# उत्पाद मैन्युअल
# आई एस 4985:2021 के अनुसार
# जल की पूर्ति के लिए असुघटियत पी.वी.सी. पाइप के लिए

**दस्तावेज़ संख्या – पीएम/आईएस 4985/6/अक्टूबर 2023**

***भारतीय मानक ब्यूरो की स्कीम-I (अनुरूपता मूलयांकन) विनियम, 2018 के तहत यह उत्पाद मैन्युअल प्रमाणीकरण के प्रचालन में रीति और पारिशिता की सुसंगतता सुनिश्चित करने के लिए सभी क्षेत्रीय/शाखा कार्यालयों और लाइसेंसी द्वारा संदर्भ सामग्री के रूप में उपयोग किया जाएगा। बीआईएस प्रमाणीकरण लाइसेंस/ प्रमाणपत्र प्राप्त करने के इच्छुक भावी आवेदकों द्वारा भी इस दस्तावेज़ का उपयोग किया जा सकता है ।***

# PRODUCT MANUAL FOR
# UNPLASTICIZED PVC PIPES FOR WATER SUPPLIES
# ACCORDING to IS 4985:2021

**Document No - PM/IS 4985/6/Oct 2023**

***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.***

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| | | | |
|---|---|---|---|
| 1. | **Product** | : | IS 4985:2021 |
| | **Title** | : | Unplasticized PVC Pipes for Water Supplies |
| | **No. of Amendments** | : | 1 |
| | | | |
| 2. | **Sampling Guidelines:** | | |
| a) | **Raw material** | : | a) PVC resin – Clause 6.1 of IS 4985<br>b) Additives – IS 10148 |
| b) | **Grouping guidelines** | : | Please refer ANNEX – A |
| c) | **Sample Size** | : | 10 pipes of 1 mtr length |
| | | | |
| 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 4985 : 2021 with the following scope: | | |
| | Name of the product | Unplasticized PVC Pipes for Potable Water Supplies | |
| | Class of pipes<br>(Pressure rating) | | |
| | Nominal Size | | |
| | Type | Type A/ Type B | |
| | End of pipes | a) Plain ended pipes<br>b) Socketed for elastomeric sealing ring jointing<br>c) Socketed for solvent cement jointing | |
| | Additional Parameter (if applicable) | Lead-Free (LF) | |

# ANNEX A

## Grouping Guidelines

1. Unplasticized PVC pipes for water supplies as per IS 4985:2021 are categorized into following groups for the purpose of GoL/ CSoL:

a) ***Based on Size, Class and Pressure rating of pipes***:

| Class of Pipe | Working Pressure (PN) MPa | Group-1 | Group-2 | Group-3 |
|---|---|---|---|---|
| 1 | 0.25 | 90-110 | 125-315 | 355-630 |
| 2 | 0.40 | 63-110 | 125-315 | 355-630 |
| 3 | 0.60 | 40-110 | 125-315 | 355-630 |
| 4 | 0.80 | 25-110 | 125-315 | 355-630 |
| 5 | 1.00 | 20-110 | 125-315 | 355-630 |
| 6 | 1.25 | 20-110 | 125-315 | 355-630 |
| Plumbing pipes | - | 20-50 | - | - |

b) ***Based on ends of pipe***:

(i) Plain ended pipes
(ii) Socketed for elastomeric sealing ring jointing
(iii) Socketed for solvent cement jointing

***c) Based on the application of pipe:***

(i) Type A (Pipes for water supply)
(ii) Type B (Pipes for agricultural use)

Note: Type A and Type B are grouped under one group of variety for the purpose of GoL/CSoL, since all the requirements for Type A pipes (water supply) and Type B pipes (agricultural use) remain the same except the additional marking required on Type A pipes as per Clause 13.1.2 of IS 4985:2021.

***d) Additional Requirement (if applicable):***

Lead-Free (LF) pipes (pipes manufactured without lead stabilizer)

2. For considering GoL/CSoL, testing shall be done as follows:

a) Pipe of any size from each size group and class of pipe shall be tested for all requirements to cover pipes of all sizes in that size group and class of pipe tested.

b) (i) Separate pipes for each ends shall be tested. However, if socket ended pipe is tested, plain ended pipe in that size group and pressure class may also be covered.

(ii) If plain ended pipe is covered in the licence and extension of Scope is requested for socket ended pipe, only applicable tests for socket shall be carried out.

c)

(i) If Type A pipe is tested, then Type B may also be covered in the licence without any further testing.

