



**PRODUCT MANUAL FOR
PRESTRESSED CONCRETE PIPES (INCLUDING SPECIALS)
ACCORDING TO IS 784: 2019**

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 784: 2019 |
| | Title | : | Prestressed Concrete Pipes (Including Specials) |
| | No. of Amendments | : | Nil |
| 2. | Sampling Guidelines: | | |
| a) | Raw material | : | Please refer ANNEX – A |
| b) | Grouping guidelines | : | Please refer ANNEX – B |
| c) | Sample Size | : | 3 Pipes (One for pressure permeability test, One for boiling absorption test and one for remaining tests) |
| 3. | List of Test Equipment | : | Please refer ANNEX – C |
| 4. | Scheme of Inspection and Testing | : | Please refer ANNEX – D |
| 5. | Possible tests in a day : | | |
| | As the licence is operated on Factory Testing basis, complete testing of a sample shall be done in factory. | | |
| 6. | Scope of the Licence: | | |
| | “Licence is granted to use Standard Mark as per IS 784: 2019 with the following scope: | | |
| | Name of the product | Prestressed Concrete Pipes | |
| | Type of pipes | Prestressed concrete cylinder pipe/Prestressed concrete non-cylinder pipe | |
| | | Pressure/Non-pressure pipes | |
| | Nominal Internal Diameter | | |
| | Type of Joint (As applicable) | | |

ANNEX A

Raw Material

- 1) Cement used for the manufacture of concrete pipes shall be ISI marked conforming to the relevant Indian Standard as mentioned in IS 784.
- 2) All types and sizes of coarse and fine aggregate – Clause 4.2 of IS 784 and IS 383
- 3) Water used for mixing of concrete and curing of pipes – Clause 4.3 of IS 784 and Clause 5.4 of IS 456.
- 4) Chemical admixtures (If used)–IS 9103
- 5) Steel for reinforcement:
 - a) Prestressing steel - Clause 4.5.1 of IS 784, IS 1785 (Part 1), IS 1785 (Part 2), IS 6003, IS 6006.
 - b) Un-tensioned reinforcement - Clause 4.5.2 of IS 784
 - c) All types and sizes of steel used for longitudinal and spiral reinforcement shall be ISI marked conforming to the relevant Indian Standard as mentioned in IS 784.
- 6) Steel for cylinder, joint rings and specials – Clause 4.6 of IS 784 and IS 2062
- 7) Rubber sealing rings – Clause 4.7 of IS 784 and IS 5382.
- 8) Bitumen or other Protective coating – Clause 4.8 of IS 784

Note: If different type and/or sizes of steel for reinforcement are used, it shall be treated as additional raw material. Similarly, if source and/or size and types of coarse and fine aggregate has changed, it shall be treated as additional raw material.

ANNEX B**Grouping Guidelines**

1. Prestressed Concrete Pipes (including Specials) as per IS 784: 2019, are classified as given below:
 - a) Manufacturing method:
 - i) Prestressed concrete cylinder pipe
 - ii) Prestressed concrete non-cylinder pipe
 - b) Nominal internal diameter of pipes: 200 mm to 2500 mm
 - c) Pressure and Non-pressure pipes
 - d) Joints:
 - i) For pressure pipes: Spigot and socket type with rubber ring or with steel joint ring embedded
 - ii) For non-pressure pipes: Spigot and socket roll on gasket joint or confined gasket joint or flush joint
2. Nominal internal diameter of pipes is further classified into following groups:

| Group Designation | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 |
|---|----------------|----------------|----------------|----------------|----------------|
| Nominal Internal diameter of pipe (mm) | 200 – 500 | 600 – 900 | 1000 – 1200 | 1300 -1800 | 1900 - 2500 |

3. Considering the above, the guidelines given below shall be followed for GOL/CSoL:
 - a) Prestressed concrete pipes including specials (as applicable) of any two sizes from each group designation and highest pressure rating shall be tested for all requirements to cover the complete range of sizes in that group designation for pressure ratings upto and including the pressure rating tested.
 - b) For covering variety based on manufacturing method, separate samples of prestressed concrete cylinder pipe and prestressed concrete non-cylinder pipe shall be tested.
 - c) Pipes of each joint type shall be tested to cover that particular joint in the licence.
4. The Scope of Licence may be restricted based on the Manufacturing and Testing capabilities of the Manufacturer.
5. During operation of licence, BOs shall ensure that all the varieties covered in the license are tested in rotation, to the extent possible.

