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उत्पाद मैनुअल

मध्यम और अल्प ताप के दाब पात्रों के लिए

इस्पात प्लेटें एवं पतियां -विशिष्ट

IS 2041: 2024 के अनुसार

PRODUCT MANUAL FOR
Steel Plates and Strips for Pressure Vessels Used at Moderate and Lower Temperature —
Specification according to IS 2041: 2024

विभिन्न उत्पादों के लिए भारतीय मानक ब्यूरो) अनुरूपता मूल्यांकन (विनियम, 2018 की योजना -I के तहत प्रमाणन के संचालन में एकरूपता और पारदर्शिता के लिए इस उत्पाद मैनुअल का उपयोग सभी क्षेत्रीय / शाखा कार्यालयों और लाइसेंसधारियों द्वारा संदर्भ सामग्री के रूप में किया जाएगा। दस्तावेज़ का उपयोग बीआईएस प्रमाणन प्राप्त करने के इच्छुक संभावित आवेदकों द्वारा भी किया जा सकता है।

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure uniformity of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification.

1.	मानक संख्या IS No.	:	IS 2041: 2024
	शीर्षक Title	:	Steel Plates and Strips for Pressure Vessels Used at Moderate and Lower Temperature — Specification
	संशोधनों की संख्या No. of amendments	:	0
2.	नमूना दिशानिर्देश Sampling Guidelines		
a)	कच्चा माल Raw material	:	Steels (semi-finished products such as Slabs/Ingots) (excluding Strips) used for manufacturing the product covered in the standard shall conform to the requirements of IS 14650 Note: This section indicates the requirements for raw material (if specified in the IS) for which compliance is to be established during Grant of Licence/Change in Scope of Licence/Factory Surveillance
b)	समूहीकरण दिशानिर्देश Grouping Guidelines	:	Please refer Annex – A

c)	नमूने का परिमाण Sample Quantity	:	For physical tests: Prepared pieces for Grain Size, Tensile Test, Bend Test, Low Temperature Impact Test For chemical tests : 5 pcs of 5 cm x 5 cm The requirements of Freedom from Defects (cl.9.), Dimensions and Tolerances (cl.10.) shall be carried out in the factory during FT on plates/strips of full width/ length from which samples are drawn for IT. If agreed between the manufacturer and purchaser, for plates of thickness (25 mm and above), the requirements of Ultrasonic Test as per cl.13. shall be carried out in the factory during FT only. Note: This section indicates the quantity of the sample of the product and/or the raw material (if applicable), required to be sent to the laboratory for testing, for the purpose of Grant of Licence/Change in Scope of Licence/ Factory Surveillance (in case of market surveillance, effort may be made to procure the required quantity of product sample, as far as possible since raw material sample may not be available in market)
3.	परीक्षण उपकरणों की सूची List of Test Equipment	:	Please refer to Annex-B
4.	निरीक्षण और परीक्षण की स्कीम Scheme of Inspection and Testing	:	Please refer to Annex-C
5.	एक दिन में संभावित परीक्षण Possible tests in a day		
	All tests Note: This section is for the guidance of BIS Certification Officers/Technical Auditors of BIS Authorized Outside Surveillance Agencies (OSAs) during factory inspection to provide readyreference regarding the tests which can be witnessed during the inspection in the factory by the officer/auditor.		
6.	लाइसेंस का दायरा /Scope of the Licence:		
	2041:2009 के अनुसार मानक मुहर का उपयोग करने के लिए लाइसेंस निम्नलिखित कार्यक्षेत्र के लिए प्रदान किया जाता है “ Licence is granted to use Standard Mark as per IS 2041:2009 with the followingscope:		
7.	Name of the product		Steel Plates and Strips for Pressure Vessels Used at Moderate and Lower Temperature — Specification
8.	Dimensions/Sizes		Thickness from ...mm up to and including ...mm,Width from ...mm up to and including ...mm ,Length from ...mm up to and including ...mm
9.	Grade		R205, R220,.....
10.	Optional Requirements		Excluding Impact Test Temperature (-20 deg, -40 deg) Including/Excluding Ultrasonic Test Requirements

