78324/2022/CMD-II

PM/IS3601/3/March 2022

PRODUCT MANUAL FOR
Steel Tubes for Mechanical and General Engineering Purposes
According to IS 3601:2006

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 3601:2006**
	Title	**:**	Steel Tubes for Mechanical and General Engineering Purposes
	No. of amendments	**:**	1
2.	**Sampling Guidelines**		
a)	**Rawmaterial**	**:**	Steel, with ladle analysis, not showing Sulphur or phosphorus more than 0.040. For ERW pipes, HR strips as per IS10748 are used preferably, wherever applicable.
b)	**Grouping Guidelines**	**:**	Please refer Annex-A
c)	**Sample Size**	**:**	Mechanical Test: 2 meters Chemical test:5pcs of5cmx5cm(for OES)or50gm drillings for testing by chemical method, 1mforZn coating test.
3.	**Additional Guidelines**	**:**	Please refer Annex-B
3.	**List of Test Equipment**	**:**	Please refer Annex-C
4.	**Scheme of Inspection and Testing**	**:**	Please refer Annex- D
5.	**Possible tests in a day**	**:**	All tests
6.	**Scope of the Licence :**		
	Licence is granted to use Standard Mark as per IS3601:2006 with the following scope:		

	Name of the product	Steel Tubes for Mechanical and General Engineering Purposes
	Grade	HFW 160,…

	Sizes	OD Thickness
	Condition	As welded,..
	With/Without	Zn coating

ANNEXUREA
TO PRODUCT MANUAL FOR
Steel Tubes for Mechanical and General Engineering
Purposes According to IS 3601:2006

GROUPING GUIDELINES

PAGE 1 of 2

1. Grouping of steel tubes for Mechanical and General Engineering Purposes is carried out on the basis of following
   a) Method of manufacture
   b) Strength, Condition
   c) Bend Test
   d) Flattening Test
   e) Surface protection
2. Accordingly, for the purpose of the GOL/CSoL the product is grouped as under:

A. Welded Steel Tubes

Section	Tube Designation (in ascending order)	Size	Group	Remarks
2	WT 160 WT 210 WT 240 WT 310	Upto & Including 60.3mm OD	1	i. In order to cover all sizes under the group one sample of any size may be subjected to complete testing. ii. Subject to(i) above ,in case Tube of higher-tube designation is tested and foundconforming then lower grades may also be covered in the licence. iii. Subject to(i)&(ii)above, in case Galvanized Tubes are tested and found conformingthen tubes uncoated or with manufacturer's standard mill protective Coating may also be covered in the scope of the licence.
		OD Above 60.3 mm	2	-do-
5	CEW160 CEW210	Upto & Including60.3mm OD	3	-do-
	CEW240	OD Above 60.3mm	4	-do-
	CEW370 CEW430	Upto & Including 60.3mm OD	5	-do-
		Above 60.3mm OD	6	-do-

A. Seamless Tubes

Section	Tube Designation (inascendingorder)	Size	Group	Remarks
3	HFS160 HFS210 HFS240 HFS310	Up to and including 406.4mm OD	1	i. To cover all sizes under the group one sample,preferably of the highest OD,may be subjected to complete testing. ii. Subject to(i) above, in case Tube of higher-tube designation is tested and foundconforming then lower grades may also be covered in the licence. iii. Subject to(i)&(ii) above,in case Galvanized Tubes are tested and found conforming then tubes uncoated or with manufacturer's standard mill protective coating may also be covered in the scope of the licence
4	CDS160 CDS210 CDS240 CDS310	Upto and including 406.4mm OD	2	i. To cover all sizes one sample of any size each from the group maybe subjected to complete testing. ii. Subject to (i)above, incase Tube of higher-Tube designation is tested and found conforming then lower grades may also be covered in the licence. iii. Subject to(i)&(ii)above, in case Galvanized Tubes are tested and found conforming then tubes uncoated or with manufacturer's standard mill protective coating may also be covered in the scope of the licence
	CDS370 CDS430 CDS540	Upto and including 406.4mm OD	3	-do-

3. Therefore, licence can be granted for all the sizes, conditions, tube designations applied by the applicant/licensee,as stated above, provided that the firm is having all necessary manufacturing capabilities and testing facilities for manufacture and testing for varieties proposed to be included in the licence scope.