(ii) If Type B is tested and then the manufacturer applies for Type A and Type B; compliance to the marking requirements as per Clause 13.1.2 of IS 4985:2021 in the form of manufacturing capabilities and in-house factory test report of any single variety of Type A pipe for the above marking requirement, will suffice for incorporation of Type A and Type B under the scope. The same shall also apply for the purpose of CSoL for including Type A pipes.

d) Lead-Free (LF) pipes of each class shall be tested for all requirements to cover the additional requirement of 'Lead-Free' in the scope of licence, for that particular class of pipes tested.

e) The Firm shall declare the varieties of 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.

f) 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 | Wall Thickness (Clause 7.1.2) | - Dial Gauge Method or<br>- Micrometer<br>- Ultrasonic gauge |
| 2 | Outside Diameter at any Point (Clause 7.1.1.2) | - Vernier Calipers or outside caliper |
| 3 | Mean Outside Diameters (Clause 7.1.1.1) | - Pi Tape or flexible tape |
| 4 | Effective length (Clause 7.1.4) | - Tape |
| 5 | Dimension of Socket (Clause 7.2) | - Vernier Caliper or Vernier depth gauge<br>- Inside Caliper<br>- Micrometer |
| 6 | Pipe Ends (Clause 9.1, 9.2) | - Angle Protractor |
| 7 | Sealing Ring (Clause 8) | - Vernier caliper<br>- Micrometer<br>- Radius gauge<br>- Shore hardness tester |
| 8 | Opacity (Clause 10.2) | - Opacity Test Apparatus<br>- Standard sample of opacity 0.2 % |
| | | **or Apparatus for Test Method-2**<br>- Source of light (halogen lamp 1000 W),<br>- Photo-electric cell (with filter correction to match eye response),<br>- Adjustable power arc or Incandescent lamp<br>- Diaphragm and optical lens<br>- Digital current meter.<br>- Standard sample of opacity 0.2 % |
| 9 | Effect on water (Clause 10.3) | - Distilled water<br>- Air conditioner<br>- pH meter<br>- Testing reagent and equipment for determination of cadmium, mercury, lead, tin and other toxic substances. |
| 10 | Reversion test (Clause 10.4) | - Thermostatically Control oil bath<br>- Mono-polyethylene glycol, glycerol or mineral oil free from aromatic hydrocarbons<br>- Vernier Calipers<br>- Stop watch |
| 11 | Vicat Softening temperature (Clause 10.5) | - Oil heating Bath equipped with means to raise the temperature at uniform rate of 50 ± 5° |

| | | |
|---|---|---|
| | | C/hr. with suitable stirrer.<br>- Rod with loading plate, load and indenting tips<br>- Micrometer dial gauge<br>- Thermometer or temperature measuring equipment |
| 12 | Density (Clause 10.6) | - Balance<br>- Thermometer<br>- Demineralized water<br>- Beaker<br>- Corrosion resistant wire |
| 13 | Sulphated ash content test (Clause 10.7) | - Balance<br>- Silica Crucible or Platinum crucible<br>- Bunsen Burner with Silica Triangle & Tripod<br>- Muffle Furnace<br>- Pipette<br>- Desiccator<br>- Drying agent<br>- Sulphuric Acid and Acetic acid |
| 14 | Hydrostatic Pressure Test (Clause 11.1 and 11.1.1) | - Hydrostatic pressure testing apparatus with pressuring unit and multiple outlets<br>- Water bath with temperature control<br>- Thermometer<br>- End plugs |
| 15 | Resistance to external blows at 0°C (Clause 11.2) | - Falling Weight testing machine from height 2000 mm<br>- Striker of weight 0.25, 0.50 & 1.00 kg<br>- Digital watch<br>- Liquid bath or freezer for conditioning of samples |

***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.

**1. LABELLING AND MARKING** – As per the requirements of IS 4985: 2021. The Standard Mark, as given in the Schedule of the licence, shall be clearly and indelibly marked in colour using ink/paint on each pipe provided always that the pipes thus marked conforms to all the requirement of the specification. In addition, the licence no. CM/L-_____ and details of BIS website shall be marked on the pipes as follows: "For details of BIS certification please visit www.bis.gov.in"

**3. CONTROL UNIT –** Pipes of same size, class, type and additional requirement (i.e. LF) extruded from same compound shall constitute a control unit.

