BUREAU OF INDIAN STANDARDS

DRAFT FOR COMMENTS ONLY

भारतीय मानक **मसौदा**

अधिकतम 5 लीटर पानी की क्षमता वाले अल्प दाब वाले द्रवित होने योग्य गैसों के लिए वेल्डिड निम्न कार्बन इस्पात सिलेंडर – विशिष्टि

(आई एस 7142 का *दूसरा पुनरीक्षण)*

Draft *Indian Standard*

WELDED LOW CARBON STEEL CYLINDERS FOR LOW PRESSURE LIQUEFIABLE GASES NOT EXCEEDING 5 LITRE WATER CAPACITY — SPECIFICATION

(Second Revision of IS 7142 *)*

ICS 23.020.35

Gas Cylinders Sectional Committee, MED 16	Last date for receipt of comments is **07 March 2024**

FOREWORD
(*Formal clause would be added later on*)

This standard was first published in 1974 and subsequently revised in 1975. This standard is being revised again to keep pace with the latest technological developments and international practices. Also, in this revision, the standard has been brought into the latest style and format of Indian Standards, and references of Indian Standards, wherever applicable have been updated. BIS certification marking clause has been modified to align with the revised *Bureau of Indian Standards Act,* 2016. In this revision all the amendments have been incorporated. This revision was considered on the basis of present manufacturing process in the country and the following major modifications have been incorporated in this revision of the standard:

a) Being a small capacity cylinder, only two piece cylinders are included in this revision and references made for longitudinal seam have been removed.
b) Based on the scope of the cylinders, the radiographic tests have not been specified.
c) Test methods are cross referred to IS 3196 (Part 3) : 2012 'Welded low carbon steel cylinders exceeding 5 litre water capacity for low pressure liquefiable gases: Part 3 Methods of test (*fifth revision*)
d) The definition of test pressure is redefined to accommodate the future developments in the gas industry.

e) Due to difficulties faced in conducting hydrostatic test, proof test has been introduced as an alternate test.

Manufacture, possession and use of any gas, when contained in cylinders of more than 500 ml water capacity in a compressed or liquefied state, are regulated under the *Gas Cylinder Rules*, 1981, of the Government of India. This standard has been prepared in consultation and agreement with the statutory authorities under those rules.

The composition of the Committee, responsible for the formulation of this standard is given at (*to be added later*).

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

The relevant SI units and the corresponding conversion factors are given below for guidance:

Pressure : 1 Pa (Pascal) = 1 N/m^2
1 kgf/cm^2 = 98.066 5 kPa (kilopascal) = 0.980 665 bar
Stress : 1 kgf/mm^2 = 9.806 65 N/mm^2 (newton per square millimetre)

Draft *Indian Standard*

WELDED LOW CARBON STEEL CYLINDERS FOR LOW PRESSURE LIQUEFIABLE GASES NOT EXCEEDING 5 LITRE WATER CAPACITY — SPECIFICATION

(Second Revision)

1 SCOPE

1.1 This standard deals with welded low carbon steel two piece cylinders intended for storage and transportation of low pressure liquefiable gases, other than toxic gases, of nominal capacity exceeding 500 ml, but not exceeding 5 litres water capacity. This standard lays down the requirements for the materials, design, manufacture, construction, tests and marking of these cylinders.

1.2 Cylinders with water capacity more than 5 litres are covered in IS 3196 (Part 1 and Part 2).

2 REFERENCE

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 7241 shall apply.

4 MATERIAL

4.1 The steel used in the manufacture of cylinders shall conform to any one of the following specifications:

a) IS 6240;

b) IS 513 (Part 1 and Part 2);

c) IS 15914; and

d) IS 1079.

The minimum yield strength (R_e) to be guaranteed after heat treatment of the finished cylinder by the cylinder manufacturer shall not be more than the yield strength guaranteed by the steel manufacturer and shall not be less than 186.32 MPa (186.32 N/mm^2). The yield strength (R_e) guaranteed by the cylinder manufacturer shall be used for the purpose of calculation of minimum wall thickness.

