

**PRODUCT MANUAL FOR
COLD REDUCED CARBON STEEL SHEET AND STRIP
PART 1 COLD FORMING AND DRAWING PURPOSE
According to IS 513(Pt.1):2016**

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 513 (Part 1):2016
	Title	:	Cold Reduced Carbon Steel Sheet and Strip Part 1 Cold Forming and Drawing Purpose
	No. of amendments	:	1
2.	Sampling Guidelines		
a)	Raw material	:	No specific requirement in case of steel producers manufacturing CR sheets from billets/blooms/ingots. Re-rollers carrying out only cold rolling uses HR coils conforming to IS 11513:2017
b)	Grouping Guidelines	:	Please refer Annex - A
c)	Sample Size	:	For mechanical tests: 2 No.s of 0.5mX0.5m For chemical tests: 5 pieces of 5 cm X 5 cm or 50 g 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 tests
6.	Scope of the Licence :		
	Licence is granted to use Standard Mark as per IS 513(Pt.1):2016 with the following scope:		
	Name of the product	Cold Reduced Carbon Steel Sheet and Strip Part 1 Cold Forming and Drawing Purpose	
	Grade	CR1, ...	
	Surface Finish	As-rolled etc..	
	Temper Designation	1/2H etc..	
	Thickness, Width, Length(sheets)	Thickness: from ...mm to...mm, Width: From mm to mm, Length: fromm tom.	
	Condition	Dull Finish (C), etc...	

ANNEXURE A
TO PRODUCT MANUAL FOR
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GROUPING GUIDELINES

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Grouping has been done on the basis of Designation (quality) as under:

Group	Designation(Quality)	Grade	No of sample
1	Cold Rolled	CR0	i) One sample of any size of the Grade may be drawn.
2	General Purpose	CR1, CR2 CR3, CR4 & CR5	i) One sample of any size of any Grade may be drawn. If sample is tested for grade of lower tensile strength and higher drawability(r) & stretch-ability(n),the recommendation may include Grades with higher tensile strength and lower drawability(r) & stretch-ability(n) also. ii) For example, Sample of CR5 should be drawn to cover CR1 to CR5.
3	Drawing Quality	ISC260G,ISC270C, ISC270D,ISC270E ISC270F.	i) One sample of any size of any Grade may be drawn. If sample is tested for grade of higher minimum tensile strength and higher drawability(r) & stretch-ability(n), then the recommendation may include lower Grades also. ii) For example, Sample of ISC270F should be drawn to cover ISC260G to ISC270F.
4	Interstitial Free-High Strength steel	ISC340P,ISC370P ISC390P,ISC440P	i) One sample of any size of any Grade may be drawn. If sample is tested for grade of higher minimum tensile strength then the recommendation may include lower Grades also. ii) For example, Sample of ISC440P should be drawn to cover ISC340P to ISC440P.
5	Bake Hardening	ISC270B,ISC300B ISC320B,ISC340B, ISC360B,ISC390B ,ISC440B	i) One sample of any size of any Grade may be drawn. If sample is tested for grade of higher minimum tensile strength then the recommendation may include lower Grades also. ii) For example, Sample of ISC440B should be drawn to cover ISC270B to ISC440B.
6	Re-phosphorized	ISC280R,ISC320R, ISC360R,ISC400R	i) One sample of any size of any Grade may be drawn. If sample is tested for grade of higher minimum tensile strength then the recommendation may include lower Grades also. ii) For example, Sample of ISC400R should be drawn to cover ISC280R to ISC400R.

7	C,Mn Steel	ISC340W,ISC370W ISC390W,ISC440W	<p>i) One sample of any size of any Grade may be drawn. If sample is tested for grade of higher minimum tensile strength then the recommendation may include lower Grades also.</p> <p>ii) For example, Sample of ISC440W should be drawn to cover ISC340W to ISC440W.</p>
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1. During preliminary inspection, before drawing samples for independent testing, it shall be ensured by IO that tests for Dimensions and Tolerances as per cl.11 of IS 513(Pt.1):2016 shall be carried out at factory premises on the samples to be drawn for independent testing as it is difficult to transport bulky samples to laboratory. In case of inclusion, factory test report for Dimensions and Tolerances as per cl.11 of IS 513(Pt.1):2016 may be accepted and conformity of the grades included to the same has to be verified during next surveillance visit.