**4. 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.

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

**5. 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 Methods** | | | **No. of Sample** | **Frequency** | **Remarks** |
| | | **Clause** | **Reference** | | | | |
| 6 | Composition | | | | | | |
| | Polyvinyl Chloride Resin<br>a) VCM Content<br>b) K-Value | 6.1<br>6.1.1<br>6.1.2 | IS 4985<br>IS 10151<br>IS 4669 | S | 1 | Each consignment | # |
| | Additives | 6.1 | IS 4985 | S | 1 | Each consignment | # |
| 8 | Sealing rings | 8 | IS 4985<br>IS 5382 | S | 1 | Each consignment | # |
| **7** | **Dimensions** | | | | | | |
| 7.1 | **Dimensions of Pipes** | | | | | | |
| | Diameter | 7.1.1<br>Table 1 | IS 4985<br>IS 12235 (Part 1) | R | Firm to have adequate in-process controls to check compliance of this parameter as per the requirements given in the Indian Standard. Appropriate records shall be maintained by the manufacturer for evidence of conformity | | |
| | Wall thickness | 7.1.2<br>Table 1 | IS 4985<br>IS 12235 (Part 1) | | | | |
| | Mean outside diameter, Outside diameter at any point and wall thickness (for plumbing pipes) | 7.1.3<br>Table 2 | IS 4985 | | | | |
| | Length | 7.1.4.1 | IS 4985 | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7.2 | **Dimensions of socket** | | | | | | |
| | Formation of socket | 7.2.1 | IS 4985 | R | Firm to have adequate in-process controls to check compliance of this parameter as per the requirements given in the Indian Standard. Appropriate records shall be maintained by the manufacturer for evidence of conformity | | |
| | Socket for solvent cement jointing | 7.2.1.1 Table 3 | IS 4985 | | | | |
| | Socket for elastomeric sealing ring joints | 7.2.1.2 Table 4 | IS 4985 | | | | |
| 9 | Pipes ends | 9.1, 9.2 | IS 4985 | | | | |
| 10.1 | Visual appearance | 10.1, 10.1.1 | IS 4985 | | | | |
| 10.2 | Opacity | 10.2 | IS 4985<br>IS 12235 (Part 3) | S | 1 | Once in three months | Pipe with thinnest wall section shall be tested $ |
| 10.3 | Effect on water | 10.3 | IS 4985<br>IS 12235 (Part 4)<br>IS 12235 (Part 10) | S | 1 | Once in six months | Smallest size pipe shall be tested @ |
| 10.4 | Reversion test | 10.4 | IS 4985<br>IS 12235 (Part 5) | R | 3 | Each control Unit | * |
| 10.5 | Vicat Softening temperature | 10.5 | IS 4985<br>IS 12235 (Part 2) | S | 1 | Once in three months | - |
| 10.6 | Density | 10.6 | IS 4985<br>IS 12235 (Part 14) | R | 1 | Each control unit | - |
| 10.7 | Sulphated Ash Content test | 10.7 Annex B | IS 4985 | S | 1 | Once in a week | - |
| **11** | **Mechanical Properties** | | | | | | |
| 11.1 | **Hydrostatic characteristics** | | | | | | |
| | Type test | 11.1 | IS 4985<br>IS 12235 (Part 8/ Sec 1)<br>IS 12235 | S | 1 | Once in three months | One sample of each class shall be tested once in 1 ½ years |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Acceptance test | | (Part 8/ Sec 4) | R | 1 | Each control unit | - |
| | Acceptance test of plumbing pipes | 11.1.1 | IS 4985 | R | 1 | Each control unit | - |
| 11.2 | Resistance to external blows at 0˚C | 11.2 Annex C | IS 4985 | R | Adequate pieces | Each control unit | - |

# No further testing is required if accompanied with the Test Certificate or ISI marked.

$ Additional test shall be carried out whenever there is a change in formulation/composition. Sampling shall be done in such a way that pipes from all extrusion machine shall be tested once in a year.

@ Additional sample shall be tested whenever there is a change in formulation/composition. Pipes from each class shall be tested in one year.

* In case of failure, additional six samples from same control units shall be tested and control unit shall be accepted if all retested samples pass.

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

(i) Dimensions of pipes and socket (Clause 7)

(ii) Dimensions of sealing rings (Clause 8)

(iii) Pipe ends (Clause 9)

(iv) Visual appearance (Clause 10.1)

(v) Opacity (Clause 10.2)

(vi) Reversion test (clause 10.4)

(vii) Vicat softening temperature (Clause 10.5)

(viii) Density (Clause 10.6)

(ix) Hydrostatic characteristics – Acceptance test (Clause 11.1)

(x) Resistance to external Blows (Clause 11.2)