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भारतीय मानक मसौदा

जल कूप ड्रिलिंग में उपयोग के लिए बाह्य अपसेट ड्रिल पाइप समुच्चय — विशिष्टि

भाग 1 चूड़ीदार संयुक्त ड्रिल पाइप

(पहला पुनरीक्षण)

DRAFT Indian Standard

EXTERNAL UPSET DRILL PIPE ASSEMBLIES

FOR USE IN WATER WELL DRILLING — SPECIFICATION

PART 1 SCREWED ON JOINTS DRILL PIPE

[*First Revision* of IS 11312 (Part 1)]

ICS 23.040.70

**Diamond Core and Water Well Drilling Sectional
Committee, MED 21**

**Last date for receipt of
comments is 10 April 2022**

FOREWORD

(Adoption clauses to be added later)

This standard was first published in 1985.

Major changes in this revision are as follows:

- a) A reference clause has been added mentioning the latest version of all the referred standards;
and
- b) Editorial corrections have been incorporated.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2:2022 ‘Rules for rounding off numerical values (second revision)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

DRAFT Indian Standard
EXTERNAL UPSET DRILL PIPE ASSEMBLIES
FOR USE IN WATER WELL DRILLING — SPECIFICATION
PART 1 SCREWED ON JOINTS DRILL PIPE

[*First Revision* of IS 11312 (Part 1)]

1 SCOPE

This standard covers the requirements for external upset drill pipe with screwed on tool joints for use in water well drilling by rotary drills.

2 REFERENCE

The standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subjected to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below:

<i>IS/ISO No.</i>	<i>Title</i>
228 :1987 (Part 1)	Methods for chemical analysis of steels Determination of carbon by volumetric method (for carbon 0.05 to 2.50 percent) (<i>third revision</i>)
(Part 2)	Determination of manganese in plain - carbon and low alloy steels by arsenite method (<i>third revision</i>)
(Part 3)	Determination of phosphorus by alkalimetric method (<i>third revision</i>)
(Part 4)	Determination of total carbon by gravimetric method (For Carbon R 0.1 Percent) (<i>third revision</i>)
(Part 5)	Determination of nickel by dimethylglyoxime (Gravimetric) method (for nickel > 0.1 percent) (<i>third revision</i>)
(Part 6)	Determination of chromium by persulphate oxidation method (for chromium > 0.1 percent) (<i>third revision</i>)
(Part 7)	Determination of molybdenum by alpha-benzoinoxime method in alloy steels (for molybdenum 1 percent and not containing tungsten) (<i>third revision</i>)
(Part 8)	Determination of silicon by the gravimetric method (for silicon 0.05 to 5.00 percent) (<i>third revision</i>)
(Part 9)	Determination of Sulphur by evolution method (for sulphur 0.01 to 0.25 percent) (<i>third revision</i>)
(Part 10)	Determination of molybdenum by thiocyanate (photometric) method in low and high alloy steels (for molybdenum 0.01 to 1.50 percent) (<i>third revision</i>)

(Part 11)	Determination of total silicon by reduced molydosilicate spectrophotometric method in carbon steels and low alloy steels (for silicon 0.01 to 0.05 percent) (<i>third revision</i>)
(Part 12)	Determination of manganese by periodate spectrophotometric method in plain carbon, low alloy and high alloy steels (for manganese 0.01 to 5.0 percent) (<i>third revision</i>)
1387 : 1993	General Requirements for the supply of metallurgical materials (<i>second revision</i>)
1570 (Part 2) : 1979	Schedules for wrought steels Part 2 : Carbon steels (Unalloyed steels) (<i>first revision</i>)
IS 1608 (Part 1) : 2022/ ISO 6892-1 : 2019	Metallic materials — Tensile testing: Part 1 Method of test at room temperature (<i>fifth revision</i>)
IS 2328 : 2018/ ISO 8492 : 2013	Metallic material — Tube — Flattening test (<i>third revision</i>)
3333 (Part 3) : 1967	Dimensions for petroleum industry pipe threads: Part 3 Tubing round threads
6647 : 1972	Specification for drill pipes for use in oil or natural gas wells

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Nominal Size — The nominal outside diameter of pipe except at unsettled ends.

