AMENDMENT NO. 1 JUNE 2021

TO

IS 7285 (PART 2) : 2018 REFILLABLE SEAMLESS STEEL GAS CYLINDERS — SPECIFICATION

PART 2 QUENCHED AND TEMPERED STEEL CYLINDERS WITH TENSILE STRENGTH LESS THAN 1 100 MPA (112 kgf/mm²)

(Fourth Revision)

(*Second cover page, foreword***,** *para* 2, *line* 7) **—** Substitute '1 100 MPa' *for* '1 110 MPa'.

(*Second cover page, foreword*, *para* 2, *last sentence*) — Substitute the following for the existing:

'However, considering the prevailing practices of cylinder manufacturing in the country, changes have been made wherever necessary.'

(*Second cover page, foreword*, *para* 4, *last sentence*) — Delete.

(*Second cover page, foreword*, *para* 5, *line* 3) — Substitute 'IS 8451 : 2018 Periodic inspection and testing of seamless steel gas cylinders — Code of practice' *for* 'IS 8541 : 2009 Periodic inspection and testing of high pressure gas cylinders — Code of practice'.

(*Page* 1*, clause* **2**) — Insert the following at an appropriate place:

IS No.	*Title*
16087 : 2016	Biogas (biomethane) — Specification (*first revision*)

(*Page* 1*, clause* **3.1**, *title*) — Substitute 'Yield Strength (R_{eg})' *for* 'Yield Stress (R_e)' and wherever it appears in the standard.

Price Group 3

(*Page* 2, *clause* **3.3**) — Substitute the following for the existing:

'**3.3 Tempering** — Toughening heat treatment which follows quenching, in which the cylinder is heated to a uniform temperature below the lower critical point, AC_1, of the steel.'

(*Page* 2, *clause* **3.4**) — Substitute the following for the existing:

'**3.4 Batch** — A quantity of up to 200 cylinders plus cylinders for destructive testing, of the same nominal diameter, thickness and design, made successively from the same heat number of steel and subjected to the same heat treatment for the same duration of time.'

(*Page* 2, *clause* **3.8**) — Substitute the following for the existing:

'3.8 Service Conditions for CNG or Bio CNG Storage Cylinders

3.8.1 *Gas Composition*

Cylinders for storage of compressed natural gas or Bio CNG used in cascade application shall be designed suitable for filling gases conforming to IS 15958 or IS 16087 respectively or any other specification as approved by the statutory authority.'

(*Page* 2, *clause* **4**, *symbol* R_g) — Substitute 'R_{mg}' *for* 'R_g' and wherever it appears in the standard.

(*Page* 2, *clause* **4**, *symbol* R_m) — Substitute 'R_{ma}' *for* 'R_m' and wherever it appears in the standard.

(*Page* 3, *clause* **5.1.1**, *Note* 2) — Substitute the following for the existing:

'**2** When steel is aluminium and silicon-killed, nitrogen content shall be limited to 0.01 percent.'

(*Page* 3, *clause* **5.1.3**) **—** Insert the following new clause:

'**5.1.4** Wherever continuously cast billet material is used for manufacture of cylinders, the manufacturer shall ensure that there are no deleterious imperfections

(porosity) in the material to be used for making cylinders. Test shall be carried out as per **9.2.4** for confirmation.'

(*Page* 3, *Table* 1) — Substitute the following for the existing:

Table 1 Chemical Composition Tolerances

(*Clauses* 5.2.1 *and* 5.2.3)

Sl No.	Element	Maximum Content (Mass Fraction)	Maximum Permissible Deviations (Mass Fraction)	Maximum Permissible Range (Mass Fraction)
		Percent	Percent	Percent
(1)	(2)	(3)	(4)	(5)
i)	Carbon	< 0.30 ≥ 0.30	0.06 0.07	0.06 0.07
ii)	Manganese	All values	0.30	0.30
iii)	Silicon	All values	0.30	0.30
iv)	Chromium	< 1.50 ≥ 1.50	0.30 0.50	0.30 0.50
v)	Nickel	All values	0.40	0.40
vi)	Molybdenum	All values	0.15	0.15

(*Page* 3, *Table* 2) — Substitute the following for the existing:

Table 2 Maximum Sulphur and Phosphorus Limits (Mass Fraction) in Percent

(*Clause* 5.2.2 **)**

Sl No.	Element	Maximum Content Limits (Mass Fraction)
		Percent
(1)	(2)	(3)
i)	Sulphur	0.010
ii)	Phosphorus	0.020
iii)	Sulphur + Phosphorus	0.025

