



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 4349 (Ren. 5)

Certificate Type: N/A

Certificate Holder: PST Cylinders, LLC

Mode of Transport: Road, Rail, Air, Marine

Effective Date: June 24, 2020

Expiry Date: June 30, 2025

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 B339-96: CSA Standard B339-96, “*Cylinders, Spheres, and Tubes for the Transportation of Dangerous Goods*”, July 1996 and amended December 1999, published by the Canadian Standards Association (CSA),

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

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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 manufactured prior to May 1, 2005 by Pressed Steel Tank Co., Inc. in accordance with the conditions of this Permit for Equivalent Level of Safety SU 4349, under the *TDG Regulations*, as amended. Pressed Steel Tank Co., Inc. 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 with reduced wall thickness could be used with equivalent safety.

CONDITIONS

This equivalency certificate authorizes **PST Cylinders, LLC** 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)(iii), 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:

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

(b) Each cylinder contains one of the following dangerous goods:

- UN1002, AIR, COMPRESSED, with no more than 23.5 per cent oxygen, by volume, Class 2.2,
- UN1006, ARGON, COMPRESSED, Class 2.2,
- UN1046, HELIUM, COMPRESSED, Class 2.2,
- UN1066, NITROGEN, COMPRESSED, Class 2.2,
- UN1072, OXYGEN, COMPRESSED, Class 2.2(5.1) ;

Manufacture

- (c) The cylinders were manufactured prior to May 1, 2005, by Pressed Steel Tank Co., Inc., at 1445 South 66th Street, Milwaukee, WI, USA, in accordance with the specific procedures and with drawing No. F1297401, F1297501, F1297601, F1313011TC, F1313021TC or F1313031TC filed by Pressed Steel Tank Co., Inc. with the Transport Dangerous Goods Directorate;
- (d) Subject to conditions (e) to (x) of this equivalency certificate, the cylinders are in compliance with the requirements applicable to specification TC-3AAM set out in *CSA B339-96*;
- (e) The chemical composition of the steel cylinder corresponds to the chemical composition for Grade 1 or Grade 2, set out in Table 1 of Appendix A to this equivalency certificate;
- (f) The steel is treated with calcium to provide the following J-K micro cleanliness rating in accordance with ASTM Standard E45, "*Standard Test Methods for Determining the Inclusion Content of Steel*", published in 1997 and reaffirmed in 2002, Method D for Grade 1 and Method A for Grade 2:

A (Sulfides)	B (Alumina)	C (Silicates)	D (Oxides)
Thin / Heavy	Thin / Heavy	Thin / Heavy	Thin / Heavy
2.0 2.0	2.0 2.0	2.0 2.0	2.0 2.0

and the certificate from the material manufacturer certifies that the material was calcium treated and includes in such certification the J-K micro cleanliness 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 cold drawing process and have bottoms with a thickness not less than the cylinder sidewall thickness and have a surface finish which does not exceed a roughness of 250 root mean square;
- (i) For cylinders with a service pressure of 6.9 MPa or more, the wall stress in Equation 1 of *CSA B339-96* does not exceed 67 per cent of the minimum tensile strength as determined by the tensile test or 624 MPa, whichever is the lesser;

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- (j) Cylinders are held at the austenitizing temperature for at least 2.4 minutes for each millimetre of maximum cylinder thickness and are then quenched in a liquid medium which provides a cooling rate not greater than 80 per cent of that of water, and
 - i) the steel temperature on quenching does not exceed 927°C, and
 - ii) the tempering temperature is not less than 538°C, and the cylinders are held at that tempering temperature for at least 2.4 minutes for each millimetre of maximum cylinder thickness;
- (k) The hydrostatic testing with determination of volumetric expansion is performed by the water jacket method;
- (l) The flattening test requirement, in clause 6.10.3 of *CSA B339-96*, is flattening to 8 times the wall thickness without cracking, and the Inspector records the actual degree of flattening attained without cracking;
- (m) Three (3) 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 4 mm in accordance with ASTM standard A370, "*Standard Test Methods and Definitions for Mechanical Testing of Steel Products*", published in 2003,
 - ii) each specimen is taken from the sidewall of the cylinder,
 - iii) the axis of the specimen is parallel 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 - 50°C are not less than

