SCHEME OF TESTING AND INSPECTION FOR CERTIFICATION OF CARBON STEEL BILLETS, BLOOMS, SLABS AND BARS FOR FORGINGS ACCORDING TO IS:1875-1992 (Fifth Revision)

1. **LABORATORY**: A laboratory shall be maintained which shall be suitably equipped and staffed, where the tests shall be carried out in accordance with the methods given in the specification.

2. **TEST RECORDS**: All records of tests and analysis shall be kept in suitable forms approved by the Bureau.

NOTE: The existing forms etc., as being maintained by the manufacturers may be retained, these forms, however, shall contained all the information required for operating this Scheme of Testing and Inspection.

2.1 Copies of any records or charts that may be required by BIS shall be made available at any time on request.

2.2 **QUALITY CONTROL**: It is recommended that, as far as possible, Statistical Quality Control (SQC) methods may be used for controlling the quality of the product during production as envisaged in this scheme. [see IS:397 (Part I)-1972, is:397 (Part II)-1985 and IS:397 (PART III)-1980].

2.3 In addition the provision of quality system specified in IS:14003-1988 “Quality Systems – model for the Quality Assurance in final inspection and Test’ may be complied with as far as possible.

3. **STANDARD MARK**: The Standard Mark as given in the First Column of the first schedule of the licence is specified for the carbon steel billets, blooms, slabs and bars for forgings conforming to IS:1875-1992.

3.1 **TEST CERTIFICATE**: For each consignment of BIS Certified material conforming to IS:1875-1992 there shall be a test certificate which shall contain the Standard mark, cast number, class designation and the corresponding test results (as given in Annexure I).

3.1.1 **MARKING**: The material shall be identified as follows:

a) Each billet, bloom, slab and bar over 50 mm in diameter or width across flats shall be legibly stamped with the cast number and the class designation; and

b) Bars upto and include 50 mm dia or width across flats shall be bundled together and a tag attached bearing the cast number and the class designation.

3.1.2 The material may also be painted with a suitable colour in accordance with IS:2049-1978 colour Code for identification of Wrought Steel products for General Engineering purposes.

4. **MANUFACTURE**: Billets, blooms, slabs and bars for forgings shall be manufactured from killed steel made by open-heart, electric, basic oxygen, combination of these processes, or by any other suitable method which will meet the requirements of standard. The stock may be manufactured by hot rolling or forging.

4.1 Sufficient discard shall be made from each ingot to ensure freedom from piping, harmful segregation and other defects.

4.2 The material shall be made from ingot having at least four times the cross sectional area of the product.

4.2.1 For blooms 300x300 mm and larger size or its equivalent cross sectional area, though not meeting the requirement of 4.2 may also be supplied with prior permission from the purchaser. In case of reduction by forging process the prior permission from the user is not necessary provided the reduction is not less than 2.5:1.

4.3 The conditioning method should be so chosen that it shall not have any injurious effects in the billet, bloom and bar Ref.Cl. 5.4 of IS;1875-1992. Material required for forging may be conditioned to remove injurious surface defects provided that the following limitations shall apply.

a) Conditioning shall be allowed only in the longitudinal direction. Conditioning in the transverse direction shall not be allowed, except for surface inspection purposes.

b) The depth of conditioning shall not exceed 1 mm for every 15 mm of the dimension concerned subject to a maximum depth of 20 mm.

c) The width of conditioning shall be at least four times its greatest depth.

d) An exception is made in the case of slabs whose width is at least twice the thickness. The depth of conditioning in the case of slabs shall not exceed 1 mm for every 10 mm of the dimensions concerned subject to a maximum depth of 20 mm.

e) While conditioning the material, the dimensions of product may go below the minimum dimensions permitted according to the tolerances specified. When reduced amount of dressing than what is permitted by such clauses b), c) and d) is required, the extent of dressing shall be mutually agreed to between the manufacturer and the purchaser.

f) If the material is used for closed die forging, the dressing may be allowed to such an extent that its cross sectional area as defined by the dimensional tolerances does not go below the minimum of the tolerance limit.

5. **LEVELS OF CONTROL**: The inspections and tests as indicated in Table 1 and at the levels of control specified therein, shall be carried out on the whole production of the factory which is covered by this scheme and appropriate records and charts maintained in accordance with paragraph 2 above. All the production which conforms to the Indian Standard and covered by this licence shall be marked with BIS Certification Mark.

5.1 On the basis of tests and inspection results, decisions regarding conformity or otherwise of lots of billets, blooms slabs and bars for forgings to the requirements of the specification shall be taken as indicated below:

5.1.1 **CHEMICAL COMPOSITION**: Chemical composition (Ladle analysis) obtained by analyzing three samples from each heat of 100 tonnes and above and two samples from each heat of less than 100 tonnes shall conform to the requirements laid down in 6.1 of IS:1875-1992. Check analysis on the finished products shall be made at the rate of one samples per section per cast and shall conform to composition requirements given in Table 1 with allowance of variation as given in 6.2.1 of IS:1875-1992.