ANNEX C**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 | Size of aggregates (Clause 4.2) | - Sieve Set IS Sieve Designations: 80mm, 40mm, 20mm, 10mm, 4.75mm, 2.36mm, 1.18mm, 600 micron, 300 micron and 150 microns |
| 2 | Dimensions and Tolerances (Clause 5) | - Vernier caliper, - Depth Gauge, - Screw Gauge, - Steel tape 15 Mts, - Go gauge for checking ends diameter, - No go Gauge for checking ends diameter, - Go gauge for Centre diameter, - No go gauges for Centre diameter, - Feeler gauge. |
| 3 | Joint dimensions (Clause 6) | - Vernier caliper, - Depth Gauge, - Screw Gauge, - Steel tape 15 Mts, |
| 4 | Concrete mix (Clause 8.1.2, 8.4.7 and clause 9.2.1 of IS 456) | - 150 x 150 mm Cube Moulds, - Concrete cube vibrating machine, - Measuring jars, - Weighing Balance, - Curing tank, - Compression Testing Machine, - Suitable equipment, chemicals and glass wares required to carry out soluble chloride ion content. |
| 5 | Pre-tensioning and Release of Longitudinal wires (Clause 8.3) | - Vernier Calliper - Ball ended micrometer |
| 6 | Circumferential Pre-stressing (Clause 8.4) | - Vernier Calliper - Ball ended micrometer |
| 7 | Cover coating (Clause 8.5) | - Hammer having head mass of not more than 0.5 kg - Vernier calliper - 70.6 x 70.6 cube Moulds, - Mortar cube vibrating machine, |

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| | | <ul style="list-style-type: none"> - Test sieves for aggregates, - Measuring jars, - Weighing Balance - Curing tank, - Compression Testing Machine. |
| 8 | Steel socket and spigot joint rings (Clause 9.1.1) | <ul style="list-style-type: none"> - Outside Micrometer/Calliper |
| 9 | Fabrication of steel cylinders (Clause 9.1.2) | <ul style="list-style-type: none"> - Outside Micrometer/Calliper |
| 10 | Hydrostatic testing (Clause 9.1.2.1) | <ul style="list-style-type: none"> - Hydrostatic pressure test set up with suitable fitting to hold the pipe under pressure sealed from both ends and pressure gauge |
| 11 | Fabrication (Clause 10.1) | <ul style="list-style-type: none"> - Suitable penetrator and Developer as per IS 3658 - Outside Micrometer |
| 12 | Deviation from the straightness (clause 12.1) | <ul style="list-style-type: none"> - Straight edge and feeler gauge set |
| 13 | Finish (Clause 12.2) | <ul style="list-style-type: none"> - Vernier Calliper |
| 14 | Design Proving and Manufacturing process approval test in factory (Clause 13.1) | <ul style="list-style-type: none"> - Test set up as per Annexure-L of IS 784 |
| 15 | Hydrostatic Factory test (Clause 13.2) | <ul style="list-style-type: none"> - Hydrostatic test set up with suitable end fitting for various sizes and pressure gauge, - Stopwatch, - Feeler gauge (set up as per IS 3597:1998) |
| 16 | Permeability test on coating (Clause 13.3) | <ul style="list-style-type: none"> - Permeability Test Arrangement with graduated glass tubes, metal cups, wash bottles, crocks etc as per IS 3597 |
| 17 | Three Edge Bearing Test (for Pips for Drainage, Sewerage and Culverts) (Clause 13.4) | <ul style="list-style-type: none"> - Three Edge Load Bearing Test arrangement with Hydraulic Jack and Load gauge complete assembly as per IS 3597, - Gauge Leaf as per IS 3597(0.25 mm thickness) |
| 18 | Dimensional characteristics (Clause 13.5) | <ul style="list-style-type: none"> - Vernier caliper, - Depth Gauge, - Screw Gauge, - Steel tape 15 Mts, - Go gauge for ends diameter, - No-Go Gauge for ends diameter, - Go gauge for Centre diameter, - No-Go gauge for Centre diameter, - Feeler gauge. |