4.1.1 Suitable low carbon steels other than those given in **4.1** may be used with the prior permission of the statutory authority. In such a case, the minimum specified value of yield strength guaranteed by the cylinder manufacturer for the finished cylinder shall be used for the purpose of calculating the wall thickness of the cylinder. However, minimum percentage elongation value shall not be less than 25. Such a steel should be certified by the steel maker to be other than of rimming quality, suitable for pressing or drawing with acceptable non-ageing properties and shall be fully killed.

4.1.2 The cylinder manufacturer shall obtain and provide certificate of cast (heat) analysis of the steels supplied for the construction of gas cylinders and establish means to identify the cylinders with the casts of steel from which they are made.

4.2 The bung/valve pad shall be made from drawn bars or hot forged from drawn steel bars conforming to any one of IS 2062, IS 4431, IS 7283, and Class 1 A or Class 2 of IS 1875. The machined bung shall be free from surface defects such as fissures, surface cracks, porosity, laminations, pinholes, etc. Suitable steels other than those given above may be used with the prior permission of the statutory authority.

4.3 The material used for backing strip shall conform to IS 2062 or steel of equivalent or superior qualities with compatible chemical composition to the body material.

4.4 The material used for footring shall conform to IS 1079 or IS 513 (Part 1 and Part 2) or any other steel equivalent or superior qualities with compatible chemical composition to the body material.

5 GENERAL

A fully dimensioned sectional drawing of the cylinder, together with design calculations and scheme of manufacture, shall be submitted by the manufacturer to the inspecting authority for final approval by statutory authority.

6 DESIGN

6.1 The cylinder shall be of welded construction having a cold or hot drawn cylindrical portion with hemispherical, ellipsoidal or torispherical ends, or two halves of cold or hot drawn and circumferentially welded together, or any other construction approved by the statutory authority.

6.2 The calculation of the thickness of pressure parts of the gas cylinder is related to the minimum value of yield strength guaranteed by the cylinder manufacturer for the material of finished cylinder and the test pressure.

6.2.1 The agreed finished thickness shall not be lower than that calculated from the following formulae.

a) For cylindrical portion, greater of the following two:

$$t = \frac{P_h D_0}{200 \times 0.8 J\, R_e + P_h} = \frac{P_h D_1}{200 \times 0.8 J\, R_e - P_h}$$

b) For semi-ellipsoidal part or end (*see* Fig. 1A):

$$t_e = \frac{P_h D_0}{200 \times 0.8\, J\, R_e + P_h} \times \frac{K\,(0.65 + 0.1K)}{4}$$

c) For torispherical part or end (*see* Fig. 1 B):

$$t_e = \frac{P_h D_0}{200 \times 0.8\, J\, R_e + P_h} \times \frac{K\, Z}{5}$$

where

t = Calculated minimum wall thickness of cylindrical shell in mm excluding any additional thickness to resist influences other than those of internal pressure and of external forces due to normal handling (*see* **8.1**);

t_e = Calculated minimum wall thickness of torispherical or semi-ellipsoidal ends in mm;

P_h = Test pressure in kgf/cm^2 as specified in IS 15975. For the gases not covered in the above standard, one and a half times the gas manufacturer's declaration of vapour pressure at 65 °C and approval from statutory authority shall be taken. The minimum test pressure shall not be less than 18 kgf/cm^2;

D_1 = Inner diameter in mm;

D_0 = Outer diameter in mm;

J = Weld joint factor;

= 0.9 for cylinders with circumferential seam only (not radiographed);

R_e = Yield strength (minimum value specified in **4.1** and **4.1.1** in kgf/mm^2); however, the value of 'R_e' shall not be more than the minimum value specified in the material specification;

H = External height of domed ends in mm;

K = The ratio D_0/H

R = Dishing radius in mm ($R \leq D_0$)

r = Knuckle radius in mm ($r \geq 0.1$); and

Z = $$\frac{\frac{20\,r}{R} + 3}{\frac{20\,r}{R} + 1}$$

6.2.1.1 For hemispherical ends or parts, the minimum finished thickness need not exceed that of the cylindrical portion of the cylinder.

