



**PRODUCT MANUAL FOR
STRUCTURED-WALL PLASTICS PIPING SYSTEMS
FOR NON-PRESSURE DRAINAGE AND SEWERAGE —
PIPES AND FITTINGS
WITH SMOOTH EXTERNAL SURFACE, TYPE A
ACCORDING TO IS 16098 (PART 1): 2013**

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 16098 (Part 1): 2013
	Title	:	Structured-Wall Plastics Piping System for Non-Pressure Drainage and Sewerage – Pipes and Fittings with Smooth External Surface – Type A
	No. of Amendments	:	1
2.	Sampling Guidelines:		
a)	Raw material	:	a) PVC -U resin – As per clause 5.1 of IS 16098 (Part 1): 2013 b) CaCO ₃ – As per clause 5.1 of IS 16098 (Part 1): 2013 c) Pipes and fitting material – Clause 5.2 and Table 1 of IS 16098 (Part 1): 2013
b)	Grouping guidelines	:	Please refer ANNEX – A
c)	Sample Size	:	a) Pipes – 1 m x 10 Nos + 4 Nos with spigot and sockets b) Fittings – 10 Nos c) Raw material – PVC-U resin – 1 kg + Solid pipe manufactured (extruded/injection moulded) from same material 1 m
3.	List of Test Equipments	:	Please refer ANNEX – B
4.	Scheme of Inspection and Testing	:	Please refer ANNEX – C
5.	Possible tests in a day	:	Please refer ANNEX – D
6.	Scope of the Licence	:	Please refer ANNEX-E

ANNEX A**Grouping Guidelines**

1. IS 16098 (Part 1): 2013 covers Structured-Wall Plastics Piping System for Non-Pressure Drainage and Sewerage – Pipes and Fittings with Smooth External Surface – Type A which are categorized as below:

Material	PVC – U
Structural wall construction	<ul style="list-style-type: none"> • Foam core Construction • Hollow core Construction
Sizes of pipes and fittings (DN)	110, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1200
Ring stiffness class for pipes and fittings	<ul style="list-style-type: none"> • DN ≤ 500: SN 4, SN 8 or SN 16 • DN > 500: SN 2, SN 4, SN 8 or SN 16
Ends of pipes	<ul style="list-style-type: none"> • Without integral socket • With integral socket and spigot ends for <ul style="list-style-type: none"> a) Elastomeric sealing ring joints b) Solvent cement welding joints
Types of fittings	<ul style="list-style-type: none"> • Injection moulded fittings • Fabricated fittings • Rotational moulded fittings
	<ul style="list-style-type: none"> • Reducer • Unswept bend • Swept bend • Coupler • Slip coupler

2. The sizes/stiffness class of pipes and fittings are grouped as given below:

Group	SN (Nominal stiffness class)	Size
Group 1	SN 4 / SN8 / SN 16	DN ≤ 500
Group 2	SN2 / SN4 / SN8 / SN16	DN > 500

3. Considering the above, following grouping guidelines is developed for GoL/CSoL:

- a) One sample of pipe/fitting of any size from each group, with highest SN class from each structural wall construction shall be tested for all requirements to cover pipes/fittings of that structural wall construction for all the sizes covered in that group for all stiffness class upto and including the stiffness class tested.