4. Incase of tube designations under section-2,for ratio of OD:thickness greaterthan33:1,agreed upon tolerances to be declared by the manufacturer.

5. During the operation of license,BO shall ensure that all Grades &Product types covered in the license are drawn for independent testing on rotation over a period of time.

ANNEXURE B

PRODUCT MANUAL FOR

Steel Tubes for General Enginnering Purposes

According to IS 3601:2006

ADDITIONAL GUIDELINES
FOR MANUFACTURERS WHO INTEND TO OUTSOURCE
POST BLACK PIPE OPERATIONS

1. **The post black pipe operation could be galvanizing.**

Action by licensees

i. The licensee intending to outsource post black pipe operation shall outsource these operations **only to a manufacturer holding a valid BIS licence for IS 3601:2006.**

ii. **For the purpose of these guidelines, the licensee which is outsourcing the post black pipe operation shall be called Licensee A and the licensee to whom the operation is being outsourced, shall be licensee B.**

iii. Black pipes shall be dispatched by the licensee A for post black pipe operations to the licensee B, control unit wise. Both the licensee A and B shall maintain records for post black pipe operations as per frequency stipulated in the SIT. These records shall be made available by both licensees for examination to BIS Certification Officers or Agents during surveillance visits or whenever otherwise sought by BIS.

iv. The responsibility of conformity of the product in respect of all requirements shall lie with both the licensees.

v. The licensee A shall emboss the Standard Mark (ISI) and its licence number on the black pipes conforming to IS 3601 along with all other details as per the marking clause of the SIT. The pipes shall be sent control unit wise to the licensee B. The licensee B shall employ 'transfix labels' for identification on the pipes; the label shall contain IS No. over Standard Mark and under Standard Mark, its licence number and the phrase 'Only Galvanizing' (See image below); after ensuring conformity of post black pipe operations to the IS 3601.

vi. The licensee A shall issue the test certificate of the ISI marked black pipes as per IS 3601 along with each consignment of the black pipes dispatched to licensee B. The licensee B, after carrying out Galvanizing and testing conformity of galvanizing as per IS 2633 shall issue the final test certificate of Galvanized pipes, incorporating the results of both the black pipes and Galvanizing, and other details such as Batch No./Lot No., Size(s), Grade, Quantity etc. for ensuring traceability to the black pipes.

All such pipes, after Galvanizing, shall be dispatched by Licensee B after enclosing the final test certificate of the Galvanized pipes.

Action by BOs

i. The post black pipe operations shall be verified by the BO during the next surveillance of the outsourcer licensee unit and the licensee unit to whom this operation is outsourced. During the operation of licence, all such records maintained by the licensee and the outsourced unit shall be verified by the IOs.

ii. If the licensee and the outsourced unit are under different BOs, the BO receiving the request shall inform the other BO accordingly and the BO under which the outsourced unit is located shall verify the post black pipe operations during the next surveillance and shall provide the necessary information to the BO.

ANNEXURE C
TO PRODUCT MANUAL FOR
Steel Tubes for Mechanical and General Engineering Purposes
According to IS 3601:2006

LIST OF TEST EQUIPMENTS

Page1of2

Major test equipment required to test asper requirements of Indian Standard.

SI No.	Test Equipment/Chemicals and Identification Numbers(Where applicable)	Tests Used in with Clause Reference
1	Straightedge, String,Concrete platform and Vernier calliper	Straightness(6)
2	i) Vernier caliper gauge or any other suitable device ii) Steel scale iii) Outside micrometer iv) Weighing Balance v) Measuring Tape	Dimensions(10)
3	Universal Testing Machine(UTM)	Tensile Test (13.1)
4	UTM with suitable attachments	Crush Test (13.6)
5	UTM with flattening test attachments	Flattening Test (13.2)
6	Variable Speed Pressor UTM,Conical Mandrels with angles30 degree, 45 degree, 60 degree etc	Drift Test (13.5)
7	UTM, bars of suitable dia	Strip BendTest(13.3)
8	Tube-bending machines with grooved former	Bend Test WholeTube(13.4)
9	Copper carbonate (laboratory grade) or Copper hydroxide (laboratory grade), Copper Sulphate Crystals – Technical grade, Ammonium Hydroxide, Alcohol, Distilled water, Volatile organic solvent such as ether, trichloroethylene, carbon tetrachloride, etc. and other chemicals and reagents applicable, Thermostatically Controlled Freezer (Capable of achieving 15 deg to 20 deg Celsius temp., LC = 1 deg. C)	Surface Protection (11.2)