3.2 Tool Joints — A type of threaded socket having a ‘Box’ type connection at one end and a ‘Box’ or ‘Pin’ type connection at the other end.

4 MATERIAL

The test joints shall be made from 55C4 carbon steel conforming to IS 1570 (Part 2).

5 GRADES

Tool joints are graded in the following two grades as per IS 6647:

- a) Grade ‘Yst 379’; and
- b) Grade ‘Yst 517’.

6 DIMENSIONS AND MASS

6.1 Pipes

Dimensions and mass of drill pipes shall be as specified in Table 1.

6.1.1 Pipes shall be furnished in lengths of 3, 6, or 9 m having a tolerance of ± 60 , ± 70 , and ± 80 mm respectively.

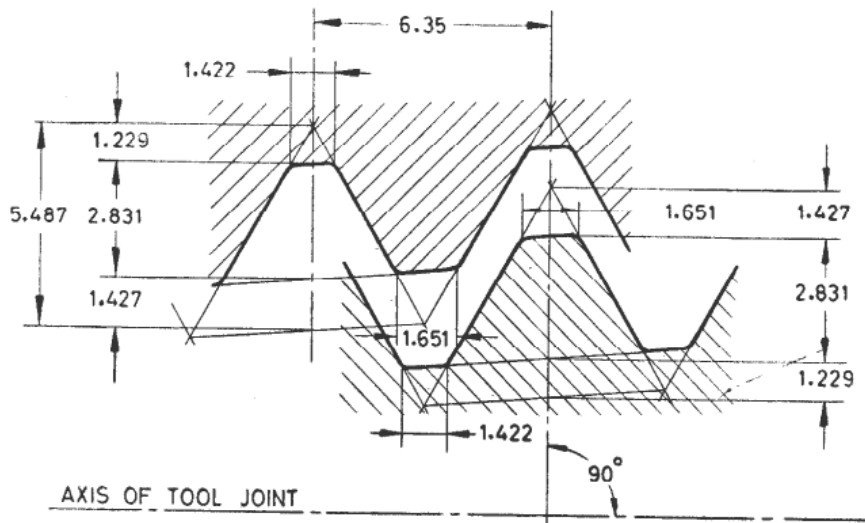
6.2 Tool Joints

Tool joints shall have dimensions as specified in Table 2.

6.3 Threads

6.3.1 Pipes shall have threads conforming to Table 3 of IS 3333 (Part 3).

6.3.2 Tool Joints — Pipe ends of tool joints shall have threads conforming to Table 3 of IS 3333 (Part 3). The threads form on ‘Pin’ and ‘Box’ end of joints shall be as shown Fig. 1.



THREAD PITCH = 6.35

TAPER = 1 IN 16

All dimensions in millimeters.

FIG. 1 DIMENSIONS OF THREADS FOR STANDARD ROTARY TOOL JOINT

7 TOLERANCES

7.1 Raw tube for drill pipes for water well drilling shall have the following tolerances:

Outside diameter	± 0.75 percent
Wall thickness	± 10 percent
Mass (single length)	+6.5 percent -3.5 percent

7.2 The joint between drill pipe and tool shall have tolerances conforming to Table 6 of IS 3333 (Part 3).

8. GENERAL REQUIREMENTS

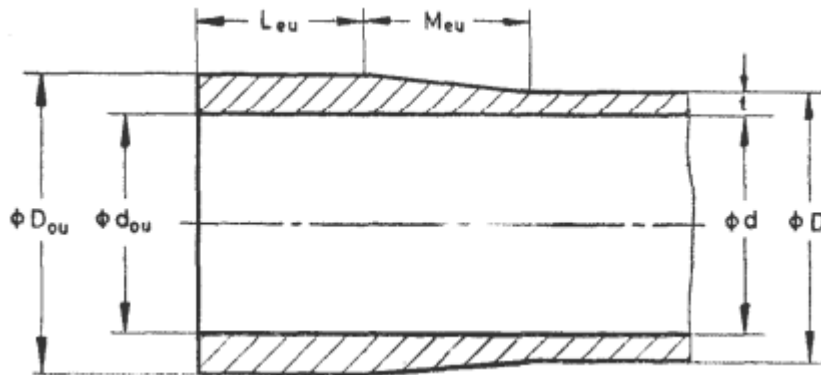
8.1 The supply of drill pipe shall conform to the general requirements laid down in IS 1387.