- b) Pipes with each type of ends shall be tested separately. However, if pipe with integral socket end is tested, then pipe without integral socket may also be covered in the scope of the licence. Also, for inclusion of additional end of pipes in the scope of licence for existing varieties, only additional applicable tests may be carried out.
 - c) Fitting manufactured by different method of manufacturing shall be treated as separate variety.
4. The Firm shall declare the varieties they intend to cover 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 the varieties 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.	PVC- U Content (Clause 5.1)	<ul style="list-style-type: none"> - Drying Oven - Digital Balance - Equipment for Volhard Titration or Potentiometric Titration - Combustion Bomb - Nickel crucible - Safety oven <p style="text-align: right;">} for combustion in bomb technique</p> <ul style="list-style-type: none"> - Round or Flat bottom Flask with platinum wire and stopper - Filter Paper free from halogen and ash-Beaker 250 ml - Silver nitrate - Nitric acid - Sodium peroxide - Starch <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> - Silver Nitrate - Nitric acid solution - Oxygen gas - Sodium nitrate - Pott Hydroxide solution - Hydrogen peroxide solution - Drying oven - Weighing balance - Equipment for Volhard Titration or Potentiometric titration - Round or flat bottom flask - Filter paper - Beaker - Platinum wire
2.	Resistance to internal Hydrostatic Pressure at 60 °C (Clause 5.2)	<ul style="list-style-type: none"> - Thermostatically controlled water bath - Hydrostatic pressure testing apparatus with pressuring unit with multiple outlets and timer upto 1000 hr - End caps of required sizes
3	Dimensions of Pipes and Fittings (Clause 6.3)	<ul style="list-style-type: none"> - PI Tape - Vernier calliper - Inside Vernier caliper - Angle protractor - Steel tape - Micrometer

4	Vicac Softening Temperature for Pipes and Fittings (Clause 7.3 and 8.2)	<ul style="list-style-type: none"> - Oil heating Bath equipped with means to raise the temperature at uniform rate of $50 \pm 5^{\circ}\text{C/hr.}$ with suitable stirrer. - Rod with loading plate, load and indenting tips - Micrometer dial gauge - Thermometer or temperature measuring equipment - Vicat Softening Tester with Temperature - Controller with dial gauge - glycerol - 50N load
5	Resistance to Dichloromethane (Clause 7.4)	<ul style="list-style-type: none"> - Dichloromethane test apparatus (Bath) thermostatically controlled digital temperature indicator, Stirrer. - Dichloromethane, Analytical grade - Micrometer - Hood fitted with fume extraction system - Chamfering machine - Demineralized Water (Lab Should be having proper ventilation)
6	Longitudinal Reversion (Clause 7.5) Effect of heating (Stress relief test (Clause 8.3)	<ul style="list-style-type: none"> - Thermostatically Control oil bath/ Hot air oven - Mono-polyethylene glycol, glycerol or -mineral oil free from aromatic hydrocarbons - Vernier Callipers - Stop watch - Metal rods to hold pipes - Heat resistant gloves
7	Ring Stiffness (Clause 9.1)	<ul style="list-style-type: none"> - Compressive testing machine with constant rate of deflection, load cell, deflection gauge - Measuring devices for length of test specimen, inside diameter of test specimen, change in inside diameter of test piece - Air conditioner
8	Resistance to External Blows (Clause 9.2) Impact strength of injection moulded and fabricated fittings (Clause 10.1)	<ul style="list-style-type: none"> - Falling Weight testing machine from height 2000 mm - Striker of weight 0.25, 0.50 and 1.00 kg - Digital watch - Liquid bath or freezer for conditioning of samples
9	Ring Flexibility (Clause 9.3) Creep Ratio (Clause 9.4)	<ul style="list-style-type: none"> - Compressing loading machine - Inside vernier calliper - Angle protector - Stop watch - Micrometer

10	Tightness of Elastomeric Sealing ring joints (Water Pressure) (Clause 12.1.1) Solvent cemented ring joints (Clause 12.2.1)	<ul style="list-style-type: none"> - Hydrostatic pressure testing apparatus with pressuring unit and timer - Framework with angular deflection arrangement in vertical and horizontal direction, - Angle protector - End plugs of required sizes - Air Conditioner
11	Tightness of Elastomeric Sealing ring joints, Solvent cemented ring joints – Vacuum pressure (clause 12.1.2 and 12.2.2)	<ul style="list-style-type: none"> - Vacuum Pump - Pressure testing apparatus with negative pressuring unit and timer - Framework with angular deflection arrangement in vertical and horizontal direction, end plugs - Air Conditioner
12	Resistance to Combined Temperature Cycling and External Loading (Clause 12.1.3)	<ul style="list-style-type: none"> - Gravel filled box [Gravel as per table 31 of IS 16098 (Part 2)] - Compressive loading equipment - Thermocouples - Bore micrometer or equivalent - Gauge, Hardball, Straight edge, A tamping tool (60 IRHD) - Hot Water supply for Type A - Cold water for Type A - Stop Watch - Water bath - Hydrostatic pressure testing apparatus with pressuring unit

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.