2. The sample tested may be any of the sizes (see Cl.11), Surface condition (cl.9.5) and Temper condition (see Cl.4.3) as mentioned in the specification. It is to be ensured that at least one sample of bright finish is to be drawn/tested in case applicant/licensee has applied for bright finish. If the sample passes, the licence/inclusion can be granted for all the sizes, temper conditions and surface finishes (cl.9.5) mentioned in the specification and as applied by the applicant/licensee, provided that the firm is having all necessary manufacturing and testing facilities for manufacture and testing of all other sizes, Temper conditions and surface finishes of sheets/strips proposed to be included in the licence.

3. During the operation of licence, BO shall ensure that all the grades, sizes, temper conditions and surface conditions of sheets/strips covered in the license are drawn for independent testing on rotation over a period of time.

ANNEXURE B
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LIST OF TEST EQUIPMENTS

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

Sl. No.	Test Equipment/Chemicals and Identification Numbers (Where applicable)	Tests Used in with Clause Reference
1.	<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>Chemical Composition Cl 7.1,7.2, 7.3 for C,S,P, Mn, Si, Al, B, N and Microalloying elements content</p> <p>Mn, S, P, Si</p>
2.	<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>cl. 7.1,7.2, 7.3 –C& S (chemical method, alternative to instrumental method)</p>
3.	<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 (NaNO₂), 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>Phosphorus content Cl 7.1,7.2, 7.3 (chemical method, alternative to instrumental method)</p>

4.	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	Manganese content Cl 7.1, 7.2, 7.3 (chemical method, alternative to instrumental method)
5.	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	Silicon content Cl 7.1, 7.2, 7.3 (chemical method, alternative to instrumental method)
6.	Determination of Nitrogen by Thermal Conductivity Method/ By Inert gas fusion followed by thermal conductivity detection/ By Steam Distillation Method	Nitrogen Content Cl. 7.1, 7.2, 7.3
7.	UTM (0-500kN)	Tensile Test cl.8.1. Plastic Strain Ratio cl.8.5, Tensile Strain Hardening Component cl.8.6, Bake Hardening Index cl.8.7
8.	Oven type furnace/Hot-air oven(upto 300°C) with temperature controller of accuracy of $\pm 1^\circ\text{C}$	Bake Hardening Index cl.8.7
9.	ERICHSEN Sheet Metal Testing Machine, bench mounted unit with a cast iron machine body and a cylindrical test head(\varnothing -20mm) with Drawing force: max. 45 kN, Blank holder force: 10 kN for Sheet thickness: 0.1 - 2.0 mm	Cupping test cl.8.2
10.	Rockwell Hardness Testing (HR 30 TM) 0-90 (HRB Scale) 0-100	Hardness test cl. 8.3
11.	Steel Mandrels (for bend tests), Templates(for Bend test), UTM attachments/clamps/vice/Magnifying glass	Bend test cl. 8.4
12.	Surface Roughness Tester (in-house Calibration using roughness block)	Surface finish cl. 9.5
13.	i) Cord ii) Vernier Caliper iii) Flat bench iv) Measuring Tape; and v) Micrometer	Dimensions & Tolerances cl. 11

Nitrogen content shall be occasionally tested.

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

**ANNEXURE C
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SCHEME OF INSPECTION AND TESTING

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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. LABELLING & MARKING –

The Standard Mark as given in the Schedule of the license and Licence Number (i.e. CM/L.....) shall be incorporated, and the 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, 50 tonnes of material or part there of representing the same cast, grade quality, rolled to same thickness & processed in identical conditions and heat-treatment (if any), shall constitute a control unit.