10	**Instrumental methods** Spectrometer: atomic-absorption spectrometry, inductively coupled plasma atomic emission, inductively coupled plasma mass spectrometry techniques, spark source optical emission spectrometry. Spectrophotometer	S,P(7,14,20,25) S,P
11	Strohleinor Leco apparatus with attachment 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 certificateReagents 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	S-chemical method,alternative to instrumental method(7,14,20,25)
	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 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	Phosphorus content -chemical method, alternative to instrumental method (7,14,20,25)

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

ANNEXURE D
TO PRODUCT MANUAL FOR
Steel Tubes for Mechanical and General Engineering Purposes
According to IS 3601:2006

SCHEME OF INSPECTION AND TESTING

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, PACKING** – The Standard Mark as given in the Schedule of the license and Licence Number (i.e. CM/L…….) shall be incorporated, and the marking and packing 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.

4 **CONTROL UNIT** – For the purpose of this SIT, tubes of same size, type, grade designation, processed to same condition, manufactured from the same consignment of material (Cast/Heat of steel) under identical conditions in a shift on each tube mill shall constitute one 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.

All the production which conforms to the Indian Standards and covered by the licence should be marked with Standard Mark.
General requirements relating to the supply of material shall conform to IS 1387. Steels shall Steel tubes shall be manufactured as per Cl 7, 17, 21, 26 & 30 of IS 3601:2006, as applicable.

6 **TEST CERTIFICATE**-For each consignment of BIS Certified material conforming to IS 3601:2006 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.

TABLE1:LEVELSOFCONTROL

Section-1:GENERAL REQUIREMENTS APPLICABLE TO ALL THE FOUR TYPES OF STEEL TUBES

(1)				(2)	(3)		(4)
TESTDETAILS					LEVELSOFCONTROL		
Clause	Requirements	Test Method		Test equipment requirement R:required(or) S: Sub-contracting permitted	No of Samples	Frequency	REMARKS
		Clause	Reference				
4	Material i) Ladle Analysis ii) Check Analysis	41 42	IS3601:2006 IS228 (various Parts)or any established chem/instr. method	R S	One One	Each Heat Each Cast	Applicable only for manufacturers with steel making facilities. No testing is required if material is ISI marked and received with test certificate.
6	Workmanship	6	IS3601:2006	R	Each Tube	Each Tube	
8	Straightness	8	IS3601:2006	R	Each Tube	Each Tube	
9	Length	91 92	IS 3601:2006	R	One	One hour's Production of One size, type and grade	In case of failure all the tubes shall be checked and only those tubes found conforming shall be Marked.
10	Dimensions and properties	10	IS 3601:2006	R	One	-do-	
11	Surface Protection	11.1 11.2	IS3601:2006 IS2633	R$	One	Each Control Unit	This is an optional requirement. See Note-3.

Section-2: WELDED STEEL TUBES(WT)

(1)				(2)	(3)		(4)
TESTDETAILS					LEVELSOFCONTROL		
Clause	Requirements	Test Method		Test equipment requirement R:required (or) S: Sub-contracting permitted	Clause	Requirements	REMARKS
		Clause	Reference				
18	Mechanical Properties	13.1 to 13.1.3 Table-2,3 14 15	IS3601:2006 IS1608Pt.1 IS4711	R	One	Each Control Unit	
19	Tolerances	19.1to 19.1.4 Table-4	IS3601:2006	**R**	One (One hour's Production of each size, type & grade)	Every Hour	1. In case internal fin is required to be cut the maximum fin height is to be as agreed to between the manufacturer and the purchaser. 2. In case of failure all the tubes shall be checked and only those tubes found conforming shall be Marked.
20	Other Tests	13.2 13.4 135 14 15 Table-5,6,7	IS3601:2006I S2329 IS2328 IS2335	R$	---do----	---do----	See Note-3