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

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

3. LABELLING AND MARKING – As per requirements of IS 16098(Part 1) : 2013

4. CONTROL UNIT

For Pipe: All pipes of same size, structural wall construction and stiffness class manufactured from same compound mix continuously under similar condition of manufacturing for maximum period upto 48 hours shall constitute a control unit.

For Fittings: All fittings of same size, structural wall construction, type and stiffness manufactured from same compound mix under similar condition of manufacturing for maximum period upto 48 hours shall constitute a control unit.

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

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

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	Levels of Control		
Cl	Requirements	Test Methods			No. of Samples	Frequency	Remarks
		Clause	Reference				
5	Composition of the Material						
5.1	PVC-U resin	5.1 Annex-B	IS 16098 (Part 1) IS 15788	S	One	Each consignment	Further testing is not required if accompanied with manufacturers test certificate.
5.1	Calcium carbonate	5.1	IS 16098 (Part 1)	S	One	Each Consignment	
5.2	Material for pipe and fittings manufacturing – Resistance to internal hydrostatic pressure at 60 °C	5.2, Table 1	IS 16098 (Part 1) IS 12235 (Part 8/ Sec3)	S	One	Once in a year	Additional sample shall be tested for change in source of supply of raw material
6.3	Dimensions of pipes and fittings						
	Mean outside diameter	6.3.1, Table 2	IS 16098 (Part 1) IS 12235 (Part 1)	R	Ten	Each control unit	-
	Wall thickness	6.3.2, Table 3	IS 16098 (Part 1)	R	Ten	Each control unit	-
	Length of pipe	6.3.3, Fig 2	IS 16098 (Part 1)	R	Ten	Each control unit	-
	Dimensions of integral socket and spigot ends	6.3.4, Fig 2, 3 and 4 Table 4 and 5	IS 16098 (Part 1)	R	Ten	Each control unit	-
	Wall thickness of socket	6.3.4.1, Fig 3	IS 16098 (Part 1)	R	Ten	Each control unit	-

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	Wall thickness of fabricated fittings	6.3.4.2, Table 4 and 5	IS 16098 (Part 1)	R	Ten	Each control unit	-
	Wall thickness of rotational moulded fittings	6.3.4.2	IS 16098 (Part 1)	R	Ten	Each control unit	-
7	Physical Characteristics of Pipes						
7.1	Appearance	7.1	IS 16098 (Part 1)	-	Each pipe	-	-
7.2	Colour	7.2	IS 16098 (Part 1)	-	Each pipe	-	-
7.3	Vicat softening temperature for pipes	7.3	IS 16098 (Part 1) IS 12235 (Part 2)	S	One	Once in three months for each wall construction	-
7.4	Resistance to dichloromethane	7.4	IS 16098 (Part 1) IS 12235 (Part 11)	R	One	Each control unit	-
7.5	Longitudinal reversion	7.5	IS 16098 (Part 1) IS 12235 (Part 5)	R	Three	Each control unit	-
8	Physical Characteristics of Fittings						
8.1	Appearance and colour	8.1	IS 16098 (Part 1)	-	Each pipe	-	-
8.2	Vicat softening temperature for Fittings	8.2	IS 16098 (Part 1) IS 12235 (Part 2)	S	One	Once in three months for each wall construction	-
8.3	Effect of Heating (Stress relief test)	8.3	IS 16098 (Part 1) IS 12235 (Part 6)	R	One	Each control unit	-
9	Mechanical Characteristics of Pipes						
9.1	Ring Stiffness	9.1, Annex-C, Table 6	IS 16098 (Part 1)	R	Three	Each control unit	-
9.2	Resistance to external blows at 0 °C	9.2, Table 7	IS 16098 (Part 1) IS 12235 (Part 9)	R	One	Each control unit	-