(*Page* 4, *Table* 3) — Substitute the following for the existing:

Table 3 Internationally Recognized Steel Compositions (Cast Analyses)

(*Clause* 5.3)

Sl No.	Element	Steel Grade and Conditions (Mass Fraction)	
		Percent	
		for Cr Mo (Q and T)	for C Mn (Q and T)
(1)	(2)	(3)	(4)
i)	Carbon	0.250 - 0.380	0.380, *Max*
ii)	Silicon	0.100 - 0.400	0.100 - 0.350
iii)	Manganese	0.400 - 1.000	1.350 - 1.700
iv)	Phosphorus	0.020, *Max*	0.020, *Max*
v)	Sulphur	0.010, *Max*	0.010, *Max*
vi)	Chromium	0.800 - 1.200	—
vii)	Molybdenum	0.150 - 0.400	—

(*Page* 4, *clause* **5.4**) **—** Substitute the following for the existing:

'**5.4** Suitable steels other than above may be used with the prior permission of the statutory authority. In such a case, the yield strength and tensile strength of the steel taken for the purpose of calculating the wall thickness of the cylinder shall not be greater than the minimum values specified by the steel manufacturer.'

(*Page* 4, *clause* **6.1.1**) **—** Substitute the following for the existing:

'**6.1.1** The calculation of the wall thickness of the pressure containing parts shall be related to the guaranteed minimum yield strength (R_{eg}) of the material in the finished cylinder.'

(*Page* 4, *clause* **6.1.2**) — Substitute the following for the existing:

'**6.1.2** For calculation purposes, the value of R_{eg} shall not exceed 0.90 R_{mg}.'

(*Page* 4, *clause* **6.1.3**) — Insert the following sentence at the end:

'P_h is hydrostatic test pressure above atmospheric (1.5 times the working pressure).'

(*Page* 4, *clause* **6.1.3**) — Insert the following new clause:

'**6.1.4** Cylinders may be designed with one or two openings along the central cylinder axis only.'

(*Page* 4, *clause* **6.2.3**, *second sentence*) — Substitute 'The minimum guaranteed value of tensile strength in MPa (R_{mg}) shall be less than or equal to value $R_{m\ Max}$ minus 100 MPa.' *for* 'The minimum guaranteed value of tensile strength in MPa (R_g) shall be less than or equal to $R_{m\ Max}$ minus 120 MPa.'

(*Page* 4, *clause* **6.3.1**) — Substitute the following for the existing:

'**6.3.1** The guaranteed minimum wall thickness of the cylindrical shell of the cylinder to be calculated using Equations (1) and (2), and additionally condition (3) shall be satisfied.

$$a = \frac{D_o}{2} \times \left(1 - \sqrt{\frac{10F \times R_{eg} - \sqrt{3}P_h}{10F \times R_{eg}}} \right) \quad \ldots (1)$$

where the value of F is the lesser of 0.65 / (R_{eg}/R_{mg}) or 0.85 and F is design stress factor (variable)

R_{eg}/R_{mg} shall not exceed 0.90.

The wall thickness shall also satisfy equation (2)

$$a \geq D_o / 250 + 1 \quad \ldots (2)$$

with an absolute minimum of a = 1.5 mm

The burst ratio shall be satisfied by test as given in equation (3)

$$P_b / P_h \geq 1.6 \quad \ldots (3)$$

NOTES

1 It is generally assumed that P_h = 1.5 times working pressure for compressed gases for cylinders designed and manufactured to conform to this standard.

2 R_{eg} and R_{mg} shall be in MPa, Diameter, in mm and P_h, in bar.'

(*Page* 4, *clause* **6.3.2**) — Delete.

(*Page* 5, *clause* **6.4.1.2**) — Insert the following new clause:

'**6.4.1.3** The cylinder manufacturer shall in any case prove by pressure cycling test as given in **9.2.3** that the design is satisfactory.'

(*Page* 5*, clause* **6.4.2**) — Delete.

(*Page* 6*, Fig.* 2) — Delete.

(*Page* 6*, clause* **6.4.3**) — Delete.

(*Page* 6*, Fig.* 3) **—** Delete.

(*Page* 6*, clause* **6.5**, *equation* 3) — Substitute '$h \geq 0.12\ D_o$' *for* '$h \geq 0.10\ D_o$'

[*Page* 9*, clause* **9.1** k)] — Substitute the following for the existing:

'k) guaranteed minimum yield strength (R_{eg}) and/or the guaranteed minimum tensile strength (R_{mg}) for the finished cylinder have changed.'