8.2 Steel for drill pipes shall be manufactured by open hearth electric basic oxygen or a combination of these processes. In case any other process is employed by the manufacturer, prior approval of the purchaser shall be obtained. If basic oxygen process is employed for manufacture, the nitrogen content of the steel shall not exceed 0.007 percent.

8.3 Drill pipes shall be manufactured by any of the following process:

- a) Hot finished seamless (HFS); and
- b) Cold drawn seamless (CDS).

**Table 1 Dimensions For Upset Ends Of Drill Pipes For
Water Wells Drilling**
(Clause 6.1)



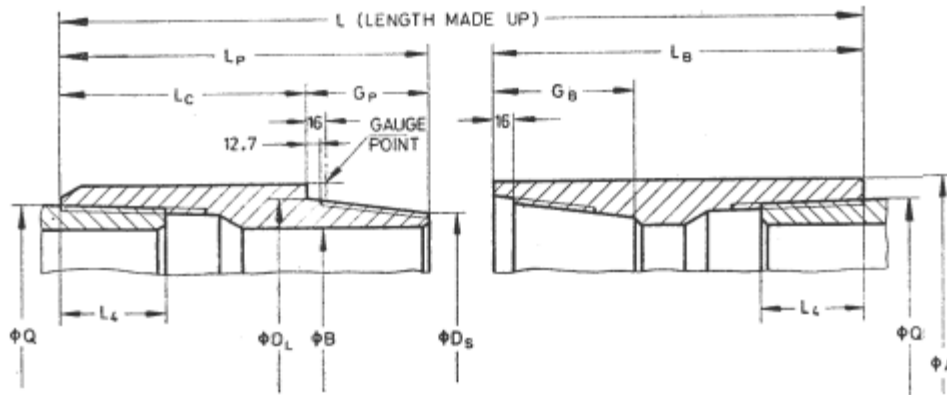
All dimensions in millimeters.

Sl No.	Nominal Size	Outside Diameter	Nominal Weight	Wall Thickness	Inside Diameter	Calculated Weight of Upset End	Outside Diameter at End of pipe	Inside Diameter at End of Pipe	Length of External Upset	Length of External Taper	Length end of Pipe to Taper Fadeout
(1)	(2)	D	kg/m	t	d	kg/m	D _{ou} +3.18 -0.79	d _{ou} -1.59	L _{eu} Min	M _{eu} Min	Min L _{eu} + M _{eu}
i)	60	60.3	7.2	4.83	50.6	0.82	67.5	50.6	53.98	38.1	92.08
ii)	60	60.3	7.8	5.11	50.1	0.82	67.5	50.1	53.98	38.1	92.08
iii)	60	60.3	9.9	7.11	46.1	0.82	67.5	46.1	53.98	38.1	92.08
iv)	73	73.0	10.2	5.51	62.0	1.09	81.8	62.0	66.68	38.1	104.78
v)	73	73.0	11.3	7.11	58.8	1.09	81.8	58.8	66.68	38.1	104.78
vi)	73	73.0	15.5	9.19	54.6	1.09	81.8	54.6	66.68	38.1	104.78
vii)	89	88.9	14.1	6.45	76.0	1.18	97.1	76.0	66.68	38.1	104.78
viii)	89	88.9	15.2	7.11	74.7	1.18	97.1	74.7	66.68	38.1	104.78

ix)	89	88.9	19.8	9.35	70.2	1.27	97.1	70.2	66.68	38.1	104.78
x)	89	88.9	23.1	11.40	66.1	1.27	97.1	66.1	66.68	38.1	104.78

Table 2 Dimensions Of Rotary Tool Joints

(Clause 6.2)



All dimensions in millimeters.