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9.3	Ring flexibility	9.3, Annex-D	IS 16098 (Part 1)	S	Three	Once in three months	Over a period of one year at least one size of pipe of each stiffness class and wall construction shall be tested.
9.4	Creep ratio	9.4, Annex-E	IS 16098 (Part 1)	S	Three	Once in three year	Over a period of three year at least one size of pipe of each stiffness class and wall construction shall be tested. Additional sample shall be tested if there is any change in raw material composition or manufacturing process
10	Mechanical Characteristics of the Fittings						
10.1	Impact strength of injection moulded and fabricated fittings	10.1	IS 16098 (Part 1)	R	Five	Each control unit	If anyone fitting is damaged the test shall be repeated with additional five other fittings. Control unit may be accepted if none of these last five fittings damaged
11	Joints						
11.1	Elastomeric sealing rings	11.1	IS 16098 (Part 1) IS 5382	S	One	Each consignment	Further testing is not required if accompanied with manufacturers test certificate or ISI marked.
11.2	Solvent cement	11.2	IS 16098 (Part 1) IS 14182	S	One	Each consignment	
12	Performance requirements						
12.1	Elastomeric sealing ring joints						
12.1.1	Tightness of elastomeric sealing ring joints (Water pressure)	12.1.1	IS 16098 (Part 1) IS 12235 (Part 8/ Sec 2)	R	One	Every tenth control unit	In case of failure additional two samples from same control unit shall be tested and control unit accepted on passing of both retested samples.
12.1.2	Tightness of elastomeric sealing ring joints (Internal vacuum)	12.1.2	IS 16098 (Part 1) IS 12235 (Part 8/ Sec 3)	R	One	Every tenth control unit	

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12.1.3	Resistance to combined temperature cycling and external loading	12.1.3, Annex-D	IS 16098 (Part 1) Is 16098 (Part 2)	S	Three	Once in three years for each wall construction	Additional sample shall be tested in case of change in composition or manufacturing process.
12.2	Solvent Cemented Joints						
12.2.1	Tightness of solvent cemented ring joints	12.2.1	IS 16098 (Part 1)	R	One	Every tenth control unit	In case of failure additional two samples from same control unit shall be tested and control unit accepted on passing of both retested samples.
12.2.2	Tightness of solvent cemented joints (Internal vacuum)	12.2.2	IS 16098 (Part 1)	R	One	Every tenth control unit	

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 BO Head.

ANNEX-D

Possible tests in a Day

- a) Dimensions of pipes and fittings (Clause 6.3)
- b) Appearance (Clause 7.1)
- c) Colour of pipe (Clause 7.2)
- d) Vicat softening temperature for pipe and fittings (Clause 7.3 and 8.2)
- e) Longitudinal reversion (Clause 7.5)
- f) Appearance and colour of fittings (Clause 8.1)
- g) Effect on heating (Clause 8.3)
- h) Resistance to external blow at 0 °C (Clause 9.2)
- i) Impact strength of injection moulded and fabricated fittings (Clause 10.1)
- j) Tightness of elastomeric sealing ring joints (Water pressure) (Clause 12.1.1)
- k) Tightness of Elastomeric Sealing Ring Joints (Internal Vacuum) (Clause 12.1.2)
- l) Tightness of solvent cemented ring joints (Clause 12.2.1)
- m) Tightness of solvent cemented joints (Internal vacuum) (Clause 12.2.2)

ANNEX-E**Scope of Licence**

“Licence is granted to use Standard Mark as per IS 16098 (Part 1):2013 with the following scope:	
Name of Product	Structured-Wall Plastics Piping System for Non-Pressure Drainage and Sewerage – Pipes and Fittings with Smooth External Surface – Type A
Material	PVC – U
Structural wall construction	Foam core Construction/Hollow core Construction
Sizes of pipes and fittings (DN)	
Ring stiffness class for pipes and fittings	Nominal stiffness class
Ends of pipes	- Without integral socket - With integral socket and spigot ends for Elastomeric sealing ring joints/ Solvent cement welding joints
Types of fittings	