6.2.2 For the cylinders made out of steel conforming to IS 15914 the minimum wall thickness of the cylindrical shell, t , shall be not less than the value derived from the following formulae:

For D < 100 mm

$t_{Min} = t_{eMin} = 1.1$ mm

For 100 mm < D_0 < 150 mm

$t_{Min} = t_{eMin} = 1.1$ mm + 0.008 (D – 100) mm

For D > 150 mm

$t_{Min} = t_{eMin} = (D/250) + 0.7$ mm

6.2.3 The minimum thickness of the shell shall not be less than 1.4 mm for steel with yield strength less than 240 MPa.

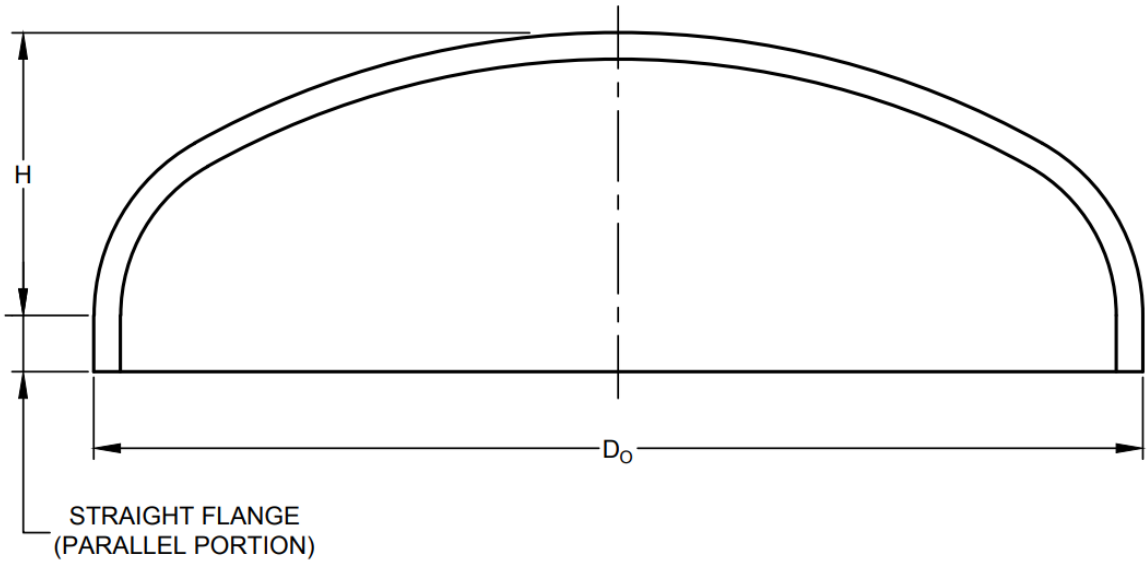
6.3 Before the design is finally approved, the statutory authority may require one or more prototype cylinders to be subjected to various tests as specified in this standard or such other tests, as authority deems fit.

