



**PRODUCT MANUAL FOR
CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPES
FOR AUTOMATIC SPRINKLER FIRE EXTINGUISHING SYSTEM
ACCORDING TO IS 16088:2012**

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 16088: 2012
	Title	:	Chlorinated Polyvinyl Chloride (CPVC) Pipes for Automatic Sprinkler Fire Extinguishing System
	No. of Amendments	:	Nil
2.	Sampling Guidelines:		
a)	Raw material	:	Clause 6.1 and 6.2 of IS 16088: 2012
b)	Grouping guidelines	:	Please refer ANNEX – A
c)	Sample Size	:	a) CPVC Compound - 5 kg b) CPVC pipes – 3 m x 12 c) CPVC pipes 40 mm dia (preferably) – 7 m for testing as per clause 9.6 and 9.7 of IS 16088: 2012
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	:	Please refer ANNEX – D
6.	Scope of the Licence:		
	“Licence is granted to use Standard Mark as per IS 16088:2012 with the following scope:		
	Name of the product	Chlorinated Polyvinyl Chloride (CPVC) Pipes for Automatic Sprinkler Fire Extinguishing System	
	Nominal size	--- mm upto and including --- mm	

ANNEX A
Grouping Guidelines

1. IS 16088: 2012 covers Chlorinated Polyvinyl Chloride (CPVC) Pipes for Automatic Sprinkler Fire Extinguishing System as per the details given below:
 - a) Working Pressure of pipe: 2.17 Mpa (315 PSI) at 23 °C and 1.21Mpa (175 PSI) at 65 °C
 - b) Nominal sizes: 20, 25, 32, 40, 50, 65 and 80 mm
 - c) SDR – 13.5

2. Two Type tests, namely, Fire Exposure test as per clause 9.6 and E- 2.5 and Flammability test as per clause 9.7 and E-2.6 are required to be carried out on any size, preferably 40 mm nominal size pipes.

3. Considering the above, following grouping guidelines is developed for GoL/CSoL:
 - a) One sample of maximum nominal size of pipe shall be tested for all requirements except Fire Exposure test (clause 9.6) and Flammability test (clause 9.7) to cover pipes of all nominal sizes upto and including the size tested.

 - b) Sample of nominal size 40 mm (preferably) shall be tested for type test as per clause 9.6 and clause 9.7.

4. The Firm shall declare the varieties 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 the types 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	Chlorine content (Clause 6.2.2)	<ul style="list-style-type: none"> - Drying Oven - Digital Balance - Equipment for Volhard Titration or Potentiometric Titration - Combustion Bomb - Nickel crucible - Safety oven - 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 - Sucrose or ethylene glycol <p style="text-align: right; margin-right: 20px;">} for combustion in bomb technique</p>
2	Density (Clause 6.2.3 and 9.5)	<ul style="list-style-type: none"> - Digital Balance with holding attachment - Distilled water - Butyl Acetate - Hydrometer - Glass beaker of 250ml capacity - Thermometer - Air conditioner - Heated press (Steam or Electrical)

3	Flammability test (Clause 6.2.4)	<ul style="list-style-type: none"> - Lab fume hood - Lab burner - Ring stands - Methane Gas supply - Conditioning room/ chamber - Micrometer - Conditioning oven - Pressure gauge - Flow meter - Standard bar specimen/ sample - Cotton
4	Dimensions of Pipes (Clause 7)	
	Diameter (Clause 7.1.1)	<ul style="list-style-type: none"> - Dial Gauge Method or Micrometer - Ultrasonic gauge - Vernier Calipers or outside caliper - Pi Tape or flexible tape - Tape
	Wall Thickness (Clause 7.1.2)	<ul style="list-style-type: none"> - Pin point micrometer/ ball end type external micrometer
	Length (Clause 7.1.3)	<ul style="list-style-type: none"> - Measuring tape
5	Pipe ends (Clause 8)	<ul style="list-style-type: none"> - Right angle - Angle protractor
6.	Opacity (Clause 9.2)	<ul style="list-style-type: none"> - Opacity Test Apparatus - Standard sample of opacity 0.2 % Or Apparatus for Test Method-2 - Source of light (halogen lamp 1000 W), - Photo-electric cell (with filter correction to match eye response), - Adjustable power arc or Incandescent lamp - Diaphragm and optical lens - Digital current meter. - Standard sample of opacity 0.2 %
7.	Reversion test (Clause 9.3)	<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

8.	Vicat Softening Temperature (Clause 9.4)	<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
9.	Fire Exposure test (Clause 9.6)	<ul style="list-style-type: none"> - Fire source – square steel pan containing n-heptane - Test room - 9.1 m × 9.1 m × 4.6 m high (1/2-inch gypsum wall board) - Test Ceiling - 3.7 m wide by 7.3 m long (1/2-inch gypsum wall board) - Closed pendent sprinklers - Digital stop watch - Temperature measuring equipment - Water source and piping arrangement
10.	Flammability test (Clause 9.7)	<ul style="list-style-type: none"> - Lab fume hood - Lab burner - Ring stands - Methane Gas supply - Conditioning room/ chamber - Micrometer - Conditioning oven - Pressure gauge - Flow meter - Standard bar specimen/ sample - Cotton
11.	Short term hydrostatic test ((Clause 10.1.1)	<ul style="list-style-type: none"> - Hydrostatic pressure testing apparatus with pressuring unit and multiple outlets
12.	Long term hydrostatic test (Clause 10.1.2)	<ul style="list-style-type: none"> - Water bath (Hot and cold temperature arrangement) with temperature control - Thermometer - End plugs/caps - Digital Stop Watch
13.	Resistance to external blow at (Clause 10.2)	<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

