

**PRODUCT MANUAL FOR
Hot rolled Steel Sheet, Plate and Strip for Forming and Flanging Purposes
According to IS 5986:2017**

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence 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 licence/certificate.

1.	Product	: IS 5986 : 2017
	Title	: Hot rolled Steel Sheet, Plate and Strip for Forming and Flanging Purposes
	No. of amendments	: 0
2.	Sampling Guidelines	
a)	Raw material	: No specific requirement
b)	Grouping Guidelines	: Please refer Annex – A
c)	Sample Size	: For physical tests: 2 No.s of 0.5 X 0.5m + Prepared test pieces for impact test For chemical tests:5 Nos. of 5cm X 5cm or 50 gm drillings
3.	List of Test Equipment	: Please refer Annex – B
4.	Scheme of Inspection and Testing	: Please refer Annex – C
5.	Possible tests in a day	: All Physical and Chemical tests
6.	Scope of the Licence :	
	Licence is granted to use Standard Mark as per IS 5986:2017 with the following scope:	
	Name of the product	Hot rolled Steel Sheet, Plate and Strip for Forming and Flanging Purposes
	Grade(with/without microalloying)	ISH410S, ...
	Condition	As-rolled, ...
	Variety(Thickness &Width)	Sheet: Thickness ...mm to ...mm, width- ...mm to ...mm, Plate: Thickness ...mm to ...mm, width- ...mm to ...mm, Strip: Thickness ...mm to ...mm, width- ...mm to ...mm,...

ANNEXURE A
To PRODUCT MANUAL for
Hot rolled Steel Sheet, Plate and Strip for Forming and Flanging Purposes
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GROUPING GUIDELINES

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1. To ensure uniform practice is followed across ROs/BOs, the following procedure to be adopted towards grant of licence & inclusion of additional varieties.
2. Grouping of steel grades: Grouping has been done on the basis of Designation (quality) of the product as under:

Group	Grade	Arrangement of steel grades within a group	Remarks
1	ISH290S ISH310S ISH330S ISH360S ISH370S ISH400S ISH410S ISH440S ISH490S	Higher Grade ↓	Grades arranged according to their increasing order of Minimum Tensile Strength required in each group
2	ISH320LA ISH360LA ISH390LA ISH410LA ISH430LA ISH450LA ISH480LA ISH500LA ISH550LA ISH600LA ISH650LA ISH700LA ISH750LA	Higher Grade ↓	One sample of any size may be drawn from the group for higher grades for considering all grades below within the group. If sample is tested for higher steel grade (e.g. ISH390LA) the recommendation for grant of licence / inclusion may include lower steel grades also (e.g. ISH320LA and ISH360LA).
3	ISH440R ISH490R ISH540R ISH590R ISH780R	Higher Grade ↓	One sample of any size may be drawn from the group for higher grades for considering all grades below within the group. If sample is tested for higher steel grade (e.g. ISH540R) the recommendation for grant of licence / inclusion may include lower steel grades also (e.g. ISH490R and ISH440R).

4	ISH440F ISH540F ISH590F	Higher Grade ↓	Grades arranged according to their increasing order of Minimum Tensile Strength required in each group.	One sample of any size may be drawn from the group for higher grades for considering all grades below within the group. If sample is tested for higher steel grade (e.g. ISH590F) the recommendation for grant of licence / inclusion may include lower steel grades also (e.g. ISH440F and ISH540F).
5	ISH540Y ISH590Y ISH780Y	Higher Grade ↓		One sample of any size may be drawn from the group for higher grades for considering all grades below within the group. If sample is tested for higher steel grade (e.g. ISH780Y) the recommendation for grant of licence / inclusion may include lower steel grades also (e.g. ISH590Y and ISH540Y).
6	ISH750MP ISH980MP	Higher Grade ↓		One sample of any size may be drawn from the group for considering both the grades within the group. If sample is tested for higher steel grade (e.g. ISH980MP) the recommendation for grant of licence / inclusion may include lower steel grade ISH750MP also
7	ISH1180MS		-	One sample of any size is to be tested for considering the grade in this group for grant of licence / inclusion

3. Among the samples drawn as above from each group, separate samples need not be drawn for each killing condition of steel.
4. If the firm intends to supply the grades along with addition of micro-alloying elements then one among the above samples drawn is to be with addition of micro-alloying elements. The testing facility for micro alloying elements should be got declared and verified suitably. An undertaking to this effect may also be taken.
5. While considering Grant of licence/inclusion of additional varieties, it shall be ensured that the applicant/licensee has got the complete manufacturing and testing facilities for all the sizes/grades/killed conditions/micro-alloyed applied.
6. During the operation of license, BO shall ensure that all the sizes/grades covered in the license are drawn for independent testing on rotation over a period of time.