ANEXURE A

GROUPING GUIDELINES

1. The steel grades covered by this standard are given in following two qualities:
 - a) The room temperature quality in Grades R205, R220, R240, R260, R275, R355; and
 - b) The elevated temperature quality in Grades H235, H265, H295, H355.
2. The following grouping based on quality of Grades, shall be followed for considering grant of licence/inclusion as per IS 2041:2024:-

2.1 Manufacturer shall declare the Grades intended to be covered in the scope of the licence.

Group	Grades	Remarks
1	R205, R220, R240, R260 R275, R355	One sample of any size (thickness/width/length) of steel plate/strip of each Grade shall be drawn and tested for covering all Grades in the scope of the licence.
2	H235, H265 H295, H355	One sample of any size (thickness/width/length) of steel plate/strip of each Grade shall be drawn and tested for covering all other Grades in the scope of the licence.

2.2 For the sample(s) drawn, impact test is to be carried out any one temperature. While considering licence scope, appropriate exclusion with respect to impact test (temperature) may be ensured.

2.3 Wherever the applicant/licensee has declared/guaranteed the required yield stress at elevated temperature (other than 300 degrees) for grades in Group-2, appropriate undertaking may be obtained from manufacturer.

2.4 Applicant/licensee to submit appropriate undertaking regarding the addition of alloying elements.

3. It shall however be ensured that firm has necessary manufacturing capabilities and testing facilities for the entire grades/conditions proposed to be covered under scope of BIS Certification.
4. During the operation of license, BO shall ensure that all sizes / grades covered in the license are drawn for independent testing on rotation over a period of time.

ANNEX – B**LIST OF TEST EQUIPMENTS****(INDICATIVE LIST, FOR GUIDANCE ONLY)**

Sl. No.	Tests Used in with Clause Reference	Test Equipment/Chemicals and Identification Numbers (Where applicable)
1.	Preparation of specimen	Rough Polishing Machine, Cutting Machine, Fine Polishing Machine, Grinder Machine, Lathe, notchcutter
2.	Cl.10.1, 10.2 (Tolerances on Dimensions & Shape)	Vernier Callipers
3.		Micrometer, Steel tape, Steel Scale, Flat surface, Straightedge 1000,2000 or 4000 mm
4.	Cl.12.1 (Tensile Test)	UTM with extensometer and strain rate control
5.	Cl.12.1.6.4 (Tensile Test at elevated temperature)	Tensile testing machine with a furnace carousel fitted with extensometer
6.	Cl.12.2 (Bend Test)	Steel Mandrels (for bend tests), UTM attachments/clamps/vice/Vernier Callipers
7.	Cl.7 (Chemical Composition)	Analytical balance (0-200g, LC:0.1mg)
8.	Cl 7.1,7.2 for C,S,P,Mn,Si,Al, Cu, Microalloying and alloying elements content Mn,S,P,Si	Instrumental methods Spectrometer: atomic-absorption spectrometry, inductively coupled plasma atomic emission, inductively coupled plasma mass spectrometry techniques, spark source optical emission spectrometry. Spectrophotometer
9.	Cl 7.1, 7.2 – C& S (chemical method, alternative to instrumental method)	Strohlein or Leco apparatus with all attachments Barometer with chart, Hot plate, Muffle furnace, Complete range of glass wares, measuring cylinders, Desiccator, porcelain boats or ceramic crucibles, Thermometer, Electronic Balance, Distilled Water, Hot air oven, Oxygen - 99.5 percent minimum purity, ether or acetone Standard Reference Material (NML) with certificate Reagents for C: tin granules or pure iron fillings, acidulated water/brine water, methyl red, caustic potash Reagents for S: Ceramic boats/crucibles – desiccators, Fluxes -Low sulphur copper, tin or iron, Dilute hydrochloric acid, Starch Iodide solution, Potassium iodate

