भारतीय मानक
Indian Standard

IS 17425 : 2020

[*Superseding* IS 14151 (Part 1) : 1999 and
IS 14151 (Part 2) : 2008]

सिंचाई उपस्कर — स्प्रिंकलर सिंचाई प्रणाली के लिए सहज संयोजी पोलिएथिलीन पाइप तथा फिटिंग — विशिष्टि

Irrigation Equipment — Quick Coupled Polyethylene Pipes and Fittings for Sprinkler Irrigation Systems — Specification

ICS 65.060.35

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November 2020 **Price Group 8**

Farm Irrigation and Drainage Systems Sectional Committee, FAD 17

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Farm Irrigation and Drainage Systems Sectional Committee had been approved by the Food and Agriculture Division Council.

Sprinkler irrigation system is one of the modern techniques being used for irrigation purpose. With the extensive use of quick coupled polyethylene pipes with sprinkler irrigation system a need was felt to formulate this standard to include the complete range of quick coupled pipes and fittings for intended use along with sprinkler irrigation systems.

This standard was initially published in two parts, 'Part 1 Polyethylene pipes' and 'Part 2 Quick coupled polyethylene pipes and fittings'. This standard is the amalgamation of these two standards. This standard supersedes both IS 14151 (Part 1) : 1999 (*first revision*) and IS 14151 (Part 2) : 2008.

IS 14151 (Part 1) was originally published in the year 1994. The first revision of this standard was done in 1999 to incorporate following modifications:

a) To incorporate amendment 1 to 3 of IS 14151 (Part 1) : 1994.
b) To incorporate orality requirement.
c) To incorporate fusion compatibility test.
d) To update the standard.

The following modification has been done in this version of standard after amalgamation of IS 14151 Part 1 and Part 2.

i) A new clause on definitions of various parts quick coupled pipe has been added.
ii) All the amendments of IS 14151 Part 1 has been incorporated in this standard.
iii) The material clause has been narmonized with IS 4984.

The principle of selection of PE pipes for Sprinkler Irrigation Systems are given in Annex C for guidance.

The composition of the Committee, responsible for the formulation of this standard is given at Annex E.

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 : 1960 'Rules for rounding off numerical values (*revised*)', The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

IRRIGATION EQUIPMENT — QUICK COUPLED POLYETHYLENE PIPES AND FITTINGS FOR SPRINKLER IRRIGATION SYSTEMS — SPECIFICATION

1 SCOPE

This standard lays down the general requirements for raw materials, manufacturing, method of tests and testing of quick coupled and plain polyethylene pipes and fittings of outside diameters 40 mm to 200 mm used for portable sprinkler and drip irrigation systems as mains, sub mains or laterals.

2 REFERENCES

The following standards 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 subject 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 indicated below:

IS No.	*Title*
2530 : 1963	Methods of test for polyethylene moulding materials and polyethylene compounds
4905 : 2015	Random sampling and randomization procedures (*first revision*)
4984 : 2016	High density polyethylene pipes for water supply (*fifth revision*)
7328 : 1992	High density polyethylene materials for moulding and extrusion (*first revision*)
504 : 1963	Methods of Chemical analysis of aluminum and its alloys
IS 504 (Part 1 to 12) : 2002	Chemical analysis of aluminium and its alloys: Part 1 to 12
504 (Part 13 to 16) : 2003	Chemical analysis of aluminium and its alloys: Part 13 to 16
513 (Part 1) : 2016	Cold reduced carbon steel sheet and strip: Part 1 Cold forming and drawing purpose
1079 : 2017	Hot rolled carbon steel sheet, plate and strip — Specification (*seventh revision*)
554 : 1999	Pipe threads where pressure tight points are made on the thread — Dimensions, tolerances and designation (*fourth revision*)
617 : 1994	Aluminum and aluminum alloy ingots and castings for general engineering purposes (*third revision*)
737 : 2008	Wrought aluminium and aluminium alloy sheet and strip for general engineering purposes — Specification (*fourth revision*)
1573 : 1986	Specification for electroplated coating of zinc on iron and steel
4736 : 1986	Specification for hot-dip zinc coatings on mild steel tubes (*first revision*)
5382 : 2018	Rubber seals — Joint rings for water supply, drainage and sewerage pipelines — Specification for materials (*second revision*)
6418 : 1971	Cast iron and malleable cast iron flanges for general engineering purposes
7634 (Part 2) : 2012	Plastics pipes selection, handling, storage and installation for potable water supplies — Code of practice: Part 2 Laying and jointing of polyethylene (PE) pipes (*first revision*)
1239 (Part 1) : 2004	Steel tubes, tubular and other wrought steel fittings — Specification: Part 1 Steel tubes (*sixth revision*)
1239 (Part 2) : 2011	Steel tubes, tubular and other steel fittings — Specification: Part 2 Steel pipe fittings (*fifth revision*)

3 DEFINITIONS

3.1 Sprinkler Pipe

An extruded pipe predominantly made of High Density Polyethylene (HDPE) manufactured in standard lengths (for example, 3 m, 6 m etc) or in continuous lengths, supplied in coil forms and used for water conveyance to operate Sprinkler systems.

3.2 Quick Coupled Sprinkler Pipe

A sprinkler pipe fitted/welded with generally male coupler at one end and female coupler at the other and equipped with clamping mechanism to couple two pipes together and incorporating an elastomeric pressure activated seal to prevent water leakage from the joint, to facilitate quick coupling or dismantling of pipes in shiftable Sprinkler systems (*see* Fig. 1).

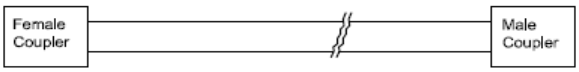


FIG. 1 QUICK COUPLED SPRINKLER PIPE

3.3 Male Coupler

A coupler generally made of the same material as pipe and welded/fitted at one end of sprinkler pipe and is complimentary to the female coupler used in sprinkler pipes for quick coupling**.**

3.4 Female Coupler

A coupler generally made of the same material as pipe and equipped with elastomeric seal welded/fitted at one end of the sprinkler pipe and is complimentary to the male coupler used in sprinkler pipes for quick coupling.

3.5 Sprinkler Quick Coupled Fittings

Quick coupled fittings equipped with either male coupler or female coupler or both used in sprinkler systems for facilitating connection to water source (for example, pump connector), branching (for example, tee), turning direction of pipe (bend), plugging of pipe ends (for example, end cap), transition from one pipe size to another (for example, reducer) and outlets for sprinkler heads connection (for example, foot batten assembly) or similar utility.

3.6 Quick Coupled Tee

A sprinkler fitting generally made of the same material as sprinkler pipes and equipped with one male coupler and one female coupler fitted at 180 degree opposite to each other with a female coupler fitted at 90 degree branching end. Female branch can also be of reduced size (*see* Fig. 2).

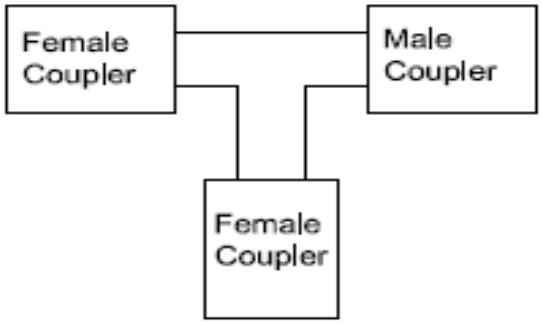


FIG. 2 QUICK COUPLED SPRINKLER TEE

3.7 Quick Coupled Bend

A sprinkler fitting generally made of the same material as sprinkler pipes and equipped with male coupler at one end and a female coupler at the other end which is generally at 90 degree angle. Female end can also be of reduced size (*see* Fig. 3).

