



PRODUCT MANUAL FOR POLYETHYLENE PIPES FOR WATER SUPPLY ACCORDING TO IS 4984: 2016

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification licence/certificate.

1.	Product	:	IS 4984 : 2016
	Title	:	POLYETHYLENE PIPES FOR WATER SUPPLY
	No. of Amendments	:	1
2.	Sampling Guidelines:		
a)	Raw material	:	a) Polyethylene resin – Clause 5.2 of IS 4984 b) Carbon black master batch – Clause 5.3 of IS 4984 c) Anti-oxidant – Clause 5.4 of IS 4984
b)	Grouping guidelines	:	Please refer ANNEX – A
c)	Sample Size	:	24 Pieces of 1 meter length for complete testing
3.	List of Test Equipment	:	Please refer ANNEX – B
4.	Scheme of Inspection and Testing	:	Please refer ANNEX – C
5.	Possible tests in a day :		
	(i) Visual appearance (Clause 7.1) (ii) Length (Clause 7.2) (iii) Coiling (Clause 7.3) (iv) Dimensions (Clause 7.4) (v) Longitudinal reversion test (Clause 8.2) (vi) Carbon black content and dispersion (Clause 8.3) (vii) Melt flow rate (Clause 8.4) (viii) Density (Clause 8.7)		
6.	Scope of the Licence : Please refer ANNEX – D		

ANNEX A**Grouping Guidelines**

1. Polyethylene Pipes for Water Supply as per IS 4984 : 2016 are classified as follows:

Material Grades	PE 63, PE 80 and PE 100
Standard Dimension Ratio (SDR)	SDR 41, SDR 33, SDR 26, SDR 21, SDR 17, SDR 13.6, SDR 11, SDR 9, SDR 7.4 and SDR 6
Pressure Ratings	PN 2, PN 2.5, PN 3, PN 3.2, PN 4, PN 5, PN 6, PN 8, PN 10, PN 12.5, PN 16 and PN 20
Sizes (Nominal Diameter)	DN 16 mm to DN 2000 mm

2. Considering the above, Polyethylene Pipes are categorized into following groups for the purpose of GoL/CSoL:

Material Grade	Pressure Rating Group (PN)			Size Group DN (mm)			
	Low	Medium	High	Group-I	Group-II	Group-III	Group-IV
PE 63	2 to 4	5 to 10	12.5 to 20	16 to 180	200 to 500	560 to 1000	1200 to 2000
PE 80	2 to 4	5 to 10	12.5 to 20	16 to 180	200 to 500	560 to 1000	1200 to 2000
PE 100	2 to 4	5 to 10	12.5 to 20	16 to 180	200 to 500	560 to 1000	1200 to 2000

3. For considering GoL/CSoL, testing shall be done as follows:
- PE resin of any grade shall be tested to cover all the grades of resin. However declaration related to master batch and other grades of PE resin shall be obtained for all other grades.
 - Pipe with highest pressure rating from each pressure rating group (Low, Medium and High) shall be tested to cover pipes of all pressure ratings in that pressure rating group and manufactured from same material grade.
 - Two pipes from each size group, preferably highest and lowest sizes, shall be tested to cover pipes of all sizes in that size group.
4. The Firm shall declare the varieties of Polyethylene Pipes intended to be covered in the Licence. The Scope of Licence may be restricted based on the Manufacturing and Testing capabilities of the Manufacturer.
5. During the operation of the Licence, BO shall ensure that all Pressure ratings, Material grades and Sizes covered in the Licence are tested in rotation, to the extent possible.

ANNEX B**List of Test Equipment***Major test equipment required to test as per the Indian Standard*