Section-3: HOT FINISHED SEAMLESS STEEL TUBES(HFS)

(1)				(2)	(3)		(4)
TESTDETAILS					LEVELSOFCONTROL		
Clause	Requirements	Test Method		Test equipment requirement R:required(or) S: Sub-contracting permitted	No. of sample	Frequency	REMARKS
		Clause	Reference				
22	Mechanical Properties	13.1 to131.3 Table-8 14 15	IS3601:2006 IS1608Pt.1 IS4711	R	One	Each Control Unit	
23	Dimensions and Properties	23.1 23.1.1 Table-9	IS3601:2006	R	One (One hour's Production of Each size, type & grade)	Every Hour	In case of failure all the tubes shall be checked andonly those tubes foundconforming shall be Marked.
24	Tolerances	24.1to24.1.3	IS3601:2006	R	---do----	---do----	
25	Other Tests	13.2 13.3 14 15 25.1 to25.3 Table -10,11	IS3601:2006 IS2328	R$	---do----	---do----	SeeNote -3

Section-4: COLD DRAWN SEAMLESS STEEL TUBES (CDS)

(1)				(2)	(3)		(4)
TESTDETAILS					LEVELSOFCONTROL		
Clause	Requirements	Test Method		Test equipment requirement R:required(or) S: Sub-contracting permitted	No. of Samples	Frequency	REMARKS
		Clause	Reference				
27	Mechanical Properties	13.1 to13.1.3 Table-12 14 15	IS3601:2006 IS1608Pt.1 IS4711	R	One	Each Control Unit	
28	Tolerances	28.1to 28.1.4 Table-13	IS3601:2006	R	One (One hour's Production of each size,type& grade)	Every Hour	In case of failure all the tubes shall be checked and only those tubes foundconforming shall be Marked.
29	OtherTests	13.2 13.6 14 15 29.1 to29.3 Table -14,15	IS3601:2006 IS2328	R$	---do----	---do----	See Note - 3

Section-5:COLD DRAWN ELECTRIC RESISTANCE WELDED STEEL TUBES & HIGH FREQUENCY INDUCTION BUTT WELDED STEEL TUBES (CEW)

(1)				(2)	(3)		(4)
TESTDETAILS					LEVELSOFCONTROL		
Clause	Requirements	Test Method		Test equipment requirement R:required(or) S: Sub-contracting permitted	No. of Samples	Frequency	REMARKS
		Clause	Reference				
32	Mechanical Properties	13.1 to13.1.3 Table-16 14 15	IS3601:2006 IS1608Pt.1 IS4711	R	One	Each Control Unit	
33	Tolerances	33.1to 33.1.4 Table-17	IS3601:2006	R	One (One hour's Production of Each size, type & grade)	Every Hour	In case of failure all the tubes shall be checked a nd only those tubes found conforming shall be Marked.
34	Other Tests	13.2 13.5 13.6 14 15 34.1 to34.4 Table -18 to20	IS3601:2006 IS2328 IS2335	R$	---do----	---do----	See Note - 3

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: Levels of control given in column 3 are only recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification.

$Note-3: Test equipment(s) to be possessed by the manufacturer only for type(s) and condition(s) in which they intend to supply the material.

ANNEXURE I

BIS STANDARD MARK

(Para 6 of the Scheme of Inspection and Testing)
XYZ IRON AND STEEL COMPANY
(Registered office Address and works address)

TEST CERTIFICATE FOR Steel Tubes for Mechanical and General Engineering Purposes

TEST CERTIFICATE No._____ DATE_____

To M/s_____We certified that the material described below fully conforms to IS 3601:2006 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 IS 3601 : 2006 FOR DETAILS OF SPECIFICATION REQUIREMENTS)

TEST RESULTS

Order No. & Date	**Control Unit No.**	**Qty in tonnes**	**Size**			**CHEMICAL COMPOSITION**		**PHYSICAL PROPERTIES@**								**Surface protection #**	**Remarks**
			OD	Thk	Length	S %	P %	TS	YS	%EL	Drift Test	Crushing Test	Bend Test	Strip Bend Test	Flattening Test		

If agreed between
@ As applicable
REMARKS
WAGON NO.
TRUCK NO.

FOR XYZ IRON AND STEEL COMPANY

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