TDG Regulations* apply.

PURPOSE

This equivalency certificate authorizes the continued use of cylinders, which were manufactured prior to February 27, 2010, by **TW Cylinders LLC** in accordance with the conditions of Permit for Equivalent Level of Safety **SU 4221**. **TW Cylinders LLC** ceased all production of cylinders manufactured in accordance with permit **SU 4221**, but an equivalency certificate is still required to allow these cylinders to be used in Canada.

Appendix A contains the last copy of the permit **SU 4221** that was issued to **TW Cylinders LLC** authorizing them to manufacture cylinders that did not comply with *CSA B339* at the time of manufacture.

CONDITIONS

This equivalency certificate authorizes **Certified Cylinder Services Inc.**, to handle, offer for transport or transport in Canada, and authorizes **any person** to handle, offer for transport, transport or import into Canada, by road or railway vehicle, by aircraft or by vessel, cylinders in a manner that does not comply with:

- sections 5.1.1 and 5.2 of the *TDG Regulations*,
- subparagraphs 5.10(1)(a)(ii), 5.10(1)(b)(ii), 5.10(1)(c)(ii), 5.10(1)(d)(iii) of the *TDG Regulations*, and
- subsection 5.10(2) of the *TDG Regulations*,

if the following conditions are met:

1) Selection and Use

- a) Subject to condition 1(b) of this certificate, the requirements for specification TC-3AAM cylinders in *CSA B340*, are complied with;

- b) The cylinders do not contain:
 - i) hydrogen, compressed,
 - ii) hydrogen sulphide,
 - iii) natural gas, compressed with high methane content,
 - iv) gas mixtures containing:
 - A) hydrogen sulphide or other free sulphide,
 - B) natural gas, compressed with high methane content,
 - C) more than 10 percent carbon monoxide, or
 - D) carbon monoxide having a dew point of -47°C or higher at atmospheric pressure;
 - v) any liquefied gas; or
 - vi) any gas that would cause hydrogen embrittlement of the cylinder steel;

2) Manufacture

- a) Subject to conditions 2)b) and 2)c) of this certificate, the cylinders were manufactured prior to February 27, 2010, in accordance with the conditions of Permit for Equivalent Level of Safety SU 4221 issued by the Transportation of Dangerous Goods Directorate, Transport Canada;
- b) The cylinders were manufactured at 1001 Herr Street, Harrisburg, PA, U.S.A., in accordance with the specific procedures and one of the following drawings filed by Taylor-Wharton, Harsco Gas & Fluid Control Group, Harsco Corporation with the Transportation of Dangerous Goods Directorate:
 - i) drawing no. 38380-4 (HC 4500 model), filed on May 6, 1994,
 - ii) drawing no. P38385-3 (HC 6000 model), filed on May 6, 1994, or
 - iii) drawing no. P38926-2 (HC 5000 model) filed on March 15, 2005;
- c) The Transport Canada mark, the specification designation, and the service pressure marked on each cylinder is “**TC-SU 4221-**” followed by the service pressure expressed in bar;

3) Requalification

- a) Subject to condition 3)b) of this equivalency certificate, cylinders due for requalification are requalified in accordance with the requirements applicable to specification TC-3AAM set out in *CSA B339*;
- b) The initial requalification period for cylinders in compliance with Clause 24.2.2.1 of *CSA B339* is 10 years. Thereafter, the cylinders shall be subjected to a 5-year requalification period;
- c) The certificate holder, cylinder owner or user reports to the Executive Director, Regulatory Frameworks and International Engagement, Regulatory Affairs Branch, Transportation of Dangerous Goods Directorate, Transport Canada, any incidents involving loss of contents or failure of the cylinders; and
- d) The certificate holder, cylinder owner or user advises the Executive Director, Regulatory Frameworks and International Engagement, Regulatory Affairs Branch, Transportation of Dangerous Goods Directorate, Transport Canada, prior to cylinders being returned to service, where the cylinders are requalified after having been subjected to fire.

Signature of Issuing Authority



David Lamarche, P. Eng., ing.
Chief, Approvals and Special Regulatory Projects

Contact Person:	Gilbert Price Operations Manager Certified Cylinder Services Inc. 1780 Alstep Drive Mississauga ON L5S 1W1
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<u>Legend for Certificate Number</u>	
SH - Road, SR - Rail, SA - Air, SM - Marine SU - More than one Mode of Transport Ren - Renewal	

For more information:

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Appendix A

Appendix A contains the last copy of the permit **SU 4221** that was issued to **TW Cylinders LLC** authorizing them to manufacture cylinders that did not comply with *CSA B339* at the time of manufacture.