7 WELDING

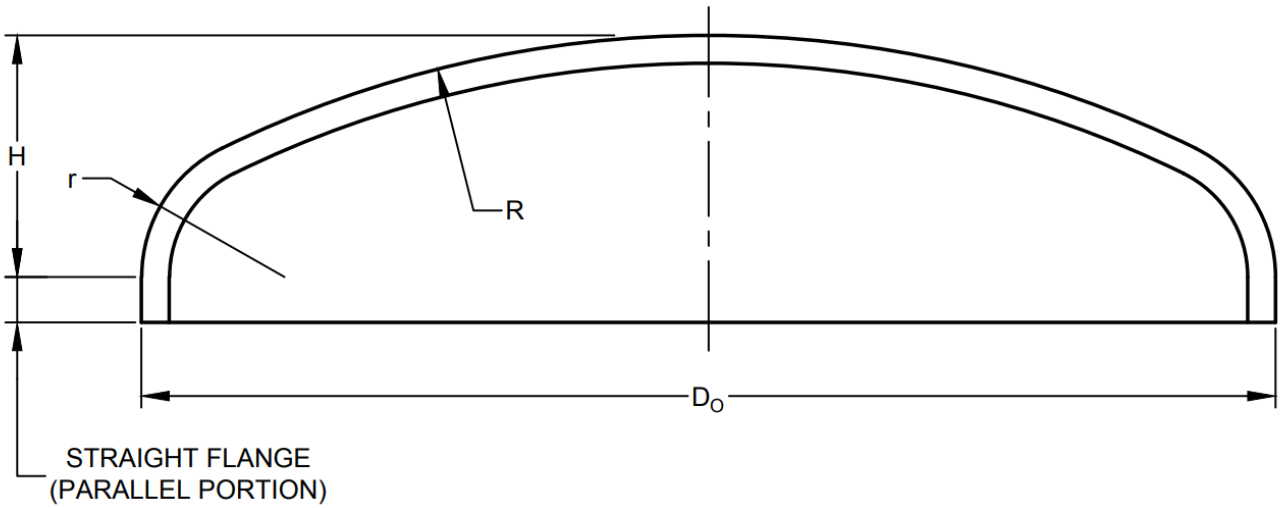
7.1 The cylinder shall be welded by any suitable fusion welding method and shall conform, as for welding procedure and welder's performance qualifications, to the requirements of IS 817 (Part 1 and Part 2) when the cylinder welding is not be fully radiographed.

7.2 Prior to welding, components shall be examined in accordance with the requirements of **12.2**.

7.3 Manual arc welding shall not be employed for circumferential seam which shall consist of a butt joint in conjunction with permanent or temporary backing material, or alternatively, a joggle joint may be used so that the external surface of the container is smooth.



1A SEMI-ELLIPSOIDAL END



1B TORISPHERICAL END

FIG. 1 SEMI-ELLIPSOIDAL AND TORISPHERICAL ENDS

7.4 Surfaces of the plates at the seams shall not be out of alignment with each other at any point by more than 10 percent of the plate thickness.

7.5 Welds shall not be dressed without the approval of the inspecting authority. The weld surface shall have a smooth contour. The weld joint shall be free from undercuts but slight intermittent occurrences may be disregarded provided that such undercut is not in the form of a sharp notch [*see* IS 817 (Part 1) and (Part 2)].

7.6 All welding of the shell and attachments shall be completed before the final heat treatment.

7.7 Before welding, the plates to be joined shall be free from scale, grease, oil and dirt.

7.8 Welding consumables used shall be such that the desired properties of the weld are obtained and the physical values of the welded metal are not lower than the specified values of the parent metal.

7.8.1 The chemical composition of the weld metal shall be compatible with that of the parent metal.

7.8.2 As far as possible, all welded joints shall be either single welded or double welded butt joints. In case where second side welding is not possible, single welded butt joints (with or without backing strip) may be used, provided sufficient care is taken to ensure complete fusion and penetration.

8 MANUFACTURE

8.1 Agreed Finished Thickness

The agreed finished thickness shall not be less than the minimum calculated wall thickness obtained by the application of formulae given in **6.2.1** at any point and at any transverse section of the cylindrical portion. Additional thickness may also be provided to cover stresses due to horizontal acceleration and retardation during transportation. The amount of this allowance shall be as agreed to between the manufacturer and the purchaser.

8.2 Examination of Cylinders before Closing in Operation

Cylinders shall be examined before the closing in operation for wall thickness, circularity of the cylindrical shell and the skirt portion of ends, external and internal surface defects, the profile regularity of the ends, offset at the joints, and straightness. The manufacturer shall assure himself that the wall thickness is not less than the agreed finished thickness at any point. The eccentricity of the bung hole centre line with respect to centre line of half/body of cylinder shall not be more than one percent the nominal diameter of cylinder subject to a maximum of 2 mm.