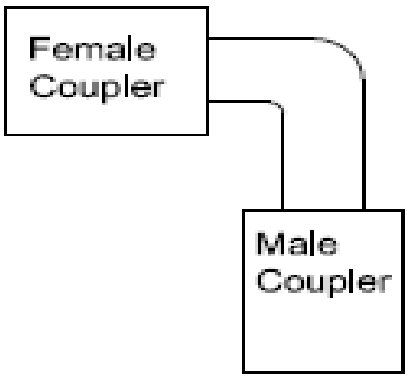


FIG. 3 QUICK COUPLED SPRINKLER BEND

3.8 Quick Coupled Pump Connector

A sprinkler fitting generally equipped with a female coupler at one end and a male/female threaded metal/plastic part or a flanged end at the other, used for connecting the sprinkler pipes to the pressurized water source, may be directly connected to pump or a pipe (*see* Fig. 4).

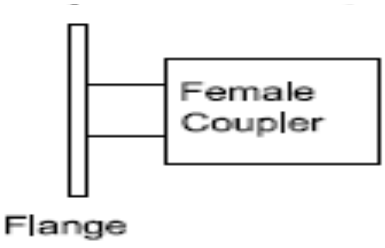


FIG. 4 QUICK COUPLED PUMP CONNECTOR

3.9 Quick Coupled End Cap

A sprinkler fittings generally with a male coupler but with blocked end, used to plug the end of sprinkler pipe (*see* Fig. 5).

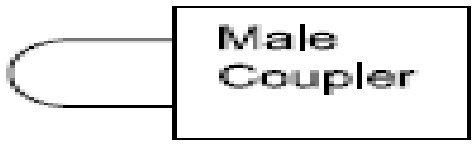


FIG. 5 QUICK COUPLED END CAP

3.10 Quick Coupled Reducer

A sprinkler fitting used for connecting quick coupled sprinkler pipes of smaller diameter to larger diameter or vice versa and usually equipped with a male coupler of diameter compatible with the larger diameter of pipe to be connected and female coupler of diameter compatible with the pipes of smaller diameter to be connected (*see* Fig. 6).

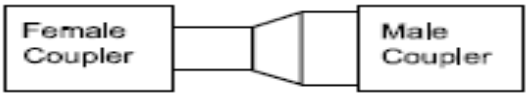


FIG. 6 QUICK COUPLED REDUCER

3.11 Quick Coupled Foot Batten Assembly

A sprinkler fitting generally equipped with a female coupler at one end and male coupler at the other with a threaded outlet at middle to connect sprinkler riser and a pedestal to support the sprinkler to withstand its oscillations. The pedestal can be of metallic or of plastic, can be clamped on fitting or it can be integral part or one piece construction of fitting, however, totally one piece foot batten with pedestals can also be used (*see* Fig. 7).

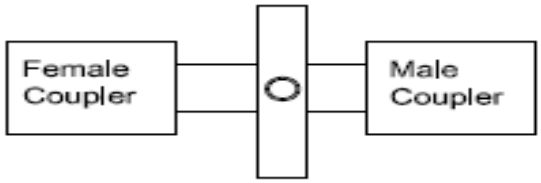


FIG. 7 QUICK COUPLED FOOT BATTEN ASSEMBLY

3.12 Sprinkler Riser

A metallic pipe generally of nominal size ¾" and with pipe threading at both ends used to install sprinkler heads at an elevated height on the foot batten assembly. Risers of other sizes such as ½", 1", 1 ¼", 1 ½" and 2" may also be used (*see* Fig. 8).

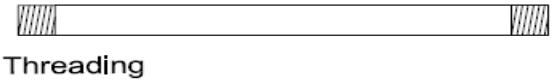


FIG. 8 SPRINKLER RISER

3.13 Sprinkler Main Line

Sprinkler pipes generally used as mains to connect to water supply in a sprinkler system. The mains may be equipped with quick couplers or without.

3.14 Sprinkler Sub-main

Sprinkler pipes, generally used as sub-mains to convey water from the mains to the end pipes in a sprinkler systems. The sub-main pipes are intermediate between the mains and laterals, may or may not be equipped with quick couplers.

3.15 Sprinkler Laterals

Sprinkler pipes generally equipped with quick couplers to facilitate shifting from one place to another, are coupled with foot batten assembly with riser and sprinklers to operate the sprinkler system.

4 MATERIAL

4.1 PE Pipes, Couplers and Fittings

4.1.1 Polyethylene material of grade PE 63 or PE 80 (*see* Table 1 of IS 4984) and above shall be used for pipe, couplers and fittings manufacture.

The material used for the manuafacture of pipes should not constitute toxic hazard, should not support microbial growth.

4.1.2 Pipe manufactures shall obtain a certificate to this effect from the manufacturer of raw material.

4.1.3 PE resin used for the manufacture of pipes shall conform to parameters mentioned in Table 2 of IS 4984. The material classification conformity shall be provided by the raw material (resin) manufacturer with documentation duly certified as per Table 1.

4.1.4 *The Carbon Content and Dispersion*

The carbon content in the material shall be with in 2.5 ± 0.5 percent and the dispersion of carbon black shall be satisfactority when tested according to the procedure described in 10 and 16 of IS 2530 respectively. Carbon black content and dispersion tests shall be performed on the end product (pipe).

Table 1 Characteristics of PE Resin as Granules

(*Clauses* 4.1.3 *and* 7.1.6)

Sl No.	Characteristics	Units	Requirements	Test Parameters
(1)	(2)	(3)	(4)	(5)
i)	Base density	Kg/m³	930 – 960	27 °C
ii)	Melt flow rate	Gm/10 Minutes	0.2 – 1.10	At 190 °C using 5 Kg load
iii)	Thermal stability	Minutes	≥20	200 °C, Isothermal
iv)	Volatile matter	Mg/Kg	≤350	Number samples 1
v)	Water content	Mg/Kg	≤300	Number samples 1
vi)	Minimum tensile strength at yield	MPa	19	Test speed 100 mm/min
vii)	Minimum elongation at break	Percent	500	Test speed 100 mm/min

4.1.5 *Carbon Black Specification*

Carbon black master batch shall consist of a mixture of the following:

a) Polyethylene which may include co-polymer of ethylene and higher olefin, constituent, in which the higher olefin constituent does not exceed 10 percent (mass/mass) and density of 910 – 950 kg/m³.

b) Loading of carbon black shall not exceed 50 percent (mass/mass).

c) Ash content shall be < 0.10 percent.

d) Carbon black used in carbon black master batch shall comply with the following requirements:

1) Carbon black density: 1.50 – 2.00 g/ml

2) Toluene extract of carbon black: Not more than 0.10 percent (m/m)

3) Maximum volatile matter: 0.90 percent (m/m)

4) Carbon particle size not more than 25 micron

4.1.6 *Antioxidant*

The percentage of antioxidant in the base resin shall not be more than 0.5 percent by mass.

4.1.7 *Rework Material*

Addition of not more than 10 percent of the manufacturer's own rework material produced during the manufacture and works testing of pipes, coupled pipes and fittings complying with this standards is permitted. No other rework material shall be used.

4.2 Metallic Couplers

Metallic parts of couplers shall be made of either of following materials.

4.2.1 Aluminium alloy complying with the composition requirements of alloys 31000, 31500, 40800, 51300, 52000, 53000 and 55000 as specified in IS 737 or alloy 4600 of IS 617.

One coupler shall be selected at random from each lot (*see* **9.1.1**) for chemical analysis. Before test sample is cut off, it shall be marked to identify the batch number it represents.

The chemical composition of the test piece shall be determined either by methods specified in IS 504 Part 1 to 12 and IS 504 Part 13 to 16 or any other established instrumental/chemical method. In case of dispute, method specified in IS 504 Part 1 to 12 and IS 504 Part 13 to 16 shall be the referee methods.

4.2.2 Tested quality cold rolled steel conforming to 'CR1' grade of IS 513 (Part 1) or hot rolled steel confirming to IS 1079.

Metallic Couplers shall be hot-dip galvanized or electroplated, or passivated or powder coated after manufacture so that no part remains un-galvanized or un-electroplated or uncoated. The hot dip galvanizing shall be done in accordance with IS 4736 with a minimum zinc coating of 500 g/m². Electroplating shall not be less than 20 µm and powder coating shall not be less than 50 µm. Passivation for electroplate coating of zinc on iron or steel if performed as per Table 1 of IS 1573.