ANNEXURE B
TO PRODUCT MANUAL FOR
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LIST OF TEST EQUIPMENTS

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Major test equipment essentially required to test as per requirements of Indian Standard.

Sr. No	Test Equipment/Chemicals	Tests Used in with Clause Reference
1	Rough Polishing Machine, Abrasive Cutting Machine, Fine Polishing Machine, Grinding Machine, Molding machine, Longitudinal cutting machine	Preparation of specimen
2	<p>Instrumental methods Spectrometer: atomic-absorption spectrometry, inductively coupled plasma atomic emission, inductively coupled plasma mass spectrometry techniques, spark source optical emission spectrometry.</p> <p>Spectrophotometer</p>	<p>7, 7.1, 7.2, 6.2 for C,S,P,Mn,Si,Al,Cu,N,B,Ti, Nb,V.</p> <p>Mn,S,P,Si</p>
3	<p>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</p> <p>Reagents for C: tin granules or pure iron fillings, acidulated water/brine water, methyl red, caustic potash</p> <p>Reagents for S: Ceramic boats/crucibles – desiccators, Fluxes -Low sulphur copper, tin or iron, Dilute hydrochloric acid, Starch Iodide solution, Potassium iodate</p>	<p>7, 7.1, 7.2 C & S (chemical method, alternative to instrumental method)</p>
5	<p>Weighing balance, Heater/ Heating element along with 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</p> <p>Potassium Permanganate (KMnO₄), Sodium Nitrite (Na₂NO₃), Ammonium Molybdate [(NH₄)₂ Mo₂O₇], Ammonium Phosphate [(NH₄)₃ PO₄], Potassium Nitrate (K₂NO₃), 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</p>	<p>7, 7.1, 7.2 Phosphorus content (chemical method, alternative to instrumental method)</p>

6	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	7, 7.1, 7.2 Manganese content (chemical method, alternative to instrumental method)
7	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	7, 7.1, 7.2 Silicon content (chemical method, alternative to instrumental method)
8	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 Solution, Ammonium Bifluoride Solution	7, 7.1, 7.2 Cu content (chemical method, alternative to instrumental method)
9	Determination of Nitrogen by Thermal Conductivity Method/ By Inert gas fusion followed by thermal conductivity detection/ By Steam Distillation Method	7, 7.1, 7.2 N content (chemical method, alternative to instrumental method)
10	UTM(0-600KN, LC -0.1kN)	8(Tensile Test)
11	Steel Mandrels (for bend tests), Templates (for Bend test), UTM attachments/clamps/vice/Magnifying glass	9(Bend Test)
12	Charpy Impact tester, Thermometer, Specimen Inspection (Profile projector/Go & No Go Gauges, dial stand, surface plate, Micrometer), Deep Freezer, Dry ice- Solid carbon dioxide (sublimates at -78°C) as a coolant.	10(Impact Test)
13	Vision-based inspection system	CI 13 (Freedom from defects)
14	Vernier Calipers, Micrometer, flat table, Straight Edge, measuring tape, cord	CI 15 (Dimensions and Dimensional Tolerances)
15	Weighing Balance	CI 16 (Weight)

Note: The above is an indicative list for the purpose of guidance only

ANNEXURE C
TO PRODUCT MANUAL FOR
Hot rolled Steel Sheet, Plate and Strip for Forming and Flanging Purposes
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SCHEME OF INSPECTION AND TESTING

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1. LABORATORY - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

1.1 The manufacturer shall prepare a calibration plan for the test equipments.

2. TEST RECORDS – The manufacturer shall maintain test records for the tests carried out to establish conformity.

3. PACKING & MARKING – The Standard Mark as given in the Schedule of the license and Licence Number (i.e. CM/L.....) shall be incorporated, and the packing, marking shall be done as per the provisions of the Indian Standard, provided always that the product thus marked conforms to all the requirement of the specification. In addition, details of BIS website shall be marked as follows: “For details of BIS certification please visit www.bis.gov.in”

4. CONTROL UNIT – For the purpose of this Scheme, a control unit is defined as hot rolled steel of same dimensions and of same grade manufactured by using steel of same heat under uniform conditions of production.

5. LEVELS OF CONTROL - The tests as indicated in column 1 of Table 1 and the levels of control in column 3 of Table 1, shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

5.1 All the production which conforms to the Indian Standards and covered by the licence should be marked with Standard Mark.

6. TEST CERTIFICATE- For each consignment of BIS Certified material conforming to IS 5986:2017 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)

7. REJECTIONS – 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. Any rejected material which is potentially re-salable be sheared or cut or deformed in such a manner that it cannot be used for any other purpose except re-melting. A separate record shall be maintained giving information on quantity and cast number/coil number/control unit number, as applicable, relating to all such rejections/defective/sub-standard material of the production not conforming to the requirements of the Specification and the method of its disposal. Such material shall in no case be stored together with that conforming to the Specification. The Standard Mark (if already applied) on rejected material should be defaced.