Sl No.	Nominal Size of Pipe	Outside Diameter of Tool Joint	Bore of Tool Joint	Small Diameter of Pin	Large Diameter of Pin	Length Small End of Pin to Shoulder	Length Pipe End of Pin to Shoulder	Total Length of Tool Joint	Combined Length of Pin and Box Made Up	Total Depth of Box	Total Length of Tool Joint	Diameter of Count Bore in Drill Pipe Ends	Total Length of Drill Pipe Threads
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
		$A \pm 0.79$	B $+0.40$ -0.79	D_s	D_L	G_p 0 -3.180	L_c	L_p $+3.18$ -12.7	L -25.4 0 -9.53	G_b	L_b $+3.18$ -12.7	Q	L_4
i)	60	85.72	44.45	60.35	73.05	76.20	165.1	241.30	406.4	92.08	241.3	70.64	53.98
ii)	73	104.77	53.98	71.32	86.13	88.90	171.45	260.35	431.8	104.78	260.35	84.93	66.68
iii)	89	120.65	68.26	85.06	102	101.6	177.8	279.4	457.2	117.4	279.4	100.0	66.68

8.4 Heat Treatment — Grade ‘Yst 517’ drill pipe shall be heat-treated in full length after upsetting. Grade ‘Yst 379’ drill pipes shall be normalized if so specified by the purchaser.

8.4.1 Hardness for ‘Yst 517’ drill pipe shall be 285 BHN.

8.5 Thread protectors shall be applied to each end of the pipe and tool joint to prevent damage to threads and pipe ends if applied separately. The type of protector shall be as agreed to between the purchaser and the manufacturer.

8.5.1 The manufacturer shall apply external and internal thread protectors of such design, material and mechanical strength as to protect the thread and end of the pipe from damage under normal handling and transportation. Thread protectors shall exclude water and dirt from the thread during transportation and normal storage period of about one year. The thread form in protectors shall be such that the product threads are not damaged by the protectors.

8.5.2 Protector material shall contain no compounds capable of causing corrosion or promoting adherence of the protectors to the threads and shall be suitable for service temperature according to Indian climatic condition.

8.6 Each drill pipe shall be supplied with tool joints in assembled condition. Tool joints shall be bucked on drill pipes by application of torque as specified in the following table:

<i>Sl No.</i>	<i>Nominal Size, mm</i>	<i>Minimum Bucking Torque For Tool Joint, mm</i>	<i>Power Makeup Turn</i>
(1)	(2)	(3)	(4)
i)	60	4 745	$3\frac{1}{2}$
ii)	73	8 810	$3\frac{1}{2}$
iii)	69	10 845	$3\frac{1}{2}$

9. DESIGNATION

A grade ‘Yst 517’ water well drill pipe of 60.3 mm diameter with a wall thickness of 7.11 mm manufactured by hot finished seamless process having a length of 6 m conforming to this standard shall be designated as:

Extend upset —Water Well Drill Pipe 517-60.3~7.11 HFS 6 IS 11312 (Part 1)

10. TESTS

10.1 Chemical Analysis

10.1.1 Ladle Analysis — If required by the purchaser, the manufacturer shall furnish the ladle analysis of each heat of steel. The steel, when analyzed in accordance with IS 228 (Parts 1 to 12) shall show not more than 0.06 percent of sulphur and 0.04 percent of phosphorous.

10.1.2 Product Analysis — Two samples drawn one from each of two length of pipes representing 400 lengths or part thereof shall be analyzed in accordance with IS 228 (Parts 1 to 12). The samples shall compose of cuttings or drillings representing the full wall thickness of drill pipe and shall be taken from several points around drill pipe. If drillings are used, the minimum drill size shall be 12.7 mm. The samples when analyzed shall conform to requirements laid down in **10.1.1**.

10.1.2.1 Recheck analysis — If the product analysis of both lengths of pipe representing the lot fails to conform to the specified requirements, at the manufacturer's option, either the lot shall stand rejected or all the remaining lengths in the lot shall be tested individually for conforming to the specified requirements of the product analysis. If only one of the two samples fails, at the manufacturer's option, either the lot shall stand rejected or two recheck analysis shall be made on two additional lengths from the same lot. If both the recheck analysis conform to the requirements, the lot shall be accepted, except for the length represented by the initial analysis which failed. If one or both of the recheck analysis fail, at the option of the manufacturer, the entire lot shall be rejected or each of the remaining lengths shall be tested individually. In the individual testing of the remaining in any lot, analysis for only the rejecting element or elements need the determined. Samples for recheck analysis shall be taken in the same manner as specified for product analysis samples.