5 DIMENSIONS

5.1 Dimensions of Quick Coupled Pipes and Fittings

The dimensions of the quick coupled Pipes and fittings shall conform to the following requirements as per Table 2.

Table 2 Dimensions of Quick Coupled Pipes and Fittings

(*Clause* 5.1)

Sl No.	Description of Pipes and Fitting	Reference Standards for Dimension
(1)	(2)	(3)
i)	Plain pipes	The outside diameters, tolerances, ovality and wall thicknesses of pipes shall be as given in Table 3.
ii)	90° Bends and tee	The conventional sprinkler fitting being used shall be as per specification/ drawing declared by manufacturer, suitable to the class and dimensions of pipe
iii)	Base pipe	
iv)	PCN	
v)	Reducers, ferrule reducers	
vi)	End caps, insert valve coupler, valve openers	
vii)	Riser pipe and socket	IS 1239 (Part 1) and IS 1239 (Part 2)

Table 3 Dimension of Polyethylene Pipes for Sprinkler Irrigation

All Dimensions in millimeters

[*Table* 2 (i)]

Nominal Diameter	Outside Diameter	Nominal Tolerance on Outside Diameter	Ovality	Wall Thickness (e)							
				Class - 1 (0.25 Mpa)		Class - 2 (0.32 Mpa)		Class - 3 (0.40 Mpa)		Class - 4 (0.60 Mpa)	
				Min	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*
40	40.0	+ 0.4	1.40	-	-	-	-	-	-	2.30	2.80
50	50.0	+ 0.5	1.40	-	-	-	-	2.00	2.40	2.90	3.40
63	63.0	+ 0.6	1.50	-	-	2.00	2.40	2.50	2.90	3.80	4.40
75	75.0	+ 0.7	1.60	2.00	2.40	2.50	2.90	3.00	3.40	4.50	5.20
90	90.0	+ 0.8	1.80	2.20	2.60	2.90	3.40	3.50	4.10	5.30	6.10
110	110.0	+ 1.0	2.20	2.70	3.20	3.40	3.90	4.20	4.80	6.50	7.40
125	125.0	+ 1.2	2.50	3.10	3.60	3.80	4.50	4.80	5.50	7.40	8.30
140	140.0	+ 1.3	2.80	3.50	4.10	4.30	5.00	5.40	6.10	8.30	9.30
160	160.0	+ 1.5	3.20	3.90	4.50	4.90	5.60	6.20	7.00	9.40	10.60
180	180.0	+ 1.7	3.60	4.40	5.00	5.50	6.30	6.90	7.80	10.60	11.90
200	200.0	+ 1.8	4.00	4.90	5.60	6.10	7.00	7.70	8.70	11.80	13.20

NOTES

1 Wall thickness of pipes are based on safe working stress of 5.0 MPa at 35 °C for transport of cold water at atmospheric temperature. Occasional rise in temperature has no deleterious effects on the life and working pressure of the pipes.

2 Normal working conditions of pipes shall be operation of maximum 3000 pumping hours per year at the pressure rating of pipe and at water temperature up to 35 °C. Ifthese working conditions are exceeded the next higher class of pipe with greater wall thickness should be chosen. With these working conditions the life expectancy of the pipe is 15 years.

5.1.1 The outside diameter of the pipe shall be the average of two measurements taken at right angles for pipes up to 110 mm outside diameter or Pie tape. For sizes greater than 110 mm the diameter shall be measured by using a flexible Pi tape or with a circometer having an accuracy of not less than 0.1 mm. The wall thickness shall be measured by a dial vernier or ball ended micrometer. The resulting dimension shall be expressed to the nearest 0.1 mm.

NOTES

1 The outside diameter shall be measured at a distance of at least 300 mm from the ends of the pipe.

2 In the case of dispute the dimension of pipes shall be measured after conditioning at room temperature for 4 h.

5.1.2 Ovality shall be measured as the difference between maximum outside diameter and minimum outside diameter during manufacturing after extrusion but prior to coiling at the same cross section of the pipe, at 300 mm away from the cut end.

6 CLASSIFICATION OF PIPES

The pipe shall be classified by pressure ratings (working pressure) as given in Table 4.

Table 4 Classification of Pipes

(*Clause* 6)

Sl No.	Class of Pipes	Maximum Permissible Working Pressure at 30 °C
(1)	(2)	(3)
i)	Class 1	0.25 MPa
ii)	Class 2	0.32 MPa
iii)	Class 3	0.40 MPa
iv)	Class 4	0.60 MPa

6.1 Quick Coupled Pipes

Quick coupled pipes shall consist of polyethylene pipes conforming to this Standard and male and female couplers shall be fixed or welded on either side of such a pipe or integrally formed. The quick coupled male and female couplers shall be manufactured/fabricated from material conforming to **4**.

6.2 Quick Coupled Male and Female Couplers

The male and female couplers shall be of any of the two types described below. These male and female couplers have to be welded or integrally formed or fixed to each end of the pipes as well as to the other plain fittings. The types of male and female couplers are broadly:

a) Metallic Couplers — Manufactured predominantly from metal with suitable corrosion protection.

b) HDPE Couplers — Major parts of the couplers shall be manufactured from High Density Poly Ethylene (HDPE) with or without latching/ clamping arrangements manufactured out of either hot-dip zinc galvanized steel stripes or electroplated coating of Zinc or yellow passivation or powder coating or stainless steel or engineering plastics (UV stabilized) or integrally formed."

6.2.1 *HDPE Couplers*

HDPE parts of the coupler and fittings shall meet the material requirements given in **4** of this standard *or* UV Stabilized HDPE material. The wall thickness of the HDPE male and female couplers (welding end) shall be not less than the wall thickness of the HDPE pipe to which these couplers are being welded/fixed or integrally formed.

6.2.2 Metal parts of the coupler and fittings shall be manufactured from the aluminium or steel conforming to requirements given in **4.2.1** and **4.2.2** respectively.

6.2.3 *Sizes of Coupler Parts*

The size of coupler parts shall be designated by outside diameter and pressure class of pipes/fittings on which they are welded or fitted otherwise or integrally formed.

6.2.4 *Workmanship and Appearance*

The coupler parts shall be clearly and neatly finished and be free from burrs or other features likely to damage the pipe.

The internal and external surfaces of the coupler shall be clean and free from pin holes, voids or other features likely to affect the performance and service of the system.

6.2.5 *Holding Attachments for Coupler Parts*

In case any external attachment is provided for holding the coupler parts to form a quick leak proof joint, it must meet the following requirements:

a) Material for holding attachment shall conform to requirements given in **4.2.1** and **4.2.2**; and

b) The holding attachments must be strong enough to withstand the pressure two times the working pressure of the pipes.

6.2.6 *Rubber Ring*

The rubber ring or gasket or 'o' ring used for sealing the coupler against leakage, it shall be of natural rubber or nitrile or neoprene or TPE or EPDM and shall have shore hardness (Shore-A) between 55 to 70 with black or other colour with UV stabilisation. Maximum change in the hardness after keeping it in air at 70 °C for 7 days shall not vary by ± 10 percent when compared with the observed value at the beginning of the test.

6.3 Quick Coupled Pipe Fittings

The quick coupled pipe fittings consist of plain fittings (couplers, bends, tees, pump connecting nipples, end caps, service saddles with base supports, reducing couplers, reducing tees, reducing bends, threaded adopters, insert valve couplers, valve openers and transition pieces) welded or integrally formed or fixed with the male or female parts of the couplers of corresponding pressure class and with outside diameters to facilitate quick coupling with pipes. The male and female parts of the couplers on the quick coupling fittings shall conform to specifications given under **6.2** of this Standard, whereas the plain fittings or integrally formed fittings shall conform to the conventional sprinkler fitting being used by manufacturer suitable to class and dimensions of the pipe.

If the HDPE quick coupled bends, tees, reducers, ferrule reducers, pipe ends, reducing tees and end caps are made out of welding or integrally formed or fixing together of male end, female end on a plain fitting, the HDPE plain fitting shall meet the following material specifications.