Permit No.:	SU 4221 (Ren. 10)
Permit Holder:	TW Cylinders LLC
Mode of Transport:	Road, Rail, Air, Marine
Issue Date:	April 29, 2008
Expiry Date:	April 30, 2013

This Permit for Equivalent Level of Safety authorizes TW Cylinders LLC to manufacture, sell, offer for sale, distribute, or deliver in Canada and authorizes any person to handle, offer for transport, transport, or import into Canada, by road or railway vehicle, by aircraft or by ship, cylinders in a manner that does not comply with sections 5.1 and 5.2, subparagraphs 5.10(1)(a)(i) and 5.10(1)(b)(i), paragraph 5.10(1)(c), subparagraph 5.10(1)(d)(i), and subsection 5.10(2) of the *Transportation of Dangerous Goods Regulations*, if:

- (a) subject to paragraph (b), the requirements with respect to specification TC-3AAM cylinders, in National Standard of Canada CAN/CSA B340-02, entitled "Selection and Use of Cylinders, Spheres, Tubes, and Other Containers for the Transportation of Dangerous Goods, Class 2", dated October 2002, as amended in January 2004 and in February 2005, cited in the rest of this permit as CAN/CSA B340-02, are complied with;
- (b) the cylinders do not contain:
 - (i) hydrogen, compressed,
 - (ii) hydrogen sulphide,
 - (iii) NATURAL GAS, COMPRESSED with high methane content,
 - (iv) gas mixtures containing:
 - (A) hydrogen sulphide or other free sulphide,
 - (B) NATURAL GAS COMPRESSED with high methane content,
 - (C) more than 10 percent carbon monoxide, or
 - (D) carbon monoxide having a dew point of -47°C or higher at atmospheric pressure;

- (v) any liquefied gas; or
- (vi) any gas that would cause hydrogen embrittlement of the cylinder steel;

Manufacture

- (c) the cylinders are manufactured at 1001 Herr Street, Harrisburg, PA, U.S.A. in accordance with the specific procedures and one of the following drawings filed by Taylor-Wharton, Harsco Gas & Fluid Control Group, Harsco Corporation with the Transport Dangerous Goods Directorate;
 - (i) drawing No. 38380-4 (HC 4500 model), filed on May 6, 1994,
 - (ii) drawing No. P38385-3 (HC 6000 model), filed on May 6, 1994, or
 - (iii) drawing No. P38926-2 (HC 5000 model) filed on March 15, 2005;
- (d) subject to paragraphs (e) to (v), the cylinders are in compliance with the applicable requirements for specification TC-3AAM set out in National Standard of Canada CAN/CSA B339-02, "Cylinders, Spheres, and Tubes for the Transportation of Dangerous Goods", dated October 2002, as amended in November 2003 and in February 2005, cited in the rest of the permit as CAN/CSA B339-02;
- (e) the chemical composition of the steel cylinder corresponds to the chemical composition set out in Table I of Appendix A to this permit;
- (f) the steel is treated with calcium to provide the following J-K microcleanliness rating in accordance with Method A of ASTM Standard E45-05e1, "Standard Test Methods for Determining the Inclusion Content of Steel", published in 2005:

A (Sulfides)

Thin	Heavy
2.0	1.5

B (Alumina)

Thin	Heavy
2.0	1.0

C (Silicates)

Thin	Heavy
1.0	0.5

D (Oxides)

Thin	Heavy
2.5	1.5

and the certificate from the material manufacturer certifies that the material was calcium treated and includes in such certification the J-K microcleanliness rating for each heat of steel;

- (g) the steel is aluminum killed and made by a fine grain practice;
- (h) the cylinders are manufactured by the backward extrusion process, and
 - (i) the cylinder bottoms have a minimum thickness not less than two times the minimum design wall thickness to be measured within an area bounded by a

line representing the points of contact between the cylinder and the floor when the cylinder is in a vertical position, and

- (ii) metal removal for any purpose other than removal of isolated defects and threading is done prior to the hydrostatic and ultrasonic tests;
- (i) for cylinders with a service pressure of 6.9 MPa or more, the wall stress in Equation 1 of CAN/CSA-B339-02 does not exceed 67 percent of the minimum tensile strength as determined by the tensile test or 717 MPa, whichever is the lesser;
- (j) the heat treatment furnace is equipped with:
- (i) recording infrared pyrometers capable of determining cylinder temperature at the beginning and at the end of the austenitizing and tempering soak zone, and
 - (ii) the furnace has fault controls providing uniform temperature in each zone and proper function of the feed mechanism;
- (k) the cylinders are held at the austenitizing temperature for at least 2.4 minutes for each millimeter of maximum cylinder thickness and are then quenched into a liquid medium which provides a cooling rate not greater than 80 percent of that of water, and
- (i) steel temperature on quenching does not exceed 927°C, and
 - (ii) the tempering temperature is not less than 560°C, and the cylinders are held at that tempering temperature for at least 2.4 minutes for each millimeter of maximum cylinder thickness;
- (l) hydrostatic testing with determination of volumetric expansion is performed by the water jacket method, and any cylinder that exceeds the rejection elastic expansion (REE) developed in accordance with clause 6.15.2 of CAN/CSA B339-02, is rejected;
- (m) the flattening test requirement is flattening to 10 times the wall thickness without cracking, and the Inspector records the actual degree of flattening attained without cracking;
- (n) three Charpy impact specimens, taken from one heat treated cylinder for each lot of 200 cylinders or less, are tested, and
- (i) each specimen is a V-notch type size 10 X 4mm or 10 X 5mm in accordance with ASTM Standard A370-07b, "Standard Test Methods and Definitions for Mechanical Testing of Steel Products", published in 2007,
 - (ii) each specimen is taken from the sidewall of the cylinder,