8.2.1 *Circularity*

The out of roundness of the cylindrical shell shall be limited to such a value that the difference between the maximum and the minimum outside diameter in the same cross section is not more than one percent of the mean of these diameters.

8.2.2 *Surface Defects*

The internal and external surfaces of the cylinder shall be free from defects which will adversely affect the safe working of the cylinder.

8.2.3 *Profile Regularity*

The contour of the dished end shall not deviate from the approved dimensions by more than 1.25 percent of the nominal diameter in respect of radial dimensions and by more than one percent in respect of axial dimensions. Such deviations shall not be abrupt changes and shall be outside the specified shape.

8.2.4 *Offset at the Joint*

The misalignment measure at the surface of the plates shall not exceed 10 percent of the nominal plate thickness. Where the thickness of the ends exceeds the shell thickness by more than 25 percent, the abutting edges shall be reduced by a smooth taper extending for a distance of four times the offset between the abutting edges.

8.2.5 *Straightness*

Unless otherwise shown on the drawing, the maximum deviation of the shell from a straight line shall not exceed 0.3 percent of the cylindrical length.

9 VALVES AND VALVES PAD

9.1 The valve connection for cylinders may be forged integral with the end or in the case of a valve connection not forged integral with the end, it shall consist of a welded pad/bung or nipple, and shall be threaded to suit the type of valve specified in IS 8776 or IS 12300 or IS 3224 or IS 8737.

9.2 Any other valve connection may be provided as agreed to between the manufacturer and the purchaser and approved by the statutory authority.

10 FITTINGS OTHER THAN VALVES

10.1 Handle or other suitable arrangement for lifting the cylinder may be provided. If provided, it shall be capable of withstanding static loading in any direction equal to twice the weight of the cylinder when filled with water.

10.2 Footring

The footring, where fitted as a separate fixture to the bottom end of the cylinder, shall be at least 20 mm away from the circumferential weld. The thickness of the sheet from which the footring is made shall not be less than the calculated wall thickness of the cylinder body. The footring may be intermittently welded. In case, the bottom edge is curled, the curling shall be inwards to facilitate safe handling. It shall be provided with holes for ventilation, and if curled, drainage holes to be provided to avoid corrosion. The maximum permissible deviation from the vertical shall not exceed 1°. Footrings shall be sufficiently strong and made of steel compatible with that of the cylinder, such as IS 1079, or of other steel having equivalent properties. The bottom of the footring shall not be less than 5 mm below the outside bottom of the cylinder shell.

For non-LPG Cylinders, polymer foot ring may be used, which shall be tightly fitted.

10.3 Bung

Wherever applicable, the requirements of bungs shall be in accordance with Annex B.

11 HEAT TREATMENT

All cylinders shall be efficiently normalized, or stress relieved in accordance with the steel maker's recommendation, after manufacture and completion of all welding (including that of attachments) and before pneumatic or proof testis carried out. A complete record of the heat treatment cycle shall be maintained.

12 INSPECTION

12.1 General

12.1.1 The inspecting authority shall have free access, at all reasonable times to that part of the manufacturer's works engaged in the order. They shall also be at liberty to inspect the fabrication at any stage and to reject any cylinder, or part of a cylinder, that does not comply with the requirements of this standard.

12.1.2 The manufacturer shall supply the manpower and equipment for such inspection and tests as are required and for any additional checks which may be agreed between the inspecting authority and the manufacturer.

12.1.3 The visual inspection of low pressure liquefiable gas cylinders shall be carried out and the limits of defects shall be as given in IS 9639.

12.2 Inspection of Components

12.2.1 All pressings, halves and cylindrical shells shall be examined for surface defects before any seam is welded. If there are defects which, in the opinion of the inspecting authority, would be deterimental to the sound construction of the cylinder, the pressing or shell shall be rejected.

12.2.2 At the discretion of the inspecting authority, 2 percent or more of the pressings, halves and the cylindrical shells shall be selected at random to represent all batches of material used for the manufacture of the cylinders, and these batches shall be examined for minimum thickness before any seam is welded.