Sl. No.	Tests used in with Clause Reference	Test Equipment
1	Dimensions (Clause 6.2.1,7.2,7.3,7.4)	<ul style="list-style-type: none"> - Vernier caliper - Travelling microscope - Measuring Tape - Pi Tape or Circometer - Ball ended Micrometer - Measuring scale
2	Internal Pressure creep rupture test (Clause 8.1.1, 8.1.2) Slow crack growth rate (Clause 8.10)	- As per E-3 of IS 4984
3	Longitudinal Reversion test (Clause 8.2)	<ul style="list-style-type: none"> - Hot air Oven - Glass Plate & Talcum - Vernier caliper
4	Tensile Strength for Butt-fusion (Clause 8.8)	- As per G-2 of IS 4984
5	Elongation at break (Clause 8.9)	- As per H-1 of IS 4984
6	Slow Crack Growth rate test (Clause 8.10)	- As per J-1 of IS 4984
7	Oxidation Induction Time (Clause 8.5)	- As per B-1 of IS 4984
8	Melt Flow rate (Clause 8.4)	- Melt flow rate Apparatus with digital temperature controller and timer and load of 5 kgf
9	Carbon black content and dispersion (Clause 8.3)	<ul style="list-style-type: none"> - Furnace to accommodate the combustion tube with digital temperature controller - Combustion boats made of porcelain or silica, having minimum dimensions of 75 mm length, 9 mm width & 8 mm height - Combustion tube made of hard glass of approximately 30 mm diameter and 400 ± 50mm length - Nitrogen gas Cylinder with flow meter for controlling flow of nitrogen within 1.7 ± 0.3 liters per minute.

		<ul style="list-style-type: none"> - Analytical balance or equivalent, capable of weighing to the nearest 0.1 mg - Desiccator, Trichloroethylene & solid carbon dioxide - Fume Hood - Hot plate - Projection Microscope with 100/200 times magnification - Glass Slides
10	Density (Clause 8.7)	<ul style="list-style-type: none"> - Digital Balance with holding attachment - Distilled water - Butyl Acetate - Hydrometer - Glass beaker of 250 ml capacity - Thermometer - Air conditioner - Heated press (Steam or Electrical)
11	Overall Migration (Clause 8.6)	<ul style="list-style-type: none"> - Hot Air oven with digital temperature controller - Hot plate with temperature control regulators - Analytical balance or equivalent, capable of weighing to the nearest 0.1 mg - Platinum crucible or silica dish - Desiccator - Glassware & distilled water

The above list is indicative only and may not be treated as exhaustive.

ANNEX C

Scheme of Inspection And Testing

1. LABORATORY - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

1.1The manufacturer shall prepare a calibration plan for the test equipments.

2. TEST RECORDS –The manufacturer shall maintain test records for the tests carried out to establish conformity.

3. LABELLING AND MARKING–As per the requirements of IS 4984: 2016.

4. CONTROL UNIT – Pipes of same designation from a continuous extrusion run of one machine manufactured from same batch of raw material upto maximum of 48 h duration shall constitute one control unit.

5. LEVELS OF CONTROL - The tests as indicated in column 1 of Table 1 and the levels of control submitted by the manufacturer in column 3 of Table 1, shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

5.1 All the production which conforms to the Indian Standard and covered by the licence should be marked with Standard Mark.

5.2 Storage, handling, laying and jointing of pipes shall be as per IS 7634 (Part 2):2012.

6. REJECTIONS –Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016.

TABLE 1

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Recommended Levels of Control		
Clause	Requirement	Test Methods Clause Reference			No. of Sample	Frequency	Remarks
5	Material	5.1, 5.2, 5.3 and 5.4	IS 4984 IS 2530 IS 7328 IS 10141 IS 10146	S	One	Each batch in a consignment	No further testing is required, if accompanied with the test certificate or ISI Marked.
6.2	Colour	6.2	IS 4984	R	All	-	-
6.2.1	Identification strip	6.2.1	IS 4984	R	10 %	Each control unit	Samples shall be selected at random to cover entire production evenly as far as possible. In case failure of sample in any requirement, double the initial sample shall selected and tested, control unit shall be rejected in case of failure of retested samples.
7	Geometric Characteristics of Pipes (Visual appearance, Length/ Coiling and Dimensions)	7.1, 7.2, 7.3 and 7.4	IS 4984	R	10 %	Each control unit	
8.1.1	Internal Pressure Creep Rupture Test of Pipe (at 80 ° C for 48 h)	8.1.1 and Annex E	IS 4984	R	One	Each control unit	-