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 513(Pt.1):2016 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.

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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				
7	Chemical Composition						
	Ladle Analysis	7.1 ,7.2 Table-3	IS 513(Pt.1): 2016 & IS 228 (Various Parts) / any established Chemical/ Instr. Method. Alternativel y, method specified in relevant ISO standard may also be used.	R	One	Each Cast	Applicable for primary steel producers only
	Check Analysis	7.3, Table-4		R	i) Nil ii)One	i)Nil ii) Each Cast	i) Applicable for primary steel producers with steel making and rolling facilities, wherever traceability to the heat is ensured by manufacturer. ii)Applicable for manufacturers feeding to rolling mills(see Note-3)
8.1	Tensile Test	8.1.1, 8.1.2,8. 1.3 , 8.1.4 & 8.1.5 Table 5A,5B, 5C	IS 513(part 1):2016 IS 1608	R	One (from every 50 tonne or less)	Each Control Unit	To be carried out only if specified by the purchaser

8.2	Cupping Test	8.2 Fig.1	IS 513(part 1):2016 IS 10175	R	One (from every 50 tonne or less)	Each Control Unit	Applicable for steel grades of quality CR2, CR3, CR4 subject to mutual agreement between purchaser and manufacturer.
8.3	Hardness Test	8.3 Table 6	IS 513(part 1):2016 IS 1586	R	-do-	-do-	Applicable for steel grades of quality CR0, CR1.
8.4	Bend Test	8.4.1, 8.4.2, 8.4.3 & 8.4.4 Table 7	IS 513(part 1):2016 IS 1599	R	-do-	-do-	Bend test can be applied with mutual agreement between the manufacturer and the purchaser
8.5	Plastic Strain Ratio	8.5.1 8.5.2 Table 5A,5B, 5C	IS 513(part 1):2016 IS 11999	R	-do-	-do-	
8.6	Tensile strain hardening component	8.6.1 8.6.2 Table 5A,5B, 5C	IS 513(part 1):2016 IS 15756	R	-do-	-do-	
8.7	Bake hardening Index	8.7 Annex B Table 5B, 5C	IS 513(part 1):2016	R	-do-	-do-	
5	Non-ageing characteristics	5.1, 5.2 & 5.3 Table 2	IS 513(part 1):2016	R	-	Each Control Unit	Applicable for steel grades of CR2, CR3, delay ageing quality and non-ageing quality.
9	Surface condition	9.1,9.2, 9.3, 9.4, 9.4.1,9.4.2,9.4.3, 9.4.4	IS 513(part 1):2016	R	Each Sheet/ strip	Each Sheet/ strip	
9.5	Surface Finish	9.5.1, 9.5.2 & 9.5.3	IS 513(part 1):2016 IS 15262	S	As agreed between the purchaser and the supplier.		
10	Freedom from defects	10.1,10.2 & 10.3	IS 513(part 1):2016	R	As agreed between the purchaser and the supplier.		
11	Dimensions & Tolerances	11.1,11.2 & 11.3	IS 513(part 1):2016 IS/ISO16162	R	Adequate inspection to ensure each item to be within the limits of specification.		

4	Supply of material	4.1,4.2 & 4.3	IS 513(part 1):2016	As agreed to between the purchaser and the supplier			Records of mechanical properties as agreed to between purchaser and the manufacturer as per cl.4.3 of ISS shall be maintained.
13.3	Packing	Cl.13.3, 9.6 & Table 9	IS 513(part 1):2016	R	Each Sheet/strip	Each Sheet/strip	<p>i) Weight of sheets and strips in bundles or packages shall be as agreed to between the purchaser and the manufacturer.</p> <p>ii) Each Sheet/strip shall be treated on both sides with non-hardening type rust preventive oil, which can be easily washed with aqueous alkali solution.</p> <p>iii) The product may not be oiled, only if required by the purchaser.</p>

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 for product analysis is required if material fed to rolling mills is ISI marked and received with test certificate.