10.	Phosphorus content CI 7.1, 7.2 (chemical method, alternative to instrumental method)	Weighing balance, Heater/ Heating element alongwith energy regulator, Ice water bath, Vol Flask Cap – 1 litre, (Whatman) filter paper No. 040, Suction Filtration Facility, Filter paper pulp pad, Standard Reference Material (NML) with certificate Potassium Permanganate (KMnO₄), Sodium Nitrite (NaNO₂), Ammonium Molybdate [(NH₄)₂ MoO₇], Ammonium Phosphate [(NH₄)₃ PO₄], Potassium Nitrate (KNO₃), Phenolphthalein Solution, Rectified spirit or methyl alcohol, Sodium Hydroxide (NaOH), Hydrofluoric Acid (HF), Perchloric Acid (HClO₄), Sulphurous Acid, Hydrobromic Acid (HBr), other chemicals and reagent as applicable
11.	Manganese content CI 7.1, 7.2 (chemical method, alternative to instrumental method)	Hot plate, Conical flask Reagents: silver nitrate, ammonium persulphate sodium arsenite solution, Dilute Nitric Acid, Phosphoric Acid, Dilute Sulphuric Acid, Concentrated Nitric Acid, NaCl Solution, Permanganic acid
12.	Silicon content CI 7.1, 7.2 (chemical method, alternative to instrumental method)	Medium textured filter paper, Porcelain casserole, platinum crucible, filter paper pulp, hot plate, hot air oven, muffle furnace Reagents: Silver nitrate solution, concentrated nitric acid, concentrated sulphuric acid, Dilute Hydrochloric Acid, Dilute Sulphuric Acid, Perchloric Acid, Tartaric acid and hydrofluoric acid
13.	Cu content CI 7.1, 7.2 (chemical method, alternative to instrumental method) Solution, Ammonium Bifluoride Solution	Plate, Muffle Furnace, porcelain or silica crucible, Reagents: Hot Wash Solution (dilute sulphuric acid solution 1 : 99 v/v with hydrogen sulphide), dilute sulphuric acid, hydrogen sulphide, Dilute Nitric Acid, Sodium Fluoride, solid, Dilute Ammonium Hydroxide, Acetic Acid, Potassium Iodide, Starch Solution, Sodium Thiosulphate
14.	Ni content CI 7.1, 7.2 (chemical method, alternative to instrumental method)	ashless paper pulp, paper pulp pad, hot plate, dessicator, Reagents: ammonium nitrate, methyl red, dilute ammonium hydroxide, Concentrated hydrochloric acid, Concentrated nitric acid, Perchloric acid, Hydrofluoric Acid

15.	Cr content CI 7.1, 7.2 (chemical method, alternative to instrumental method)	Hot plate, stop watch Reagents: dilute sulphuric acid and phosphoric acid mixture, concentrated nitric acid, ammonium persulphate, silver nitrate, dilute hydrochloric acid, ferrous ammonium sulphate, standard potassium permanganate solution.
16.	CI 7.1, 7.2 Mo content (for determination of Mo by thiocyanate (photometric method) method in low and high alloy steels for Mo 0.01 to 1.50 percent) as per IS 228 Part 10	Reagents: Perchloric Acid, Phosphoric Acid, Nitric Acid, Hydrochloric Acid, Dilute sulphuric acid, potassium thiocyanate solution, stannous chloride solution, n-butyl acetate, Iron-Mo free, molybdenum metal (99.9 pc pure) Spectrophotometer, Volumetric flask, conical flask, titration apparatus (burette, pipette etc.), hot plate, thermometer, separating funnel, dry filter paper and other laboratory glassware and apparatus
17.	CI. 7.1(Nitrogen Content)	Determination of Nitrogen by Thermal Conductivity Method/ By Inert gas fusion followed by thermal conductivity detection/ By Steam Distillation Method
18.	CI 12.3 (low temperature impact test)	Charpy Impact tester, Thermometer, Specimen Inspection (Profile projector/Go & No Go Gauges, dial stand, surface plate, Micrometer), Deep Freezer
19.	CI 13 (Ultrasonic Test)	Pulse-Echo UT inspection system, frequency 1 MHz to 6MHz with pulser/receiver, transducer(normal beam compression wave type) and a display device.

ANNEX C

SCHEME OF INSPECTION AND TESTING

1. QUALITY ASSURANCE PLAN

1.1 It is expected that manufacturers (licensees/applicants) will implement a Quality Assurance Plan i.e. a plan of regular testing and in-process controls, designed to ensure that the product bearing the Standard Mark conforms to all requirements of the Indian Standard.