5.1.2 **FREEDOM FROM DEFECTS**: Billets, blooms, slabs and bars shall be free from any external or internal cracks; surface flaws; laps; rough; jagged and imperfect edges; and all other injurious surface imperfections which may result in defects in the forgings made therefrom. Each and every piece shall be inspected and those found defective shall be eliminated and not covered under Standard Mark.

5.1.3 **TENSILE TEST**: Periodic calibration shall be done on the tensile testing machines. The frequency of such calibration should preferably be once in six months and in any case not less than in once in a year.

5.1.3.1 **SELECTION OF TEST SAMPLES**: In case of bars upto 100 mm size, the test samples shall be selected from finished product the rate of one sample from each lot provided the quantity from one cast does not exceed 25 metric tonnes. Where the quantity from each cast exceeds 25 metric tonnes, one more test sample shall be selected. When more than one diameter or thickness or bar is rolled from the same cast, one additional test sample shall be selected from each diameter or thickness or bar.

5.1.3.2 **TENSILE TEST**: Tensile test shall be carried out in accordance with IS:1608-1972 Method for Tensile Testing of Steel products. The test pieces shall be machined lengthwise from each test sample selected as desired in clause 9.1 of IS;1875-1992.

5.1.3.3 **HARDNESS TEST**: The hardness test shall be carried out as per IS:1500-1983.

5.1.3.4 **DIMENSIONS AND TOLERANCES**: The material shall conform to the tolerances as specified in clause 8.1 to 8.3 of IS:1875-1992.

5.1.4 **RETEST**:

5.1.4.1 **PRODUCT ANALYSIS**: If the results of the check analysis do not conform to the composition requirements given in Table 1 and steel grade with allowance of variation in case of check analysis from the specified limits, unless otherwise agreed to between the purchaser and the manufacturer, two new samples shall be taken on different pieces from the same cast. Should the two analysis satisfy the requirements, the lot represented shall be accepted, should either of the sample fail, the material shall be taken as not complying with this standard.

5.1.4.2 **MECHANICAL PROPERTIES**: Should any of the test pieces first selected fail to pass any of the tests specified, two further samples shall be selected for testing in respect of each failure. Should the test pieces from both these additional samples pass, the material represented by the test samples shall be deemed to comply with the requirement of that particular test. Should the test pieces from either of these additional samples fail, the material represented by the test samples shall be considered as not having complied with this standard, except that the manufacturer may reheat-treat (not more than twice) the material represented and re-submit it for testing.

5.1.5 **SUPPLEMENTARY REQUIREMENTS**:

5.1.5.1 The following supplementary requirements shall apply only when specified by the purchaser in the inquiry, contract and order. Details of these supplementary requirements shall be as agreed to between the manufacturer and the purchaser.

5.1.5.2 **CHEMICAL COMPOSITION**: The purchaser may specify in special cases more restricted range for one or more elements in respect of carbon, sulphur and phosphorus than the compositional limits indicated in Table 1 of the specification.

5.1.5.3 **BEND TEST**: When bend test requirements for classes 1, 1A, 2, 2A, 3, 3A and 4 are specified the same shall be carried out in accordance with IS:1599-1985. Where the dimensions permit, test pieces 230 mm long and 32 mm square with edges rounded off shall be machined lengthwise from each test sample and bent cold by direct pressure round a former of diameter appropriate to the class of steel as shown in fig. 3 (of the specification) until the sides of the test piece are parallel.

5.1.5.3.1 Smaller sizes shall be bent in full section by a former having a diameter proportional to that specified for a 32 mm square test piece. Each bend test shall comply with the requirements without fracture.

5.1.5.3.2 Subsequently, the end of the test pieces for classes 1, 1A, 2, 2A, 3 and 3A material shall be brought together by direct pressure and the test piece shall not fracture.

5.1.5.3.3 No bend test shall be required for classes 5 and 6.

5.1.5.4 **GRAIN SIZE**: When agreed to between the supplier and the purchaser, steel shall be supplied with the specified grain size in accordance with IS:4748-1988.

5.1.5.5 **MACRO STRUCTURE**: Macro structure of the steel on the etched transverse sections when examined in accordance with IS;11371-1985 shall be free from harmful shrinkage porosity, blow holes, laminations, cracks, non-metallic inclusions, cavities, flux, dendrits, etc. Acceptance norms shall be as agreed to between the supplier and the purchaser.

5.1.5.5.1 The steel rolled from continuously cast route shall also be examined by following the methods of preparation of sample in accordance with IS;11371-1985 and the norms of acceptance shall be mutually agreed to between the supplier and the purchaser.

5.1.5.6 **ULTRASONIC TEST**: Ultrasonic examination and the level of acceptance shall be mutually agreed to between the manufacturer and the user.

5.1.5.7 **MAGNETIC PARTICLE TEST**: Magnetic particle test shall be carried out in accordance with the method specified in IS:10138 (Part III)-1983 and level of acceptance shall be mutually agreed to between the supplier and the purchaser.