12.2.3 Should any pressing, half or shell be less than the minimum specified thickness, the whole output from the relevant batch of material snail be examined for minimum thickness, and any pressing or shell which is less than the specified minimum thickness shall be rejected. For the purpose of this clause ‘batch of material’ is defined to mean pressings or cylindrical shells manufactured in a continuous production run.

13 CHECKING OF WATER CAPACITY

The water capacity of the cylinders shall be checked. This shall be done by weighing or by volumetric method. The tolerance for water capacity shall be +5/0 percent on calculated or declared capacity.

14 PROOF TEST

14.1 Proof test shall be carried out hydrostatically at the maximum testing pressure which shall be one and a half times of the design pressure.

14.1.1 Each heat-treated cylinder shall be subjected to hydrostatic test. During the hydrostatic test, the pressure shall be increased gradually till the required test pressure is reached. After the test pressure is reached, the external surfaces of the cylinder are dried, and the pressure shall be retained for a period of not less than 30 second. Any reduction in pressure noticed during this retention period or any leakage or visible bulge or deformation shall be treated as a case of failure in the test.

14.1.2 The values of hydrostatic test pressure shall be in accordance with IS 15975. For the gases not covered in the above standard, one and a half times the gas manufacturer's declaration of vapour pressure at 65 °C and approval from statutory authority shall be taken. The minimum test pressure shall not be less than 1 764 kPa (18 kgf/cm^2).

14.1.3 Hydrostatic test shall be carried out according to clause **7** of IS 3196 (Part 3).

14.2 The proof test may be carried out on each cylinder pneumatically as an alternate to hydrostatic test as given in **14.1** at the maximum testing pressure which shall be one and a half times of the design pressure. Such a test shall be carried out by providing a protective jacket, which shall withstand the rupture of cylinder during testing.

14.2.1 The pressure shall be increased gradually to the required test pressure under proper control and shall be maintained at the test pressure for a period of not less than 30 second. Special precautions shall be taken to protect personnel against consequences of cylinder rupture. The cylinder shall not be struck during testing. Any cylinder which leaks or develops a visibly bulge shall be rejected and destroyed.

15 PNEUMATIC LEAKAGE TEST

15.1 Subsequent to the hydrostatic test, each cylinder after it has been dried and fitted with valve, shall be tested . for leakage by subjecting to air pressure of not less than 686 kPa (7 kgf/cm^2) for a period of one minute while immersed in water and shall show no leakage from the body of the cylinder. Proper adopter/ filling gun shall be used for air filling to avoid damage to the valve.

NOTE — This test may be carried, out without valve fitted to the cylinder.

15.1.1 Pneumatic leakage test shall be carried out according to clause **8** of IS 3196 (Part 3).

15.1.2 Alternatively any other method approved by the statutory authority may be used.

16 HYDROSTATIC STRETCH TEST AND BURSTING TEST

16.1 Hydrostatic Stretch Test

One cylinder taken at random from each lot of 403 or less shall be subjected to hydrostatic stretch test. No pressure greater than 80 percent of the test pressure shall have been applied to the cylinder before the test.

16.1.1 Hydrostatic stretch test shall be carried out according to clause **6** of IS 3196 (Part 3).

16.1.2 Permanent stretch suffered by the cylinder due to application of the pressure shall not exceed 10 percent of the total stretch suffered during test.

16.2 Bursting Test

The cylinder which has passed the hydrostatic stretch test under **16.1** shall then be subjected to a hydrostatic pressure till it bursts.

16.2.1 Bursting test shall be carried out according to clause **9** of IS 3196 (Part 3). The nominal hoop stress value of (f_b) shall be not less than 0.95 of the minimum specified tensile strength of the material of the cylinder. The cylinder shall burst without fragmentation. During burst test in case leakage starts from any welding before fracture before achieving required hoop stress, the specimen shall be discarded and fresh test specimen shall be taken. Fracture shall not occur in the weld in the direction of the circumferential seam. The fracture shall not occur in the direction parallel to circumferential weld within 10 mm from its edge.