ANNEXURE C
TO PRODUCT MANUAL FOR
Hot Rolled Carbon Steel Sheet, Plate and Strip
According to IS 5986:2017

SCHEME OF INSPECTION AND TESTING

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TABLE 1: LEVELS OF CONTROL

(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 6.2 6.3	IS 5986 : 2017	R	----	----	Records of condition supplied shall be maintained.
7	Chemical Composition						
	Ladle Analysis	7.1 Table-3, 4	IS 5986 : 2017 & IS 228 (Various Parts) / any established Chemical/ Instr. Method.	R	One	Each Heat	Applicable only for manufacturers with steel making facilities. Other manufacturers shall maintain record of test certificate received from supplier of steel.
	Product Analysis	7.2,11, Table- 3,4 & 5		R	i) Nil ii)One	i) Nil ii) Each Cast	i) Applicable for manufacturers with steel making facilities, wherever traceability to the heat is ensured by manufacturer. ii)Applicable for manufacturers without steel making facilities and feeding to rolling mills (see Note-3)
8	Tensile Test	8.1,8.1.1 8.2, 8.2.1, 8.3 , 8.3.1, 8.3.2, 12 Table-6 & 7	IS 5986:2017 IS 1608(Pt.1) IS 3803	R	One	Each Control Unit	

9	Bend Test	9.1, 9.1.1, 9.2, 9.2.1, 9.2.2, 9.2.3, 12 & Table-8	IS 5986:2017 IS 1599	R	One	Each Control Unit	
10	Impact Test	10.1, 10.2, 10.3, 10.4 & 12	IS 5986:2017 IS 1757(Pt.1)	R	-----	-----	If agreed to between manufacturer and purchaser. See Note-4
11	Hole Expansion Ratio Test	11,12 & Table-7	IS 5986:2017	S	-----	-----	As and If agreed to between manufacturer and purchaser. See Note-4
13	Freedom from defects	13.1 13.2 13.3	IS 5986:2017	R	Adequate inspection to ensure each item to be free from defects		
15	Dimensions and Tolerances	15.1 15.2 15.2.1	IS 5986: 2017 IS 1730 IS/ISO 16160 IS 1852	R	Adequate inspection to ensure each item to be within the limits of specification.		
16	Weight	16	IS 5986:2017	R	Each Coil/ Package	Each Coil/ Package	
17	Delivery	4, 6.3, 14, 17.1 & 17.2	IS 5986: 2017	R	-----	-----	Unless and otherwise agreed, material shall be supplied in hot rolled condition (As rolled). See Note-4

Note-1: Whether test equipment is required or sub-contracting is permitted in column 2 shall be decided by the Bureau and shall be mandatory. Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empaneled by the Bureau.

Note-2: The control unit and levels of control as decided by the Bureau are obligatory to which the licensee shall comply with.

Note-3: No testing is required if material fed to rolling mills is ISI marked and received with test certificate mentioning the requirement.

Note -4 : ----- means the levels of control in Column(3) of Table-1 are as agreed to between the manufacturer and purchaser.

Annexure-I**Page 4 of 4**

(Para 6 of the Scheme of Inspection and Testing)

XYZ IRON AND STEEL COMPANY

(Registered office Address and works address)

TEST CERTIFICATE FOR SPECIFICATION FOR**Hot rolled Steel Sheet, Plate and Strip for Forming and Flanging Purposes**BIS
STANDARD
MARK

TEST CERTIFICATE No. _____

DATE _____

To M/s _____

We certified that the material described below fully conforms to IS 5986:2017 Chemical composition and Physical properties of the product, as tested in accordance with the Scheme of Inspection and Testing contained in the BIS Certification Marks LicenceNo.CM/L_____ are as indicated below against each order No.

(PLEASE REFER TO IS5986:2017 FOR DETAILS OF SPECIFICATION REQUIREMENTS)

TEST RESULTS

Order No. & Date	(Dimensions)	Cast/ Control Unit No.	Grade	Qty	CHEMICAL COMPOSITION							MECHANICAL PROPERTIES					Impact # Test	Condition	Tolerances #	
					C %	S %	P %	Si %	Mn %	Al %	N %	#Micro-alloyin g%	#Cu %	TS	YS	Elongati on				Hole expansion ratio test

as agreed between manufacturer and purchaser

REMARKS

WAGON NO.

TRUCK NO.

(It is suggested that size A4 paper be used for this test certificate)

FOR XYZ IRON AND STEEL COMPANY