1.2 The manufacturers shall define a Quality Assurance Plan defining the control unit (i.e. lot/batch etc.) and the levels of control (i.e. the frequency and number of samples for conducting the different tests as per the Indian Standard) and submit the same to BIS Branch Office for information. The manufacturer shall comply with the same and maintain test records in accordance with para 2.4.

1.3 RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT:

1. For the guidance of manufacturers, the recommended definition of control unit is : All steel plates of same dimensions and heat treatment, representing the same cast & grade, manufactured under uniform conditions of production in a day on the same line constitutes a control unit.

1.3.1 For the guidance of manufacturers in preparing the Quality Assurance Plan, recommended levels of control are given in **Table 1**.

1.3.2 The manufacturer shall ensure inspection and testing as per the Quality Assurance Plan submitted by them on the whole production of the factory which is covered by this plan. Alternatively, the manufacturer has the option of adherence to the quality plan as per levels of control recommended in column 3 of Table 1.

1.4 However, all manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard.

2. ENSURING COMPLIANCE THROUGH TESTING- It is expected that manufacturers (licensees/applicants) will establish a suitably equipped and staffed in house laboratory (In house testing facility) for testing at least those parameters of the Indian Standard which require routine testing for ensuring quality of the product. This includes in-process controls as may be defined and put in place by the manufacturer and testing parameters/requirements which can only be performed in the factory.

2.1 For the guidance of manufacturers, Table 1 giving the recommended levels of control is given below. Column 2 of Table 1 indicates routine tests where test equipment is required in house as "R" or other tests which can be subcontracted as "S". Subcontracting is permitted to BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.2 For MSME manufacturers, the requirement of maintaining a laboratory/in-house testing facility for routine tests (indicated as "R" in Column 2 of Table 1) is also optional.

2.2.1 MSME manufacturers may utilize common cluster based facilities as per guidelines for the utilization of cluster based test facilities by MSMEs or the provisions of Sharing of testing facilities or get testing done from BIS recognized/empaneled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.3 Large Scale manufacturers shall maintain an in-house laboratory equipped at least with test facilities for routine tests (indicated as "R" in Column 2 of Table 1), where different tests

given in the specification shall be carried out in accordance with the method given in the specification. They shall also implement a calibration plan for the in-house test equipment.

2.3.1 Alternatively, in lieu of an in-house laboratory, large scale manufacturers can also utilize the provisions of Sharing of testing facilities as per the Guidelines for Grant of Licence available on BIS website www.bis.gov.in. (Under Conformity Assessment>Product Certification Process). Even for subcontracted tests, provisions for sharing of testing facilities can be utilized.

2.4 TEST RECORDS- The manufacturers maintaining an in-house laboratory or utilizing common cluster based facilities or shared test facilities shall maintain test records for the tests carried out to establish conformity. For the tests being subcontracted to BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025, test reports issued by the laboratories shall be available for inspection by BIS.

3. PACKING AND MARKING - The Standard Mark as given in the Schedule of the license and Licence Number (i.e. CM/L.....) shall be incorporated on each plate/strip or metal tag sticker attached to each Plate/Strip or bundle of Plates, and the marking shall be done as per the provisions of the Indian Standard , provided always that the product thus marked and packed conforms to all the requirement of the specification.

3.1 For plates or plates produced from strips, 6 mm and over in thickness, the name or trade mark of the manufacturer, cast number, grade and plate number shall be legibly “steel die stamped” or “stencil marked” or “both” in at least one place on each finished plate, at least 150 mm from one of the transverse or longitudinal edges at the middle.

3.2 For plates produced from strips or plates under 6 mm in thickness, the marking specified above (at 3.1) shall be legibly stencilled instead of stamping.

3.3 Packing and Marking shall be done as per the Indian Standard.

4. TEST CERTIFICATE- For each consignment of BIS Certified material conforming to IS 2041:2024 there shall be a test certificate which shall contain the Standard Mark, the cast/Control Unit number and the corresponding test results (as given in Annexure-I enclosed)

5. REJECTION - All the production which conforms to the Indian Standard and covered under the scope of this licence shall be marked with the Standard Mark. Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016.