14.	Flattening test (Clause 10.3)	<ul style="list-style-type: none"> - Compression testing machine - Loading plates - Deformation/Deflection indicator - Vernier calliper - Internal diameter gauge/bore gauge - Digital Universal Testing Machine with 10.5 mm thick plate and with variable speed controller and constant loading across head movement - Flattening rig
15.	Tensile strength (Clause 10.4)	<ul style="list-style-type: none"> - Tensile Testing machine - Dumb bell dies along with Hydraulic jack - Micrometer Ball ended - Air Conditioner
16.	Kinking Resistance Test (Clause 10.5)	<ul style="list-style-type: none"> - Cold chamber for conditioning - Hot chamber for conditioning - Pipe bending equipment with bending facility to bend pipes with variable radius or all mandrels of different diameter

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 equipments and records be maintained.

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 16088: 2012.

4. CONTROL UNIT – All pipes of same nominal size and class/pressure rating extruded from same compound under similar manufacturing conditions continuously upto a maximum period of 48 hours on one extruder 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 Standards 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.	Requirement	Test Method			No. of Sample	Frequency	Remarks
		Clause	Reference				
6	Composition						
6.2.1	Compound Designation	6.2.1	IS 16088 IS 15225	S	One	Each Consignment	Pipe manufacturer shall obtain a test certificate for each batch of raw material along with consignment indicating conformity to the requirements as per clause 6.1 and clause 6.2 of IS 16088: 2012. In case a test certificate is not received, a sample shall be tested for its conformity as per the frequency specified.
6.2.2	Compound Chlorine Content	6.2.2 Annex - B	IS 16088 IS 15778	S	One	Each Consignment	
6.2.3	Density	6.2.3	IS 16088 IS 13360 (Part 3/ Sec 1)	S	One	Each Consignment	
6.2.4	Flammability test	6.2.4 Annex C	IS 16088	S	One	Each Consignment	
7	Dimensions of Pipes						
7.1.1	Diameter and Diameter at any point	7.1, 7.1.1, Table 1	IS 16088 IS 12235 (Part 1)	R	Ten	Each Control Unit	-
7.1.2	Wall Thickness	7.1, 7.1.2, Table 1	IS 16088 IS 12235 (Part 1)	R	Ten	Each Control Unit	-
7.1.3	Length and Effective length	7.1.3, 7.1.3.1	IS 16088	R	Ten	Each Control Unit	-

8	Pipe ends	8	IS 16088	R	Ten	Each Control Unit	-
9.1	Visual appearance	9.1, 9.1.1	IS 16088	R	Each Pipe	Each Pipe	-
9.2	Opacity	9.2	IS 16088 IS 12235 (Part 3)	R	2 (Thinnest wall sections)	Once in Three months	This test is to be done whenever there is a composition change. In an operative year, production from all extruders and all sizes be covered
9.3	Reversion test	9.3	IS 16088 IS 12235 (Part 5/ Sec 1 and Sec 2)	R	Three	Each Control Unit	In case of failure, twice the number of initial samples from same control unit shall be tested and control unit may be accepted on passing of retested samples.
9.4	Vicat softening temperature	9.4	IS 16088 IS 12235 (Part 2)	R	Two	Each Control Unit	-
9.5	Density	9.5	IS 16088 IS 12235 (Part 14)	R	Two	Each Control Unit	-
9.6	Fire Exposure test	9.6, Annex-B	IS 16088	S	One	Once in a year (40 mm pipe only)	Please see Note -1
9.7	Flammability test	9.7, Annex-C	IS 16088	S	One	Once in a year (40 mm pipe only)	Please see Note -1.

10	Mechanical Properties						
10.1	Hydrostatic Characteristics						
10.1.1	Short term test	10.1.1	IS 16088 IS 12235 (Part 8/ Sec 1)	R	One	Each Control Unit	-
10.1.2	Long term test	10.1.2	IS 16088 IS 12235 (Part 8/ Sec 1)	S	One	Once in a year	Please see Note -1
10.2	Resistance to external blow at 0 °C	10.2, Table 2	IS 16088 IS 15778	R	One	Each Control Unit	-
10.3	Flattening test	10.3	IS 16088 IS 12235 (Part 19)	R	One	Each Control Unit	-
10.4	Tensile strength	10.4	IS 16088 IS 12235 (Part 13)	R	One	Each Control Unit	-
10.5	Kinking Resistance Test	10.5.1 to 10.5.3	IS 16088	S	Three	Once in a year	Please see Note -1

Note -1: These tests shall be carried out once in a year or whenever there is any change in composition or new size is introduced. All sizes shall be tested in rotation to the extent possible.

Note-2: Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau.

Note-3: 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 C

Possible tests in a day

- i) Dimensions of pipes (Clause 7)
- ii) Pipe ends (Clause 8)
- iii) Visual appearance (Clause 9.1)
- iv) Opacity (Clause 9.2)
- v) Reversion test (Clause 9.3)
- vi) Vicat Softening Temperature (Clause 9.4)
- vii) Density (Clause 9.5)
- viii) Short term hydrostatic test (Clause 10.1.1)
- ix) Resistance to External Blow at 0 °C (Clause 10.2)
- x) Flattening Test (Clause 10.3)
- xi) Tensile Strength (Clause 10.4)