(*Page* 10*, clause* **9.2.3**, *para* 2 and *Note*) — Substitute the following for the existing:

'For cylinders with hydraulic test pressure (P_h) > 450 bar, the upper cyclic pressure to be reduced to two third of this test pressure as below. In this case, the cylinders shall withstand 80 000 cycles without failure.

NOTE — UCP = $2/3 \times P_h$'

(*Page* 11*, clause* **9.2.4**, *title*) — Substitute following for the existing:

'*Base Check* (*for Cylinder Made from Tube or Made from Continuously Cast Billets*)'

(*Page* 12*, clause* **10.1.3**) — Insert the following new clause:

'**10.1.4** For cylinders made from continuously cast billet material, base check shall be in accordance with **9.2.4**.'

(*Page* 13, *Table* 4) — Substitute the following for the existing:

Table 4 Impact Test Acceptance Values

(*Clauses* 10.3.1 *and* 10.3.2)

Sl No.	Cylinder Diameter D_o mm		> 140			≤ 140
(1)	(2)		(3)			(4)
i)	Direction of testing		Transverse			Longitudinal
ii)	Width of the test piece in mm		3 to 5	> 5 to 7.5	> 7.5 to 10	3 to 10
iii)	Test temperature, in °C[1)]		-20			-20
iv)	Impact strength in J/cm^2, *Min*[2)]	Mean of 3 specimens	30	35	40	60
		Individual specimen	24	28	32	48

NOTES

[1)] For applications at lower temperatures the test shall be carried out at the lowest temperature specified.

[2)] The impact value J/cm^2 is calculated by dividing the impact energy (J) by the actual cross-sectional area below the notch (cm^2) of the Charpy test specimen.

(*Page* 14, *Table* 5) — Substitute the following for the existing:

Table 5 Bend Test Requirements

(*Clause* 10.4.3)

Sl No.	Actual Tensile Strength, R_{ma} MPa	Value of *n*
(1)	(2)	(3)
i)	Upto and including 800	4
ii)	Above 800 upto and including 880	5
iii)	Above 880 upto and including 950	6
iv)	Above 950 upto and less than 1 100	7

[*Page* 15*, clause* **10.5.3** a), *para* 2] — Substitute the following for the existing:

'For the result of a bursting test to be considered satisfactory, the following requirements shall be met:

1) Observed yield pressure (P_y) shall be greater than or equal to $1/F$ times the test pressure (P_h);
   That is $P_y \geq 1/F \times P_h$ and
2) Actual burst pressure (P_b) shall be greater than or equal to 1.6 times the test pressure (P_h).'

(*Page* 16*, clause* **10.6**, *Title*) — Substitute the following for the existing:

'**Pressure Cycling Test for CNG/Bio-CNG Cylinders**'

(*Page* 17*, clause* **11.4**, *last sentence*) — Substitute the following for the existing:

'This test shall be conducted at a pressure not lower than $2/3 \times P_h$ (*see* **6.3**).'

(*Page* 17*, clause* **12**) — Substitute the following for the existing:

'12 COLOUR IDENTIFICATION

12.1 The cylinder shall be painted/powder coated externally in accordance with the colour scheme specified in IS 3933 or IS 4379. For cylinders in CNG/ Bio-CNG Cascade Service, the external surface of cylinder shall be painted/ powder coated with following paint system and total dry film thickness of minimum 70 microns shall be maintained:

a) Epoxy primer (two component system) 1 coat – Zinc Phosphate / Zinc Chromate / Zinc Rich, and
b) Epoxy / Polyurethane (two component system) 1 coat.

12.2 The cylinders used for fire extinguisher or used in fire-fighting service, in accordance to IS 15683 or IS 2878 shall be painted/powder coated externally to the requirements of respective standard.'

(*Page* 18*, clause* **14.1**) — Substitute 'Each cylinder shall be permanently stamped with the following before final painting:' *for* 'Each cylinder shall be permanently stamped with the following:'

[*Page* 18*, clause* **14** n)] — Substitute the following for the existing:

'n) If the cylinder (shell) is manufactured for dissolved acetylene cylinder according to IS 7312, each cylinder shall be permanently stamped with the following:

1) Serial number, identification of porous mass filler;
2) IS Number of this standard;
3) Inspector's official mark;
4) Maximum gas capacity;
5) Gas identification 'ACETYLENE' and the chemical symbol 'C_2H_2'; and
6) Additional marking as per IS 7312.'

(MED 16)

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