6.3.1 If the material of construction/manufacture is HDPE, it has to conform to requirements given in **4**.

6.2.2 Metal parts of plain fitting shall be manufactured from the aluminum or steel meet requirements given in **4.2.1** and **4.2.2**.

6.2.3 The quick coupled insert valve coupler shall consist of a valve with a stud built into a HDPE or U.V. Stabilized plastic or aluminium or steel (*see* **4.2.1** and **4.2.2**) plain tee confirming to requirements of the conventional sprinkler fitting being used by manufacturer suitable to class and dimensions of the pipe shall match the corresponding stud holder at the end of valve spindle inside the valve opener. HDPE male or female quick couplers need to be welded, fixed or integrally formed on each side of the tee depending on the requirements of corresponding quick coupled valve openers.

6.2.4 The quick coupled valve openers shall consist of valve handle and spindle built into a HDPE or U.V. Stabilized plastic or aluminium or steel (*see* **4.2.1** and **4.2.2**) plain bend conforming to requirements under the conventional sprinkler fitting being used by manufacturer suitable to class and dimensions of the pipe: HDPE male and female quick couplers need to be welded or fixed or integrally formed on either side of the bend matching the requirements of quick coupled insert valve coupler.

6.2.5 The quick coupled sprinkler saddle/foot batten (base pipe) sprinkler assembly (plastic/metallic) shall consist of quick coupler (male female welded or integrally formed) with a female threaded outlet to take the sprinkler riser pipe. The size of female threaded socket and length of plain saddle shall conform to Table 5. The threaded outlet shall consist of corrosion resistant galvanized iron socket insert-moulded into the saddle and also optionally a metallic protection band on the outside diameter of the outlet to protect it from splitting or cracking. The saddle shall be adequately supported by a metallic or HDPE or U.V. Stabilized plastic base so that it does not topple during the rotation of sprinkler on the riser. Alternatively, the foot batten sprinkler assembly may be made out of quick coupler base pipe and metal saddle cum pedestal. All HDPE parts shall conform to the material requirements of **4** and all metallic parts shall conform to **4.2.1** and **4.2.2**.

The dimensions of metal (M.S.) or HDPE quick coupled saddles shall conform to Table 5.

6.2.6 The quick coupled pump connector (threaded type) shall consist of quick male or female couplers attached with a Galvanized Iron (G.I.). Nipple inserted into the HDPE pipe, as per the procedure under **2.2** of IS 7634 (Part 2). It can also be metallic/plastic screwed coupler or insert moulded threaded parts. The GI nipple may also be fixed in place with the HDPE pipe. All HDPE parts shall conform to the material requirements of **4** and all metallic parts shall conform to **4.2.1** and **4.2.2**. The threaded parts for connection to other threaded components shall comply with IS 554.

6.2.6.1 Flanged connections shall comply with specifications given in the following Table 6 and Table 7. The quick coupled pump connector (flanged shall consist of HDPE pipe end (stub end) and flange set attached to quick coupler.

6.2.6.2 *Dimensions of quick coupled pump connectors*

The dimensions of HDPE quick coupled pump connectors shall conform to Table 8.

Table 5 Dimension of Quick Coupled Sprinkler Saddles (Foot Batten)

(*Clause* 6.2.5)

Sl No.	Nominal Diameter (mm)	Minimum Length of Plain Saddle Without Male and Female Coupler (mm)	Nominal Size (Designation) of Threaded Female Outlet (*see* IS 554)
(1)	(2)	(3)	(4)
i)	40	50	¼, ½, ¾, 1
ii)	50	50	¼, ½, ¾ , 1
iii)	63	50	¼, ½, ¾ , 1, 1¼
iv)	75	50	¼, ½, ¾, 1, 1¼
v)	90	50	½, ¾ , 1, 1¼
vi)	110	90	¾, 1, 1 ¼
vii)	125	135	1, 1 ¼ , 1 ½
viii)	140	135	1 ¼, 1 ½, 2
ix)	160	135	1¼, 1 ½ , 2
x)	180	135	1¼, 1 ½, 2
xi)	200	135	1¼, 1 ½, 2

Table 6 Specifications (M.S.) Slip on Flanges Mild Steel (MS) Slip on Flanges for HDPE Pipes

(*Clause* 6.2.6.1)

Sl No.	Nominal Diameter of HDPE Pipe, mm	Nominal Size of Flange	Minimum Outer Diameter of Flange, mm	Pitch Circle Diameter, mm	Minimum Inside Diameter mm	Minimum Thickness, mm	No of Bolt Holes	Bolt Hole Diameter, mm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	40	1 ¼	120.7	87.3	51	6	04	14
ii)	50	1 ½	133.4	98.4	62	6	04	14
iii)	63	2	152.4	114.3	74	7.5	04	18
iv)	75	2 ½	165.1	127.0	86	7.5	04	18
v)	90	3	184.2	146.1	101	9	04	18
vi)	110	4	215.9	177.8	121	9	04	18
vii)	125	5	254.0	209.6	136	12	08	18
viii)	140	6	254.0	209.6	152	12	08	22
ix)	160	6	279.4	235.0	172	12	08	22
x)	180	8	304.8	260.4	192	12	08	22
xi)	200	8	336.6	292.1	212	12	08	22

Table 7 Specifications of HDPE/PP Solid Flanges

(*Clause* 6.2.6.1)

Sl No.	Nominal Diameter of HDPE Pipe, mm	Outer Diameter of Flange, mm	Pitch Circle Diameter, PCD-1 mm	Pitch Circle Diameter, PCD-2 mm	Inside Diameter mm	Minimum Thickness, mm	No of Holes	Hole Diameter, mm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	40	140	87.3	100	53	20	4	18
	50	150	98.4	110	64	20	4	18
	63	165	114.3	125	76	20	4	18
	75	185	127.0	145	88	20	4	18
	90	200	146.1	160	103	20	8	18
	110	220	177.8	180	123	20	8	18
	125	250	209.6	210	138	20	8	18
	140	250	209.6	210	154	20	8	18
	160	285	235.0	240	174	20	8	22
	180	285	260.4	240	194	20	8	22
	200	340	292.1	295	214	25	8	22

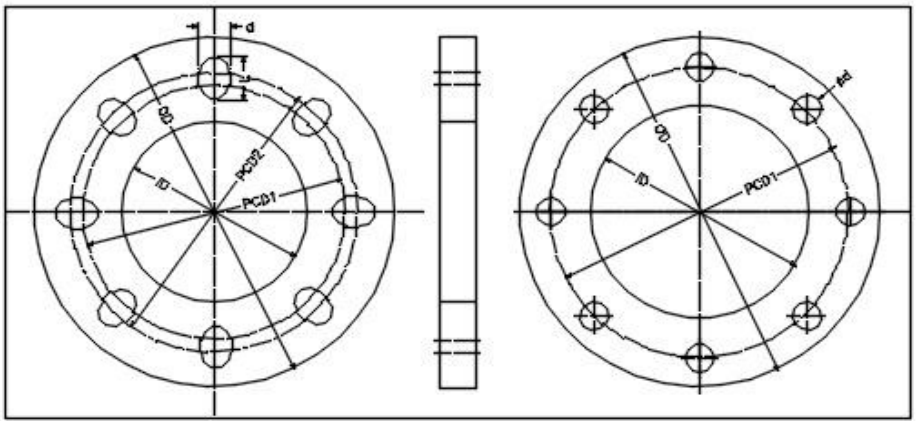


FIG. 9 HDPE/PP SOLID FLANGES (PCD-1 AND PCD-2 TYPE)

NOTE — HDPE/PP slip-on flanges can be of round hole with single PCD or multiple PCD with oval hole for bolt.