Size (mm)	Average Value for Acceptance 3 Specimens	Minimum Value 1 Specimen Only of the Three
10 X 4	17 Joules	14 Joules

- (n) A hardness test is performed on the cylindrical section of each cylinder after heat treatment, and the hardness does not exceed HRc37, and 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;
- (o) A flawed cylinder test is performed on one heat treated cylinder taken from each lot of 200 cylinders or less. Three flaws are introduced into the test cylinder by a means that will not affect the mechanical or metallurgical properties;

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- (p) Each flaw is at least 6 times the wall thickness in length and located at 120 degree intervals around the cylinder circumference;
- (q) Cycling is carried out as described in clause 4.13.4 of CAN/CSA-B339-96 except that the pressure is cycled between 0 kPa and 1.25 times the service pressure, and cycling is continued to cylinder failure;
- (r) Failure is by leakage before burst with evidence of crack propagation by fatigue prior to leakage;
- (s) Tensile strength, as determined by the tensile test, is not more than 1138 MPa, and elongation is at least 16 per cent for a 50.8mm gauge length with width not over 38.1mm;
- (t) After all shell forming operations and prior to closing-in, each cylinder is inspected by the wet magnetic particle method in accordance with ASTM Standard E 709, Standard Guide for Magnetic Particle Examination, published in 2001, and any cylinder that has a quenching crack is condemned;
- (u) The Transport Canada mark, the specification designation, and the service pressure marked on each cylinder is “**TC-SU 4349**” followed by the service pressure expressed in bar;

Requalification

- (v) Subject to condition (w) 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;
- (w) The requalification period for the cylinders is five years; and
- (x) The Transport Dangerous Goods Directorate is advised prior to the cylinders being returned to service, where cylinders are requalified after having been subjected to fire.

Signature of Issuing Authority



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

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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	

Appendix A

Manufacture

Steel cylinder chemical composition
(condition (e))

TABLE 1

Element	Mass Percent		Product Analysis Tolerances	
	Grade 1	Grade 2	Under Minimum	Over Maximum
Carbon	0.31 to 0.35	0.28 to 0.33	0.01	0.02
Manganese	0.60 to 0.90	0.60 to 0.90	0.03	0.03
Phosphorus	0.025 max.	0.015 max.	-	0.01
Sulphur	0.010 max.	0.010 max.	-	0.01
Silicon	0.15 to 0.35	0.15 to 0.35	0.02	0.03
Chromium	0.80 to 1.10	0.80 to 1.10	0.03	0.03
Molybdenum	0.15 to 0.25	0.15 to 0.25	0.01	0.01
Vanadium	0.07 to 0.10	0.02 max.	0.01	0.01
Aluminum	0.01 to 0.05	0.02 to 0.06	0.00	0.00
Copper	0.20 Max.	0.20 max.	-	0.00
Sulphur + Phosphorus	-	0.020 max.	-	-

NOTE

Under Canadian Law, a foreign manufacturer of non-specification means of containment cannot be charged with an offence under the *Transportation of Dangerous Goods Act, 1992* for failure to comply with the conditions of an Equivalency Certificate. However, certain remedies under the Act are available to Transport Canada in this eventuality.

These include:

1. detention of dangerous goods and consequently the means of containment containing them (subsection 17(1));
2. detention of the means of containment whether full or empty (subsection 17(1));
3. directions not to import the means of containment or to return them to origin (subsection 17(3));
4. inspectors' directions (section 19);
5. directions to importers of the means of containment to issue notices of defective construction or recall (subsection 9(2)); and
6. revocation of the certificate, thereby making any use of the means of containment an offence (subsection 31(6)).

If none of the foregoing is adequate, Protective Directions may be issued to prohibit or to control the use of the means of containment (section 32).