TABLE 1
(ONLY FOR GUIDANCE PURPOSE)

(1)				(2)	(3)		(4)
TEST DETAILS					LEVELS OF CONTROL		REMARKS
Clause	Requirements	Test Method		Test equipment requirement R: required (or) S: Sub-contracting permitted	No. of Samples	Frequency	
		Clause	Reference				
6	Manufacture	6.1, 6.1.1, 6.1.2, 6.2, 6.3, 6.4 (a) to (g)	IS 2002 IS 4748 IS 14650 ISO 7778 or any relevant national and international standards	R	Manufacturer shall exercise adequate in-process controls to ensure that the material is manufactured in accordance with the provisions of the standard. Appropriate Records with regards to the requirements of Grain Size number, Reduction Ratio, Sulphur Content, Ultrasonic Examination and Through-thickness tension test shall be maintained		Steels (semi-finished products such as Slabs/Ingots)(excluding Strips) used for manufacturing the product covered in the standard shall conform to the requirements of IS 14650
7	Chemical Composition		IS 2041 IS 8811 & IS 228 (Various Parts) Or any established Chemical/ Instr. method				
	Ladle Analysis	7.1 Table-1	-do-	R	One	Each Heat	Applicable for primary producers
	Product Analysis	7.2 Table-1	-do-	R	i) NIL ii) One	i) NIL ii) Each Cast	i) Applicable for primary producers ii) Applicable for

							manufacturers not having steel making facilities and are procuring raw material slabs/ingots for further Hot Rolling into Plates/Strips. No further testing if the raw material Slabs/ingots procured are ISI marked as per IS 14650 and are received with Test Certificate.
9	Freedom from defects	9.1 to 9.3.1	IS 2041	R	Manufacturer shall exercise adequate in-process controls to ensure that the material remains free from harmful defects. Each Plate Each Plate		
10	Dimensions & Tolerances	10.1 10.2	IS 2041 IS 1852 IS 16998	R	Firm to have adequate in-process controls to check compliance of this parameter as per the tolerances given in the Indian Standard. However, appropriate records shall be maintained by the manufacturer for evidence of conformity		
12.1	Tensile test	12.1 to 12.1.6 .4, 12.4, 12.5 & Table - 3	IS 2041 IS 1608 Pt.1	R	One /Three	Each Control Unit Each plate as rolled/ Each plate cut from coil	----
12.2	Bend test	12.2.1 to 12.2.3 , 12.4, 12.5	IS 1599	R	One	Each Control Unit	----
12.3	Low temperature Charpy impact test (V Notch test)	12.3, 12.4, 12.5 & Table- 3	IS 2041 IS 1757	R	One /Three	Each Control Unit Each plate as rolled/ Each plate cut from coil	---
13	Ultrasonic testing	13.1,13.1.1, 13.1.2, 13.1.3,1 3.2,	IS 2041 IS 11630 IS 13805	S	---	---	To be carried out if agreed between manufacturer and purchaser

							Applicable for plates of Thickness 25 mm and above
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ANNEXURE I

ISI Mark
With IS no.
and CM/L
no.

XYZ IRON AND STEEL COMPANY
(Registered Office Address and works address)

TEST CERTIFICATE FOR Steel Plates and Strips for Pressure Vessels Used at Moderate and Lower Temperature — Specification

TEST CERTIFICATE NO _____ DATE _____
TO M/s _____

We certified that the material described below fully conforms to IS 2041:2024. Chemical composition and Mechanical Properties the product, as tested in accordance with the Scheme of Inspection and Testing contained in the BIS Certification Marks Licence No. CM/L _____ are as indicated below against each order no. etc.

(PLEASE REFER TO IS 2041:2024 FOR DETAILS OF SPECIFICATION REQUIREMENTS)

TEST RESULTS

Order No. & Date	Section(nom Size)	Control Unit No.	Grade	Quantity in tonnes	CHEMICAL COMPOSITION								MECHANICAL PROPERTIES					Ultrasonic Test	Remarks
					C	S	P	Si	Mn	Cu	@Micro Alloying Elements %	Al	CE	Tensile strength	Elongation	Yield Stress	Bend test		
					%	%	%	%	%	%		%							

@ Micro-alloying element(s) present should be indicated

REMARKS
Wagon NO.
TRUCK NO.
(It is suggested that size A4 paper be used for this test certificate)

FOR XYZ IRON AND STEEL COMPANY