Table 8 Dimensions of Quick Coupled Pump Connectors

All Dimensions in millimetre

(*Clause* 6.2.6.2)

Sl No.	Nominal Diameter PE Pipe (mm)	Minimum Length of GI Nipple (mm)	Minimum Length of Metal Part for Insert Moulded Nipple (mm)	Length of Threaded Portion (mm)	Nominal Size of Female Threaded Socket for Fixing Pressure Gauge (IS 554) *Optional
(1)	(2)	(3)	(4)	(5)	(6)
i)	40	125	40	16.8 – 21.4	1/16
ii)	50	125	50	16.8 – 21.4	1/16
iii)	63	125	50	21.1 – 25.7	1/16, ¼
iv)	75	125	60	23.2 – 30.2	1/16, ¼
v)	90	125	60	26.3 – 33.3	1/16, ¼
vi)	110	125	60	32.3 – 39.3	1/16, ¼
vii)	125	200	100	36.6 – 43.6	1/16, ¼
viii)	140	300	140	36.6 – 43.6	1/16, ¼
ix)	160	300	160	36.6 – 43.6	1/16, ¼
x)	180	300	180	36.6 – 43.6	1/16, ¼
xi)	200	300	200	36.6 – 43.6	1/16, ¼

7 REQUIREMENTS

7.1 Plain PE Pipes

7.1.1 *Visual Appearance and Workmanship*

The internal and external surface of the pipes shall be smooth, clean and free from grooving, pitmarks and melt fractures. The ends shall be clearly cut and shall be square with the axis within tolerance of 2 mm for out-of-squareness of each pipe end. Slight shallow longitudinal grooves or irregularities in the wall thickness shall be permissible, provided the wall thickness remains within the permissible limits.

7.1.2 *Hydraulic Performance Characteristics*

When subject to internal pressure creep rupture test in accordance with the procedure given in Annex A, the pipes shall show no signs of localized swelling, leakage or weeping, and shall not rupture during the prescribed test duration. The temperature, duration of test and stresses for quality and acceptance test shall be as given in Table 9.

7.1.2.1 Acceptance tests carried out at a temperature of 80 °C allow a fast verification of the conformity to requirements of **7.1.2.**

7.1.2.2 Quality tests carried out at a temperature of 80 °C allow evaluation of the manufacturing process and the pipe material used and must be carried out once every year or when change is made in polymer composition or method of manufacture or when a new size of pipe is to be introduced.

7.1.2.3 For quality tests the manufacturer shall supply three samples of different diameters selected from a regular lot, which will be tested by testing authority. In the absence of a recognized testing laboratory, a certificate for compliance of pipe issued by the manufacturer's laboratory may be accepted.

7.1.2.4 If all the three samples, each of different diameters pass the requirements of the quality test, the type of pipe under consideration shall be considered eligible for quality approval which will be normally valid for a period of one year.

Table 9 Requirement for Internal Pressure Creep Rapture Test

(*Clauses* 7.1.2 *and* 7.1.5.1)

Test	Test Temperature °C	Test duration (Minimum Holding Time) h	Induced Stresses (Mpa)
(1)	(2)	(3)	(4)
Quality test	80	165	3.5
Acceptance test	80	48	3.8

7.1.2.5 In case any of the samples fails in quality test, the testing authority, at its discretion, may call for fresh samples not exceeding the original number and subject them to quality tests. If in repeat tests no single failure occurs, the type of pipe under consideration shall be considered eligible for approval. If any of the samples fails in the repeat tests, the type of pipe shall not be approved. The manufacturers may be asked to improve the design and re-submit the pipe for quality approval.

7.1.3 *Reversion Test*

A pipe length of 200 mm shall be placed horizontally on a support in an air-oven or a suitable liquid bath at temperature of 110 ± 2 °C for 60 min in such a way that the dimensional changes in the pipe section are not impeded. After cooling to room temperature, the dimensional change of the pipe section shall be measured in the longitudinal direction and deviation from the initial length shall be calculated and stated in percentage. The dimension shall not change by more than ± 3 percent in the longitudinal direction.

7.1.4 *Tensile Test*

Tensile strength at yield and elongation at break at 27 ± 2 °C for different wall thickness of pipes shall be as follows:

Tensile Strength at Yield, *Min*	Test Speed (mm/min)	Elongation at Break, *Min*
19 MPa	100 ± 10	500 Percent

Refer Annex D for test method of tensile testing of PE pipes.

7.1.5 *Fusion Compatibility Test*

7.1.5.1 If pipes manufactured are to be joined by butt fusion, friction welding, socket fusion or using electro fusion fitting, mixing same or different pipe materials (that is, PE 63, PE 80 or PE 100), joint shall conform to the requirements specified in Table 9.

7.1.5.2 The length of test piece, with the joint at the middle of the test piece, shall be decided in accordance with **A-2**.

7.1.6 *Corrected Density*

When tested from a composite sample of minimum three pipes in accordance with Annex A of IS 7328, corrected density shall conform to requirement given in Table 1.

7.1.7 *Melt Flow Rate (MFR)*

When tested from a composite sample of minimum three pipes in accordance with **7** of IS 2530 at 190 °C with nominal load of 50 N, the MFR shall not differ by more than 30 percent of MFR of the material used in manufacturing of pipes (Table 1).

7.2 Quick Coupled Pipes and Fittings

7.2.1 *Leakage Test*

7.2.1.1 Coupler parts duly welded or fitted or integrally formed or otherwise to straight length of pipe or fitting of corresponding diameter shall be assembled together by holding attachment and free ends of the pipe or fitting shall be tested for leakage with water as a medium for duration of 1 h. During the test, pressure shall be gradually raised from 0.0 MPa to maximum working pressure.

7.2.1.2 As far as mechanical coupling is concerned there shall be no leakage. For pressure activated couplers, there shall be no leakage at or beyond the pressure of 0.05 MPa.

7.2.2 *Hydraulic Proof Test*

7.2.2.1 The same assembly as mentioned in **7.2.1.1** shall be subjected to a hydraulic proof test with water as medium at twice the recommended working pressure at ambient temperature for a period of 1 h. The assembly shall not show any sign of localized swelling, leakage, weeping or deformation and shall not burst during the prescribed test duration.

7.2.2.2 During the test as mentioned in **7.2.2.1** the holding attachment used in the coupler shall not show any deformation of permanent nature.

7.2.3 *Weldability Test*

7.2.3.1 If parts of couplers are welded at one end of quick coupled pipes the welded joints between the pipe and coupler shall conform to requirement specified in **7.1.2**.

7.2.3.2 The total length of test piece including joint shall be 300 mm that is 150 mm on both sides of joint. However, other lengths may be chosen on the coupler side of the pipe, if design of coupler does not permit the same with the total length not less than 300 mm.

7.3 Quick Coupled Fittings

The coupler parts welded to the end of fitting, when tested as per the requirement in **7.1.2** should not show any leakage from the weld or body of fitting nor should there be any swelling in the fittings.

7.3.1 The assembly of test piece shall be based on the design of the fitting and shall be the responsibility of the manufacturer to demonstrate proper assembly of testing.

8 SUPPLY OF PIPES

The nominal length of quick coupled pipe shall be declared by manufacturer. It is measured after coupling of two identical pipes as the distance between two similar points on both pipes. It shall be either 3 m or 6

m ± 0.01 m for shiftable sprinkler systems or as coils with a minimum inner diameter of 25 times the outer diameter of the pipe. The pipes may also be supplied in other lengths where so agreed to between the manufacturer and the purchaser. The ends shall be cut at right angles to the pipe axis.

9 SAMPLING AND CRITERIA FOR CONFORMITY

The sampling procedure to be adopted and the criteria for the conformity shall be as given in Annex B.

9.1 Lot

9.1.1 All quick coupled pipes or fittings of the same size and thickness, same length /design and welded or fitted or integrally formed in a single consignment shall be grouped together to constitute a lot.

9.1.2 The conformity of the lot to the requirements of this standard shall be ascertained for each lot separately.

9.1.3 The quick coupled pipes or fittings shall be selected from the lot at random. In order to ensure the randomness of selection, procedure given in IS 4905 may be followed.

9.2 Visual and Workmanship Requirement

9.2.1 The number of quick coupled pipes or fittings to be selected from each lot shall depend on the size of the lot and shall be in accordance with column 2 and 3 of Table 10. Each quick coupled pipe or fitting so selected shall be examined for proper workmanship and appearance. Any pipe or fitting failing in these requirements shall be considered as defective. The lot shall be considered as conforming to requirements of this standard, if the number of defective pipes or fittings found in the samples does not exceed the corresponding acceptance number 'A' in column 4 of Table 10 otherwise the lot shall be rejected.