5.1.5.8 **BLUE FRACTURE TEST**: The test shall be conducted in accordance with IS:1075-1985 and the level of acceptance shall be mutually agreed to between the manufacturer and the user.

6. **REJECTION**: Records shall be maintained for a reasonable time from which information relating to the rejection of material shall be available. Such rejected material shall be segregated separately and shall not be mixed up with that which conforms to the specification.

7. **SAMPLES**: The licensee shall supply, free of charge, the samples required in accordance with the Bureau of Indian Standards (Certification) Regulation, 1988, as subsequently amended from his factory or godown. BIS shall pay for the samples taken by it from the open market.

8. **REPLACEMENT**: Whenever a complaint is received soon after the goods with Certification mark have been purchased and used and if there is adequate evidence that the goods have not been misused, defective goods shall be replaced free of cost by the licensee in case the complaint is proved to be genuine and the warranty period (where applicable) has not expired. The final authority to judge conformity of the product to the Standard shall be with BIS.

9. **SUSPENSION OF MARKING**: The marking of the product shall be suspended under intimation to BIS, if, at any time, there is some difficulty in maintaining the conformity of the product to the specification, or the testing equipment goes out of order, or if directed to do so by BIS for any reason. The marking may be resumed as soon as the defects are removed or when BIS gives the permission to do so. The information regarding resumption of marking shall also be sent to BIS.

10. **PRODUCTION DATA**: The licensee shall send to BIS as per the enclosed proforma, a statement of the quantity produced, marked and exported by him and trade value thereof during the half-year

ending 30 June and 31 December. This statement is required to be forwarded to BIS on or before the 31st day of July and January for the preceding half-year.

Table 1 …….

IS 1875:1992
CARBON STEEL, BILLETS, BLOOMS, SLABS AND BARS FOR FORGINGS
TABLE 1 LEVELS OF CONTROL
(Part 5 of the Scheme of Testing and Inspection)

TEST DETAILS				LEVELS OF CONTROL			
Sl No.	Requirements	Test Method		No. of Samples	Lot size	Frequency	
		Clause	Reference				
1. CHEMICAL COMPOSITION:							
a) Ladle analysis		6 & Table 1	IS:1875-1992 & IS:228	Three	One heat	Each heat of 100 tonnes or more.	Three sample middle and en
			-do-	Two	One heat	Each heat of less than 100 tonnes but more than 25 tonnes	For heat les tonnes, two beginning and
			-do-	One	-do-	Each heat of less than 25 tonnes.	For heat less drawn
b) Check Analysis		6.2 & Table 1	-do-	One	-do-	Each heat.	
2. Freedom from defects.		7.1	IS:1875-1992			Each and every piece.	
3. Dimensions & Tolerances.		8.1 & 8.2	-do-			Adequate inspection to ensure the p specification.	
4. Tensile test.		9.1 & Table 2	IS:1875-1992 & IS:1608-72	One	See clause5.1.3.1 of STI		See clause 4.2
5. Hardness test.		9.2 & Table 2	IS:1875-1992 IS:1500-1983	Five	One heat	Each heat	
6. Bend Test.		12.2	IS:1875-1992	These requirements shall apply only when specified by the pu Details of these requirements shall be as agreed to between the m of IS:1875-1992)			
7. Grain size.		12.3	-do-				
8. Macrostructure.		12.4	-do-				
9. Ultrasonic test.		12.5	-do-				
10. Magnetic Particle Test.		12.6	-do-				
11. Blue Fracture Test.		12.7	–do-				

ANNEXURE I

(para 3.1 of the Scheme of Testing and inspection)

XYZ IRON AND STEEL COMPANY Standard Mark

(Regd. Office Address and Works address _____)

TEST CERTIFICATE FOR CARBON STEEL BILLETS, BLOOMS, SLABS ANDBARS FOR FORGINGS

TEST CERTIFICATE NO._____ DATE. _____

To

M/s _____

We certify that the material described below fully conforms to IS:1875-1992. Chemical Composition and mechanical properties of the product as tested in accordance with the Scheme of Testing and inspection contained in the BIS Certification Marks licence No. CM/L _____ are as indicated against each order No. etc.

(PLEASE REFER TO IS:1875-1992 FOR DETAILS OF SPECIFICATION REQUIREMENTS)

TEST RESULTS

Order No. & Date	Section (nominal size mm	Cast No.	Quantity	CHEMICAL ANALYSIS					MECHANICAL PROPERTIES					Class design-nation	Rem
				C %	Si %	Mn %	S %	P %	Yield strength MPa	Tensile strength MPa	Elonga-tion %	Hard-ness BHN	Supple-mentary Require-ments		

The material supplied performs to the standard rolling tolerances.

REMARKS

SHIPPING ADVICE NO.

SIGNATURE: _____

WAGON NOS.

Designation: _____

For XYZ IRON & STEEL COMPANY

(It is suggested that size A-4 PAPER 210 X 297 mm) be used for this Test Certificate)