17 ACCEPTANCE TESTS

17.1 For every batch of 202 or less heat-treated and finished cylinders, one test cylinder shall be selected at random, and the following acceptance tests shall be carried out on test specimens taken from this cylinder.

17.1.1 *Tensile Test*

One in a longitudinal direction and one in transverse direction of the cylinder for the plate material.

17.1.2 *Weld Tests*

Including one reduced section tensile test [as shown in Fig. 4 of IS 3196 (Part 3)], one face and root bend test all in a direction transverse to the weld, macro examination. Test specimens that are not sufficiently flat shall be stretched by cold pressing. The face and root of the weld in the test specimens shall be machined according to clause **5.4.1** of IS 3196 (Part 3).

17.1.3 *Minimum Thickness Test*

One ring shall be cut from knuckle portion of the cylinder.

17.2 Acceptance tests shall be carried out according to clause **5** of IS 3196 (Part 3).

17.3 The percentage elongation and yield strength, wherever applicable, and tensile strength thus determined shall not be less than the respective requirements for the material specified in **4**.

17.4 The bend test specimen having cracks or any other open defects, which exceed 3 mm, measured in any direction on the convex surface of the specimen, shall be treated as a failure.

17.5 The weld shall show a good penetration and absence of lack of fusion.

17.6 The thickness shall not be less than the calculated thickness.

18 MARKING

18.1 General Instructions

a) Each cylinder shall be clearly and permanently marked in accordance with the following conditions by stamping or similar processes on such a part which is inseparately bound with the cylinder which is not or only negligibly affected by stresses due to the gas pressure within it;

b) The name plate shall not be affixed to the cylinder's shoulder if there is a risk of corrosion or embrittlement;

c) In conjunction with the original markings, space shall be provided for stamping the date of the test;

d) Marking shall be so carried out and the letters and numerals used shall be of such shape and size that the marking is legible; and

e) The stamps used for marking shall have small radii at changes of section to avoid formation of sharp edges in the stamped marking.

18.2 Each cylinder shall be permanently stamped with the following:

a) Serial number, identification of the manufacturer and owner;

b) The number of this Indian Standard;

c) Maximum working pressure in MPa;

d) Test pressure in MPa and date of hydrostatic test or proof test as the case may be (such as 2/95 for February 1995);

e) Tare weight in kg, gross weight in kg and water capacity in litres;

f) Inspecting agency's official mark; and

g) Letter 'N' next to IS number, if the cylinder is normalized or' 'SR' next to IS number, if the cylinder is stress relieved.

18.2.1 The markings may be made at any of the following places:

a) Footring;

b) Any non-pressure part; and

c) A plate of material compatible to the body of the cylinder may be welded at an appropriate place on the cylinder.

18.3 BIS Certification Marking

18.3.1 The cylinders may also be marked with Standard Mark.

18.3.2 The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

19 COLOUR IDENTIFICATION

The cylinders shall be painted externally in accordance with the colour scheme specified in IS 4379.

20 PREPARATION FOR DESPATCH

Before being fitted with valves, all cylinders shall be thoroughly cleaned and dried internally. The outside shall be given a suitable protective painting (*see* **19**).