9.2.2 The lot rejected according to **9.2.1** may be retested for characteristics for which it has failed. For this purpose, the number of quick coupled pipes or fittings to be selected at random from the lot, shall be according to column 2 and 3 of Table 10. Quick coupled pipes or fittings failing to satisfy the requirements of any of these characteristics shall be considered as defective. The lot shall be deemed to satisfy the requirement of this standard, if the number of defective quick coupled pipes or fittings found in the sample lot does not exceed the corresponding acceptance number 'B' in column 5 of Table 10 otherwise the lot shall be rejected.

Table 10 Scale of Sampling and Permissible Number of Defectives

(*Clauses* 9.2.1 *and* 9.2.2)

Sl. No.	Number of Quick Coupled Pipes/Fittings in the Lot	Sample size	Acceptance Number	
(1)	(2)	(3)	(4)	(5)
i)	Up to 150	2	0	0
ii)	151 to 300	3	0	0
iii)	301 to 500	4	0	0
iv)	501 to 1 000	7	1	0
v)	1 001 to 3 000	10	1	0
vi)	3 001 to 10 000	16	2	1

9.3 Leakage and Hydraulic Resistance Test

9.3.1 The lot having met the requirements given in **9.2** shall be finally tested first for leakage test and then for hydraulic resistance test.

9.3.2 For hydraulic resistance test and leakage test the number of quick coupled pipes or fittings at random (*see* **9.1.3**) shall be according to Table 11.

9.3.3 The lot shall be declared as conforming to the requirements of this specification if no failure occurs under **9.3.1** otherwise not.

Table 11 Scale of Sampling and Criteria for Conformity for Leakage and Hydraulic Resistance Test

(*Clause* 9.3.2)

Sl No.	Number of Quick Coupled Pipes/Fittings in the Lot	Sample Size
(1)	(2)	(3)
i)	Up to 150	2
ii)	151 to 300	3
iii)	301 to 500	4
iv)	501 and above	6

9.4 Weldability Test

9.4.1 For this purpose the number of pipes or fittings to be taken at random (*see* **9.1.3**) from the lot shall be according to Table 12.

9.4.2 The lot shall be declared as conforming to the requirement of the standard, if no failure occurs under **9.4.1** otherwise not.

Table 12 Scale of Sampling for Weldability Test

(*Clause* 9.4.1)

Sl No.	Number of Quick Coupled Pipes/ Fittings in the Lot	Sample Size
(1)	(2)	(3)
i)	Up to 500	1
ii)	501 to 1 200	2
iii)	1201 to 3200	3
iv)	3200 and above	4

10 MARKING

10.1 Each quick coupled pipe and fittings shall be indelibly marked in English at intervals of not more than 6 m in the pipe section and at a prominent place on the coupler which is visible even after installation by heat embossing/moulded embossing or other options of marking like LASER or inkjet printing. If marked in colour, the colours shall be as indicated in **10.1.1**. In case of fittings, marking shall be on male/female end and the plain fitting at a prominent place which is visible even after installation, by methods specified above. The marking shall show the following:

a) Manufacturer's name or trade-mark, if any;
b) Outside diameter;
c) Class of pipe; and
d) Batch number.

10.1.1 When marked by colour, the information specified in **10.1** shall be indelibly marked as indicated below for different classes of pipes:

Class of Pipe	Colour
Class 1	Orange
Class 2	Red
Class 3	Blue
Class 4	Green

11 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 products may be marked with the Standard Mark.

ANNEX A

(*Clause* 7.1.2)

INTERNAL PRESSURE CREEP RUPTURE TEST

A-1 GENERAL

The test shall be carried out not earlier than 24 hours after the pipes have been manufactured.

A-2 TEST SPECIMENS

A sample of pipe having free length between the end fittings equal to ten times the outside diameter but neither less than 250 mm nor greater than 750 mm shall be taken for testing from each pipe to be tested.

A-3 APPARATUS

Equipment which permits the application of a controlled internal hydraulic pressure to the specimen which are immersed in a thermostatically controlled water-bath.

A-4 PROCEDURE

A-4.1 The pipes shall be fitted with the locking plugs at both ends in such a way that the axial forces coming from the internal pressure are transmitted to the pipe. The pipe shall remain free to move in longitudinal direction.

A-4.2 Through a closable opening in one of the locking plugs, the pipe shall be fitted with water at ambient temperature. It shall be then put in a water bath at the test temperature (permissible deviation 1 ºC) and kept in the bath for one hour to adjust the temperature.

A-4.3 The pressure in the pipe shall then be increased to the test pressure (p) gradually and without shock, preferably within 10 to 30 s in the bath whose temperature has been adjusted in accordance with **A-4.2**. The pressure with permissible deviation of ± 2.5 percent shall be maintained for the period laid down in Table 9. The test pressure (p) shall be calculated from the minimum dimensions given in Table-3 and induced stress values given in Table 9.

$$P = \frac{2\sigma i S}{(d - S)}$$

Where

P = test pressure, in MPa;

S = minimum wall thickness, in mm;

σi = induced stress, in MPa; and

d = nominal outside diameter, in mm.

A-5 ASSESSMENT OF RESULTS

The samples shall not show signs of localized swelling or leakage and shall not burst during the prescribed test duration. The test showing failure within a distance equivalent to the length of end cap from the end shall be disregarded and the test repeated.

ANNEX B

(*Clause* 9)

SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

B-1 LOT

B-1.1 All pipes in a single consignment of the same outside diameter, same wall thickness, and same length and manufactured essentially under similar conditions of manufacture shall constitute a lot.

B-1.2 For ascertaining the conformity of the material to the requirements of this specification, samples shall be tested from each lot separately.

B-2 VISUAL AND DIMENSIONAL REQUIREMENTS

B-2.1 The number of samples to be taken from a lot shall depend on the size of the lot and shall be in accordance with Table 13.

B-2.1.1 These pipes shall be selected at random from the lot and in order to ensure randomness of selection, procedures given in IS 4905 shall be followed.

B-2.2 The number of pipes given for the first sample in column 3 of Table 13 shall be taken from the lot and examined for dimensional and visual requirements given in **5** and **6** of the specification. A pipe failing to satisfy any of these requirements shall be considered as defective. The lot shall be deemed to have satisfied these requirements if the number of defective found in the first sample is less than or equal to the corresponding acceptance number given in column 5 of Table 13. The lot shall be deemed not to have met these requirements, if the number of defective found in the first sample is greater than or equal to the corresponding rejection number given in column 6 of Table 13. If, however, the number of defective found in the first sample lies between the corresponding acceptance and rejection numbers given in column 5 and 6 of Table 13, the second sample of the size given in column 3 of Table 13 shall be taken and examined for these requirements.

Table 13 Scale of Sampling and Permissible Number of Defective for Visual and Dimensional Requirements

(*Clauses* B-2.1, B-2.2 *and* B-2.3)

No. of Pipes In the Lot	Sample No	Sample Size	Cumulative Sample Size	Acceptance No.	Rejection No.
(1)	(2)	(3)	(4)	(5)	(6)
up to 100	First	3	3	0	2
	Second	3	6	1	2
501 to 300	First	5	5	0	2
	Second	5	10	1	2
301 to 500	First	8	8	0	2
	Second	8	16	1	2
501 and above	First	13	13	0	2
	Second	13	26	1	2

B-2.3 Criterion for Conformity

The lot shall be considered to have satisfied these requirements if the number of defective found in the cumulative sample is less than or equal to the corresponding acceptance number given in column 5 of Table 13, otherwise not.

B-3 REVERSION TEST

B-3.1 The lot having satisfied visual and dimensional requirements shall be tested for reversion.

B-3.1.1 For this purpose, the first sample of three pipes shall be taken from the lot. The sample pipe failing in the reversion test shall be considered as defective. If no defective is found in the first sample the lot shall be deemed to have met the requirements given in the specification for reversion test. If, however, only one defective is found in the first sample, a second sample of three pipes shall be taken from the lot and tested for reversion.