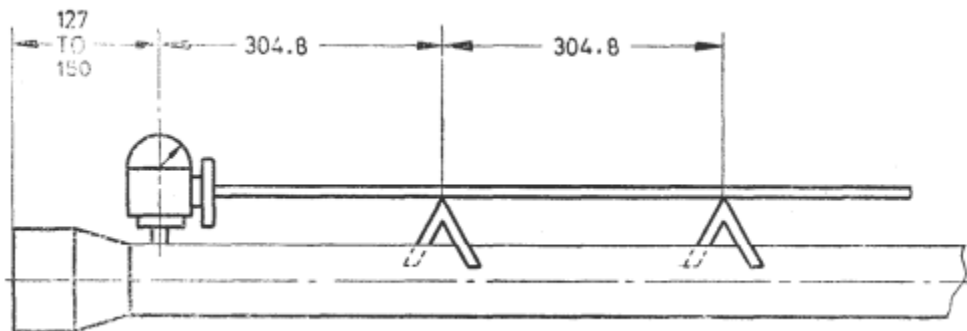
10.1.3 Mill Control Product Analysis — A product analysis shall be made by the manufacturer as a mill control of each heat of steel used for the production of pipe in this specification. Record of such analysis shall be available to the purchaser.

10.2 Dimensional Tests

10.2.1 Dimensions of pipes and tool joints and their threads shall be checked for conformity to requirements laid down in 6 and 7.

10.2.2 Eccentricity

10.2.2.1 The maximum eccentricity measured with a saddle gauge (*see* Fig. 2) at a distance of 127 to 150 mm from the upset end shall not exceed 2.4 mm (total reading of measuring instrument).



All dimensions in millimeters.

FIG. 2 SADDLE GAUGE FOR MEASURING ECCENTRICITY OF DRILL PIPE

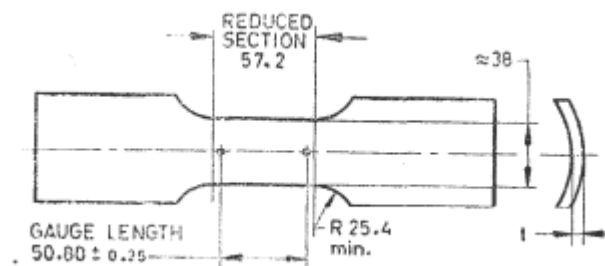
10.2.2.2 The maximum eccentricity of the bore of the upset with respect of outside surface of drill pipe shall not be more than 1.6 mm (3.2 mm total indicator reading).

10.2.2.3 Ovality — Maximum ovality as measured with micrometer on the external upset diameter shall not exceed 2.4 mm.

10.2.2.4 Drift test — Each length of external upset drill pipe except 88.9 O.D. x 9.35 mm thick, shall be tested throughout the length of the end upset with a drift mandrel having a diameter 5 mm smaller than the inside diameter of the pipe as given in Table 1 and a length of 125 mm.

10.3 Tensile Test — One tensile test shall be made on a length of pipes from each lot of 400 lengths or less provided that all the lengths in each lot shall have received the same heat treatment. For multiple length seamless pipe, a length shall be considered as all of the sections cut from a particular multiple length.

10.3.1 The yield strength, tensile strength and the percentage elongation of steel when determined in accordance with IS 1608 with the test piece as show in Fig. 3, shall conform to the values given in Table 3.



All dimensions in millimeter

FIG. 3 TENSILE TEST SPECIMEN

10.3.2 Test Specimen — Tensile test specimen shall be strip specimens as shown in Fig. 3. Strip specimens may be taken from any location at the option of the manufacturer. Tensile test specimens for heat-treated pipe shall receive the same treatment as finished pipes.

Table 3 Tensile Requirements

(Clause 10.3.1)

SI No.	Grade	Minimum Tensile Strength N/mm ² *	Minimum Yield Strength N/mm ² *	Minimum Elongation on 50.8 mm Gauge Length Percent
(1)	(2)	(3)	(4)	(5)
i)	Yst 379	655	379	See Note
ii)	Yst 517	690	517	

*1 kgf/mm² = 9.81 N/mm²

NOTE — The minimum elongation shall be determined by the following formula:

$$e = 2508 \frac{A_{0.9}}{U_{0.9}}$$

where

e = Elongation percent;

A = Cross sectional area of the tensile specimen in square millimeters; and

U = Tensile strength in N/mm².