21 RECORD

A record shall be kept of all tests made at the cylinder manufacturer's works and copies shall be made available to the inspecting authority and purchaser of the cylinder (if desired). A test certificate duly approved and signed by the inspecting authority shall be forwarded to the statutory authority and the purchaser.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 513	Cold reduced carbon steel sheet and strip
(Part 1) : 2016	Cold forming and drawing purpose (*sixth revision*)
(Part 2) : 2016	High tensile and multi-phase steel (*sixth revision*)
IS 817	Training of welders — Code of practice
(Part 1) : 1992	Manual metal arc welding (*second revision*)
(Part 2) : 1996	Oxyfuel welding (*second revision*)
IS 1079 : 2017	Hot rolled carbon steel sheet, plate and strip — Specification (*seventh revision*)
IS 1875 : 1992	Carbon steel billets, blooms, slabs and bars for forgings — Specification (*fifth revision*)
IS 2062 : 2011	Hot rolled medium and high tensile structural steel — Specification (*seventh revision*)
IS 3196	Welded low carbon steel cylinder exceeding 5 litre water capacity for low pressure liquefiable gases
(Part 1) : 2013	Cylinders for liquefied petroleum gas (LPG) — Specification (*sixth revision*)
(Part 2) : 2012	Cylinders for liquefiable non-toxic gases other than LPG — Specification (*fifth revision*)
(Part 3) : 2012	Methods of test (*first revision*)
IS 3224 : 2021	Valve for compressed gas cylinders excluding liquefied petroleum gas (LPG) cylinders — Specification (*fourth revision*)
IS 4379 : 2021	Identification of the contents of industrial gas cylinders (*second revision*)
IS 4431 : 1978	Specification for carbon and carbon-manganese free-cutting steels (*first revision*)
IS 6240: 2008	Hot rolled steel plate (up to 6 mm) sheet and strip for the manufacture of low pressure liquefiable gas cylinders (*fourth revision*)
IS 7202 : 2017	Inspection gauges for checking type iv (size 1, 2, 3) taper threads of gas cylinder valves and cylinder necks — Specification (*first revision*)
IS 7241 : 1981	Glossary of terms used in gas cylinder technology (*first revision*)
IS 7283 : 1992	Hot-rolled bars for the production of bright bars and machined parts for engineering applications specification (*first revision*)
IS 8737 : 2017	Valve fittings for use with liquefied petroleum gas (LPG) cylinders for more than 5 litre water capacity — Specification (*second revision*)
IS 8776: 1988	Specification for valve fittings for use with liquefied petroleum gas (LPG) cylinders up to and including 5 litre water capacity (*first revision*)
IS 9122 : 2008	Inspection gauges for checking type 2 taper thread of gas cylinder valves, taper 3 in 25 — Specification (*first revision*)
IS 9639 : 2017	Visual inspection of low pressure welded steel gas cylinders during manufacture — Code of practice (*first revision*)
IS 12300 : 1988	Valve fittings for refrigerant cylinders — Specification

IS 15894 : 2018	Inspection gauges for checking taper threads of gas cylinder valves and cylinder necks — Taper 1 in 16 on diameter — Specification (*first revision*)
IS 15914 : 2011	High tensile strength flat rolled steel plate (up to 6 mm), sheet and strip for the manufacture of welded gas cylinder — Specification
IS 15975 : 2020	Gas cylinders — Conditions for filling gas cylinders (*first revision*)

ANNEX B
(*Clause* 10.3)

REQUIREMENTS OF BUNGS

B-1 FINISH — The bung shall be free from any visual defects and shall have the required machining finish. The threads shall be of smooth finish and shall not be broken at any point.

B-2 The cylinder manufacturer shall check on each finished machined bung the dimensions that match with the corresponding dimensions on the cylinder, such as neck diameter that fits into the bung hole, chamfer angle at the skirt, etc. Bung threads shall be inspected for conformity with the required sizes using all the gauges as laid down in any one of the following standards depending upon the nominal size and specification of the thread:

a) IS 7202;

b) IS 9122; and

c) IS 15894;

B-3 After welding and before fitting the valve, the bung thread shall be cleaned with appropriate tap and checked for conformity to threads using only taper thread plug gauges as laid down in any one of the following standards depending upon the nominal size and specification of the thread:

a) IS 7202;

b) IS 9122; and

c) IS 15894;

B-4 However, the inspecting authority for the purpose of carrying out the inspection shall test 3 percent of the lot of machined bungs. In the event of any failure a second sample size of double the above shall be drawn and inspected. In case of failure of any one out of the second draw, the whole lot shall be rejected.

B-5 One bung out of the sample size shall be sectioned and checked for conformity to thread form and finish.