B-3.2 Criterion for Conformity

The lot shall be deemed to have met the specification requirement for reversion given in **7.1.3** if not more than one defective is found in cumulative sample, otherwise not.

B-4 HYDRAULIC AND TENSILE STRENGTH REQUIREMENTS

B-4.1 the lot having met the requirements given in B-2 and B-3 shall be finally tested for internal pressure creep rupture test specified in **7.1.2** and tensile strength tested specified in **7.1.4.**

B-4.1.1 For this purpose, the number of pipes to be taken at random (*see* **B-2.1.1**) from the lot should be according to Table 14.

Table 14 Scale of Sampling for Hydraulic Characteristics and Tensile Test

(*Clauses* B-4.1.1 *and* B-5)

No. of Pipes in the lot N	Sample Size
(1)	(2)
up to 100	2
101 to 300	4
301 and above	6

B-4.1.2 The number of pipes selected from the lot according to **B-4.1.1** shall be randomly divided into two equal sets. Each of the pipes in the first set shall be tested for internal pressure creep rupture test according to **7.1.2** and each of the pipes in the second set shall be tested for tensile strength and elongation at break according to **7.1.4**.

B-4.2 Criterion for Conformity

The lot shall be declared as conforming to the requirements of the specification if no failure occurs under **B-4.1.2**, otherwise not.

B-5 FUSION COMPATIBILITY

For testing the fusion compatibility (if applicable) scale of sampling and criteria for conformity shall be same as given in **B-4** except that the sample size shall be half of as given in column 2 of Table 14 and only internal pressure creep rapture test shall be carried out.

ANNEX C

(*Foreword*)

GUIDELINES FOR SELECTION OF PE PIPES FOR SPRINKLER IRRIGATION

C-1 The pressure class of pipe should be decided after considering:

a) Total pressure or head in a pipe system, and

b) Water temperature.

C-1.1 Total pressure in a pipe system is determined by considering:

a) Sprinkler operating pressure,

b) Friction head loss in pipes and fittings, and

c) Static head (the difference in meter between pump and highest point on pipe system).

Select the pressure class of pipe with a working pressure equal or higher than the total pressure.

C-1.2 For water temperature up to 35 °C, the class of pipe is selected as per **C-1.1**. For water temperature of 36 to 40 °C, the next higher class is to be selected.

C-2 FRICTION HEAD LOSS CHART

Friction head loss for various diameters of pipes and at various flow rates and velocities, is given in flow Nomogram (*see* Fig. 10).

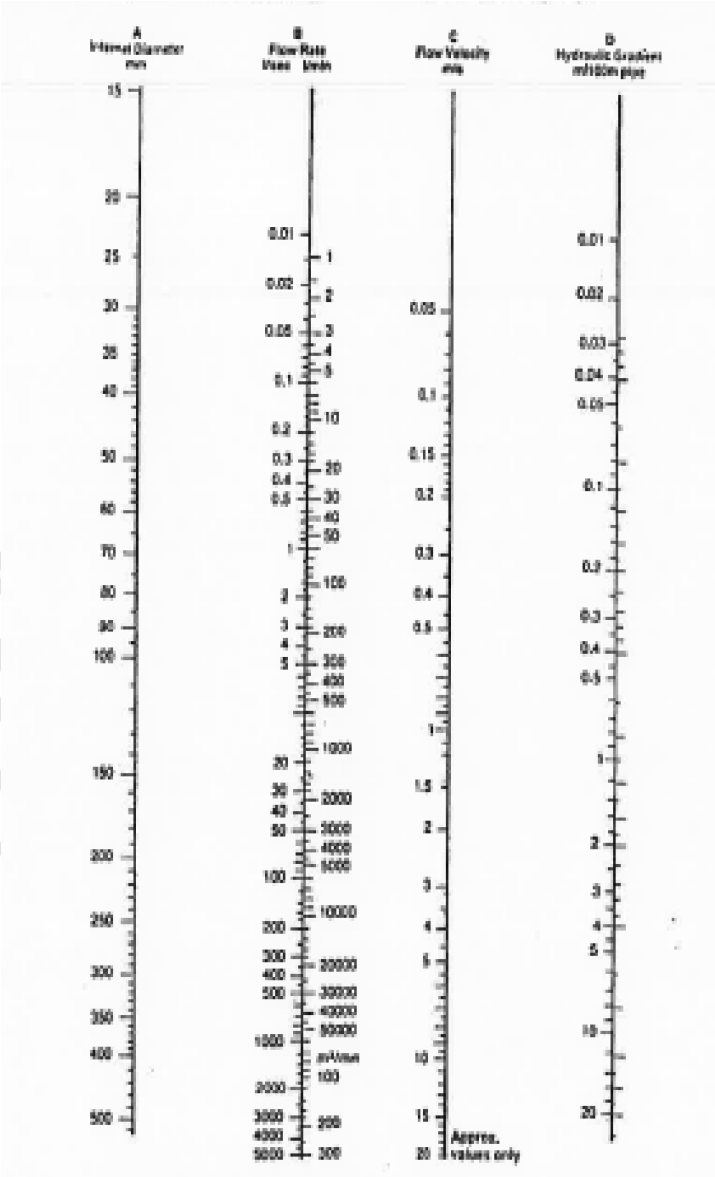


FIG. 10 FLOW NOMOGRAM

ANNEX D

(*Clause* 7.1.4)

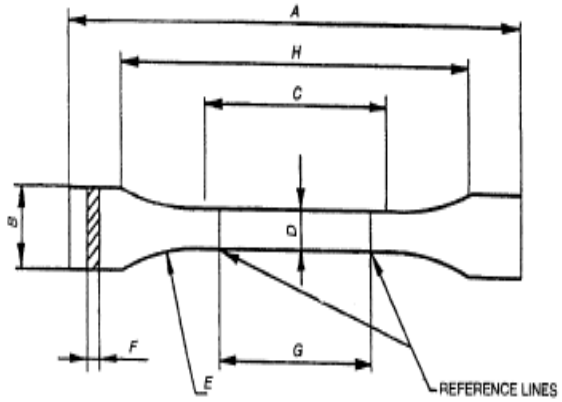
TENSILE TESTING OF PE PIPES

TENSILE STRENGTH AT YIELD AND ELONGATION AT BREAK AT 27 ± 2 °C FOR DIFFERENT WALL THICKNESS OF PIPES SHALL BE TESTED AS FOLLOWS

D-1 TEST PIECES

D-1.1 Test Piece Type 1/2

The shape and dimensions of this test piece are given in Fig. 12. This is more particularly intended for determining the tensile properties of smaller diameter pipes.



A	Minimum total length	: 150
B	Width of the ends	: 20 ± 0.5
C	Length of the calibrated part	: 60 ± 0.5
D	Width of the calibrated part	: 10 ± 0.5
E	Minimum radius	: 60
F	Thickness	: *see* Table 3
G	Distance between the reference lines	: 60 ± 0.5
H	Intial distance between clamps	: 115 ± 5

All dimensions in millimetres

FIG. 11 TEST PIECE TYPE 1

D-1.2 Test Piece Type I

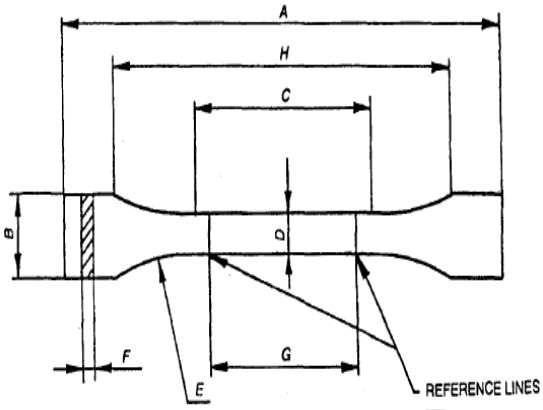
The shape and dimensions of this test piece is given in Fig. 11.

D-1.3 Test Piece Type 2

The shape and dimensions of this test piece is given in Fig. 13.