10.3.2.1 The width of the specimen gauge length shall be approximately 38 mm if suitable curved face testing grips are used or if the ends of the specimen are machined to reduce the curvature in the grip area. Otherwise, it shall be approximately 19 mm wide for pipes up to and including 88.9 mm. In no case the specimen gauge width shall be greater than four times the thickness of the specimen.

10.3.2.2 If any tensile specimen shows defective machining or develops flaws, it should be discarded and another specimen substituted.

10.3.2.3 The test specimen shall represent the full wall thickness of the pipe from which the specimen was cut and shall be tested without flattening.

10.3.2.4 When the elongation of any tensile specimen is less than that specified, if any part of the fracture is outside the middle third of the gauge length as indicated by scribe scratches marked on the specimen before testing, a retest should be allowed.

10.4 Flattening Test — Flattening test shall be carried out in accordance with IS 2328.

10.4.1 Test specimens shall be taken at each end of each pipe before upsetting and heat treatment or on pipes at the rate of one per 20 lengths before treatment. In this case, specimens should be treated in a similar way to that specified for the grade concerned.

10.4.2 The test specimen shall be flattened between parallel plates with the specimen held in any position at the discretion of the inspector. No cracks or breaks shall occur anywhere in the specimen until the distance between plates is Less than that specified below:

<i>Sl No.</i> (1)	<i>Grades</i> (2)	<i>D ≥ 13 x e</i> (3)	<i>D < 13 x e</i> (4)
i)	Yst 379 Yst 517	$0.7 \times D$	$0.965 - \frac{0.0206 \times D}{e} \times D$

where

D = Outside diameter in mm; and

e = Thickness in mm.

10.5 Retests — If the tensile test specimen representing a lot of pipes fails to conform to the specified requirements, the manufacturer may elect to make retests on two additional lengths from the same lot. If both of the retests specimens conform to the requirements the lot shall be accepted, except the length from which the initial specimen was taken. If one or both of the retest specimens fail to conform to the specified requirements, the manufacturer may elect to test individually the remaining lengths in the lot in which case determinations are required only for the particular requirements with

which the specimen failed to comply in the preceding test. Specimens shall be taken in the same manner as specified in **10.3**.

10.5.1 If either test specimen in the case of flattening test representing a single length of pipe or a multiple length of seamless pipe fails to meet the requirements specified, the manufacturer may elect to make additional test on specimens cut from the same end of the same length of pipe until the requirements are met, except that the finished pipe shall not be shorter than 80 percent of its length after initial cropping. If any test specimen from a length of pipe representing a lot fails to conform to the requirements specified, the manufacturer may elect to repeat the test on specimen cut from two additional length of pipe from the same lot. If such specimens conform to the specified requirements, all the lengths in the lot shall be accepted, except the lengths initially selected for the test. If any of the retest specimens fails to face the specified requirements, the manufacturer may elect to test the specimens cut from the individual lengths remaining in the lot. Specimen for retests shall be taken in the same manner as specified in **10.4**. At the option of the manufacturer any lot of heat-treated pipes may be reheat-treated and retested.

11. MARKING

11.1 Die-Stamped Markings — Die-stamped markings indicating manufacturer's name and trademark shall be placed on each length of pipe on the upset portion at either end. Die-stamped markings shall be placed on the outside surface or if so agreed upon between the purchaser and the manufacturer on the inside surface with location at the option of the manufacturer.

11.1.1 Die-stamping shall be done with stamps having a blunt or rounded edge to minimize the possibility of stress concentration. The size of die-stamped markings shall be 6 mm.

11.2 Paint-Stencilled Markings — Paint-stencilled markings shall be placed on the outside surface of each length of pipe or if so agreed to between the manufacturer and the purchaser on the inside surface with location and sequence of the markings at the option of the manufacturer. If placed on the outside surface, the markings, except the length markings, shall start approximately 300 mm from the end of the pipe and the individual markings shall be separated by dashes or adequate spaces. The length of markings shall be applied at a location convenient to the manufacturer, but starting within 600 mm of the end of the pipe. The sequence of marking shall be as shown below:

- a) Nominal size;
- b) Grade of pipe;
- c) Manufacturer's name or trade-mark; and
- d) Type of heat treatment given.

11.3 BIS CERTIFICATION MARKING

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.