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(iii) the axis of the specimen is perpendicular to the longitudinal axis of the cylinder, and the axis of the notch is perpendicular to the surface of the cylinder, and

(iv) the impact properties for the specimens tested at - 18°C are not less than:

Size (mm)	Average Value for Acceptance <u>3 Specimens</u>	Minimum Value for Any One <u>Specimen</u>
10 X 5 or 10 x 4	18 joules	14 joules

(o) a hardness test is performed on the cylindrical section of each cylinder after heat treatment and the hardness does not exceed HRC40. When the result of the initial hardness test exceeds the maximum permitted, two or more retests may be made, but the hardness number obtained in each retest cannot exceed the maximum permitted;

(p) a flawed cylinder pressure test is performed on one cylinder selected from each heat of steel. Following a preflaw pressure test, a sharp part-through longitudinal flaw is introduced into the test cylinder by a means that will not affect the mechanical or metallurgical properties, and

(i) the flaw is at least 50.8 mm long and has a depth that will cause the cylinder to fail when pressurized to not less than 90 percent and not more than 125 percent of the stress at service pressure,

(ii) the cylinder is hydrostatically pressurized to failure at a rate not in excess of 1.4 MPa per second, and

(iii) failure is by leakage or by plastic fracture with visible evidence of bulging;

(q) tensile strength, as determined by the tensile test, is at least 1070 MPa and not more than 1207 Mpa, and elongation is at least 12 percent for a 50.8 mm gauge length specimen with width not over 38.1 mm;

(r) each cylinder is ultrasonically inspected after heat treatment in accordance with ASTM Standard E213-04, entitled "Standard Practice for Ultrasonic Examination of Metal Pipe and Tubing", published in 2004, using the immersion oblique angle technique, and

(i) the ultrasonic testing equipment is calibrated to produce clearly identifiable indications from calibration standard notches of 5 percent of the minimum design wall thickness by 25.4 mm long,

(ii) any cylinder with an imperfection giving an indication equal to or greater than the rejection level established during calibration is rejected,

- (iii) where an imperfection requiring rejection occurs on the internal surface of the cylinder, the cylinder is condemned, and
- (iv) the manufacturer records the results of ultrasonic inspection for each cylinder serial number and retains this record for the service life of the cylinder;
- (s) there is only one reheat treatment permitted for rejected cylinders, the reheat treatment is in accordance with the requirements for the initial heat treatment, and any reheat treated cylinders are identified in the Certificate of Compliance and Test Report;
- (t) the Transport Canada mark, the specification designation, and the service pressure marked on each cylinder is:

“TC-SU 4221-”

followed by the service pressure marked in bar;

Requalification

- (u) subject to paragraph (v), the requalification period for the cylinders is five years;
- (v) the initial requalification period for cylinders in compliance with clause 24.2.2.1 of CAN/CSA B339-02 is 10 years. Thereafter, the cylinders shall be subjected to a 5-year requalification period;
- (w) the Transport Dangerous Goods Directorate is advised prior to the cylinders being returned to service where the cylinders are requalified after having been subjected to fire;
- (x) the documents referred to in clause 4.18 of CAN/CSA-B339-02 are retained by the manufacturer and by the independent inspector, as defined in that standard, for the service life of the cylinder; and
- (y) the permit holder reports, once per calendar year, a summary of the cylinder manufacturing and performance experience to the Director, Regulatory Affairs Branch, Transport Dangerous Goods Directorate, Transport Canada.

This Permit for Equivalent Level of Safety serves as the registration of TW Cylinders LLC, pursuant to clause 25.2 of CAN/CSA B339-02, to manufacture cylinders of the designs specified herein. TW Cylinders LLC's registered mark pursuant to CAN/CSA B339-02 is:



These cylinders have previously been manufactured under a permit granted pursuant to the *Regulations for the Transportation of Dangerous Commodities by Rail*. The applicant had demonstrated that by augmenting testing at manufacture, restricting certain design parameters as well as the types of gases that could be contained, a cylinder of reduced wall thickness could be used with equivalent safety. The present permit authorizes continued manufacture and use of the said cylinders under the *Transportation of Dangerous Goods Regulations*, as amended.

APPENDIX A

Manufacture

Steel cylinder chemical composition
(paragraph (e))

TABLE I

<u>Element</u>	<u>Mass Percent</u>	<u>Product Analysis Tolerances</u>	
		<u>Under Minimum</u>	<u>Over Maximum</u>
Carbon	0.32 to 0.36	0.01	0.02
Manganese	0.60 to 0.90	0.03	0.03
Phosphorus	0.025 maximum	-	0.01
Sulphur	0.010 maximum	-	0.00
Silicon	0.15 to 0.35	0.02	0.03
Chromium	0.80 to 1.10	0.03	0.03
Molybdenum	0.15 to 0.25	0.01	0.01
Vanadium	0.10 maximum	-	0.01
Aluminum	0.01 to 0.05	0.00	0.00
Copper	0.20 maximum	-	0.00