D-2 NUMBER OF TEST PIECES

The number of test pieces to be used for determining the tensile properties of a pipe depends on the lot size (*see* Table 14).



A	Minimum total length	: 75
B	Width of the ends	: 10 ± 0.5
C	Length of the calibrated part	: 30 ± 0.5
D	Width of the calibrated part	: 5 ± 0.5
E	Minimum radius	: 30
F	Thickness	: *see* Table 3
G	Distance between the reference lines	: 25 ± 0.5
H	Intial distance between clamps	: 60 ± 5

All dimensions in millimetres

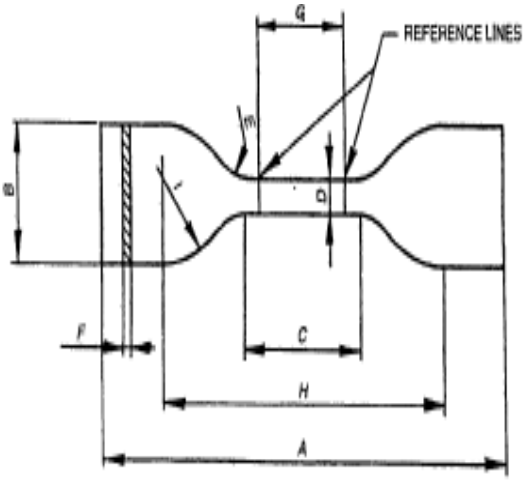
FIG. 12 TEST PIECE TYPE ½

D-3 TAKING OF TEST SPECIMEN

D-3.1 The test pieces from the pipe shall be taken in such a way that it is not flattened, that is without heating, so that the test piece axes are parallel to the axis of the pipe and in such a manner that they are regularly distributed around the circumference of the pipe.

D-3.2 To achieve this, use a sufficiently long piece of pipe, and divide its circumference into a certain number of sectors with an arc length of approximately 150 mm. From these divisions, mark out strips with a length equal to that of the test piece of pipe (*see* Fig.14). For example, a pipe with an external diameter of 200 mm and a circumference of approximately 630 mm will be divided into four strips.

D-3.3 In the middle of each of these strips, take a test piece, by means of a punch with sharp cutting edges free from burrs, and with a profile complying with one of the Fig. 11, 12 or 13 (*see* Table 15). Cut out the test piece by applying the punch to the inner surface of the strip and by exerting uniform pressure.



A	Minimum total length	: 115
B	Width of the ends	: 25 ± 1
C	Length of the calibrated part	: 33 ± 1
D	Width of the calibrated part	: 6 ± 0.4
E	Small radius	: 14 ± 1
F	Thickness	: *see* Table 3
G	Distance between the reference lines	: 25 ± 1
H	Intial distance between clamps	: 80 ± 5
I	Large radius	: 25 ± 1

All dimensions in millimetres

FIG. 13 TEST PIECE TYPE 2

D-3.4 Draw two reference lines, equidistant from the ends of the waisted part of the test piece as shown in Fig. 11, 12 and 13. Mark these lines with a wax crayon or with ink which does not affect the properties of polyethylene. The reference marks must not under any circumstances form scratches, nor shall they be stamped or printed on the test piece.

D-3.5 As a function of the pipe wall thickness (e), the test shall be carried out with the test pieces as given in Table 15.

Table 15 Selection of Test Pieces

(*Fig*. 11, 12 *and* 13)

Sl No.	Wall thickness (e) of the Pipe. (mm)	Test Piece Type	Thickness of Test Piece (F) mm	Remarks
(1)	(2)	(3)	(4)	(5)
i)	e ≤ 5	½ or 1	e	Non Machined *
ii)	5 < e < 10	1	e	Non Machined *
Iii)	e ≥ 10	2	10	Machined **

* Non-machined test piece (thickness of test piece equal to the thickness of the pipe).

** Machined test piece — Two series of test pieces are prepared. The thickness of test pieces is brought down to 10 mm by suitable machining, which does not cause any heating of the machined surface, and which enables a smooth surface to be obtained. For the first series, the inside surface of the pipe is machined and for the second series the outer surface of the pipe is machined. Only the series which has given the lowest results is taken into consideration for the test result.

D-4 PROCEDURE

The test piece shall be conditioned for two hours in air or one hour in water so that it is at a temperature of 27 + 2 °C immediately before test. The test shall be carried out as given in **6.5** of IS 2530 at testing speed of 100 mm/min.

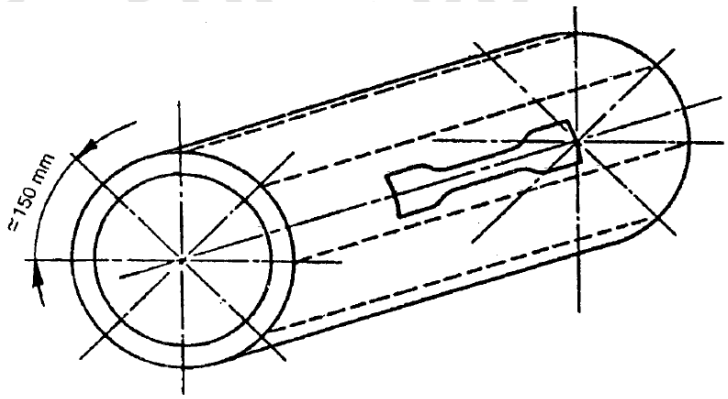


FIG. 14 TAKING OF TEST PIECE

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Farm Irrigation and Drainage Systems Sectional Committee, FAD 17

Organization	*Representative(s)*
Indian Institute of Water Management, Bhubaneswar	Dr S. K. Ambast (***Chairman***)
CIPET, Chennai	Dr S. K. Jain Dr A. K. Nema (*Alternate*)
In personal capacity	Dr T. B. S. Rajpoot
G B Pant University of Agriculture and Technology, Pantnagar, Uttarakhand	Dr H. C. Sharma Dr P. K. Singh (*Alternate*)
Gujrat Green revolutionaries Co Ltd, Vadodara	Shri P. P. Donga Shri R. V. Limbashia (*Alternate*)
ICID - CIID, New Delhi	Dr S. A. Kulkarni
Irrigation Association of India, Pune	Shri Shrikant Goenka
Ministry of Agriculture, Department of Ag & Coop, New Delhi	Shri Om Prakash
EPC Mahindra Ltd, Nashik	Shri S. K. Maity Shri C. V. Joshi (*Alternate*)
Premier Irrigation Adritec, Nagpur	Shri P. K. Basak Shri G. K. Kumar (*Alternate*)
Jain Irrigation Systems Ltd, Jalgaon	Shri Sunil L. Lodha Shri Abhijit Joshi (*Alternate*)
Netafim Irrigation (P) Ltd, Vadodara	Shri Govind Tapadia Shri S. Sethuramlingam (*Alternate*)
NABARD, Mumbai	Shri S. S. Rajshekar Shri D. Elangovan (*Alternate*)
National Committee on Plasticulture Application in Horticulture, New Delhi	Shri Naresh Modi
Orange Grower Association of India, Amravathi	Shri Amol Mohanrao Totey
Rivulis Irrigation Pvt Ltd	Shri Ashish Kumar
Water Technology Centre, IARI, New Delhi	Dr Neelam Patel
BIS Directorate General	Shri P. Rajesh, Scientist 'E' and Head (FAD) [Representing Director General (*Ex-officio*)]

Member Secretary

Shri Pawan Kumar
Scientist 'B', BIS

Panel for merger of IS 14151 Part 1 and Part 2, FAD 17/P-3

Organization	*Representative(s)*
Water Technology Centre, IARI, New Delhi	Dr Neelam Patel (***Convener***)
Premier Irrigation Adritec, Nagpur	Shri P. K. Basak
Jain Irrigation Systems Ltd., Jalgaon	Shri K. L. Nemade
EPC Mahindra Ltd, Nashik	Shri C. V. Joshi
Finolex Plasson Ltd., Pune	Shri B. R. Bhosle
National Committee on Plasticulture Application in Horticulture	Shri Naresh Modi
Bureau of Indian Standards	Shri Pawan Kumar

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