8.1.1	Internal Pressure Creep Rupture Test of Pipe (at 27 ° C for 100 h)	8.1.1 and Annex E	IS 4984	R	Three	Once in three month or whenever there is any change in resin composition or method of manufacture.	The testing schedule shall be so arranged that during period of one year, pipe of the highest size from each pressure rating/SDR and each grade manufactured during the period shall be tested. In case of failure, marking shall be stopped immediately and BIS shall be informed about failure. Corrective actions shall be taken and marking shall be resumed only after satisfactory testing of additional three samples.
8.1.1	Internal Pressure Creep Rupture Test of Pipe (at 80 ° C for 165 h)	8.1.1 and Annex E	IS 4984	R	Three	Once in three month or whenever there is any change in resin composition or method of manufacture.	The testing schedule shall be so arranged that during period of two years, pipe of the highest size of each pressure rating/SDR and each grade manufactured during the period shall be tested. In case of failure marking shall be stopped immediately and BIS shall be informed about failure. Corrective actions shall be taken and marking shall be resumed only after satisfactory testing of additional three samples.
8.1.1	Internal Pressure Creep Rupture Test of Pipe (at 80 ° C for 1000 h)	8.1.1 and Annex E	IS 4984	R	Three	Once in six month or whenever there is any change in resin composition or method of manufacture.	

8.1.2	Internal Pressure Creep Rupture Test of Pipe Joints (at 80 ° C for 48 h)	8.1.2 and Annex E	IS 4984	R	Three	Once in three month or whenever there is any change in resin composition or method of manufacture.	The testing schedule shall be so arranged that during period of one year, pipe of the highest size from each pressure rating/SDR and each grade manufactured during the period shall be tested. In case of failure, marking shall be stopped immediately and BIS shall be informed about failure. Corrective actions shall be taken and marking shall be resumed only after satisfactory testing of additional three samples.
8.2	Longitudinal Reversion Test	8.2 and Annex F	IS 4984	R	One	Each control unit	-
8.3	Carbon Black Content and Dispersion		IS 2530	R	One	Each control unit	The sample shall be composite sample of minimum three pipes drawn at regular interval.
8.4	Melt Flow Rate		IS 2530	R	One	Each control unit	The sample shall be composite sample of minimum three pipes drawn at regular interval.
8.5	Oxidation Induction Time	Annex B	IS 4984	R	One	Each control unit	-
8.6	Overall Migration		IS 9845 IS 10146	R	Three	Once in three month or whenever there is any change in resin composition or method of manufacture.	In case of failure of sample, additional sample of same size shall be drawn and tested. The sample shall be accepted, if no further failure is observed. In case of failure, marking shall be stopped and BIS shall be informed about the failure. Corrective actions shall be taken and marking shall be resumed only after satisfactory verification of corrective actions taken by manufacturer by testing of sample.

8.7	Density		IS 7328	R	One	Each control unit	The sample shall be composite sample of minimum three pipes drawn at regular interval.
8.8	Tensile Strength for Butt-fusion	Annex G	IS 4984	S	One	Once in a year or whenever there is any change in resin composition or method of manufacture.	In case of failure of sample, additional sample of same size shall be drawn and tested. The sample shall be accepted, if no further failure is observed. In case of failure, marking shall be stopped and BIS shall be informed about the failure. Corrective actions shall be taken and marking shall be resumed only after satisfactory verification of corrective actions taken by manufacturer by testing of sample.
8.9	Elongation at Break	Annex H	IS 4984	R	One	Each control unit	-
8.10	Slow Crack Growth Rate Test	Annex J	IS 4984	S	One	Once in a year or whenever there is any change in resin composition or method of manufacture.	In case of failure of sample, additional sample of same size shall be drawn and tested. The sample shall be accepted, if no further failure is observed. In case of failure, marking shall be stopped and BIS shall be informed about the failure. Corrective actions shall be taken and marking shall be resumed only after satisfactory verification of corrective actions taken by manufacturer by testing of sample.

Note-1: Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau.

Note-2: Levels of control given in column 3 are only recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification for approval by B.O. Head.

ANNEX- D**SCOPE OF LICENCE**

“Licence is granted to use Standard Mark as per IS 4984: 2016 with the following scope:	
Name of the product	POLYETHYLENE PIPES FOR WATER SUPPLY
Material Grade	
Standard Dimension Ratio (SDR)	
Pressure Rating (PN)	
Size DN (mm)	