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| 19 | Boiling Absorption test on coating mortar (Clause 13.7) | <ul style="list-style-type: none"> - Coating machine, - Soap solution, - Steel tape, - Vernier calliper, - Adequate sand bed, - Stop watch, - Groove making facility, - Adequate plastic sheet, - Sample concrete cutting machine, - Oven with temperature controller, - Weighing balance, - Facility for boiling water - Dry absorbent/blotting paper. |
| 20 | Pressure Permeability test (Clause 13.8) | - Test set up as per clause 12 of IS 3597 |
| 21 | Weighment of reinforced cage (Clause 4.5.2) | - Weighing Balance of suitable least count and range |

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

ANNEX D

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.

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 784: 2019.

4. CONTROL UNIT – Every 50 pipes/specials or part thereof, of same class and size, manufactured continuously on consecutive days (from same consignment of cement, same mix design for concrete/mortar and similar curing condition) shall constitute a 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 2.0 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 | Recommended Levels of Control | | |
| Clause | Requirement | Test Methods | | | No. of Sample | Frequency | Remarks |
| | | Clause | Reference | | | | |
| 4 | Material | | | | | | |
| 4.1 | Cement | 4.1 | IS 784 | S | - | - | Cement received shall be ISI marked and accompanied with test certificate. |
| 4.2 | Aggregates | 4.2 | IS 784 IS 383 | S | One | Once in year for each size. | Additional sample shall be tested wherever there is change in source of raw material. |
| 4.3 | Water | 4.3 | IS 784 IS 456 | S | One | Once in a year or whenever there is a change in source of water, whichever is earlier | |
| 4.4 | Admixtures (if used) | 4.4 | IS 784 IS 9103 | S | One | Each consignment | No further testing is required if accompanied with test certificate or ISI marked. |
| 4.5 | Steel for reinforcement | | | | | | |
| 4.5.1 | Prestressing steel | 4.5.1 | IS 784 IS 1785 (Part 1) IS 1785 (Part 2) IS 6006 IS 6003 | S | - | - | Reinforcement material received shall be ISI marked and accompanied with test certificate. |
| 4.5.2 | Un-tensioned reinforcement | 4.5.2 | IS 784 IS 432 (Part 1) IS 432 (Part 2) IS 1786 IS 1566 IS 1785 (Part 1) IS 1785 (Part 2) | S | - | - | Reinforcement material received shall be ISI marked and accompanied with test certificate. |

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| 4.6 | Steel for cylinder, joint rings and specials | 4.6 | IS 784 IS 2062 | S | - | - | Reinforcement material received shall be ISI marked and accompanied with test certificate. |
| 4.7 | Rubber sealing rings | 4.7 | IS 784 IS 5382 | S | One | Each size and source | No further testing is required, if received with test certificate or ISI marked. |
| 4.8 | Bitumen or other protective coating | 4.8 | IS 784 | S | - | - | As per agreement with supplier. |
| 5 13.5 | Dimensions and Tolerances | 5.1, 5.2, 5.3, 13.5 15.1.1 & 15.1.2 | IS 784 | R | Each pipe | - | By gauging each pipe. Actual dimensions may also be ensured with random checking. |
| 6 9.1 11 13.5 | Joints Dimensions | 6, 9.1.1 11, 13.5 15.1.3 | IS 784 | R | Each pipe | - | Joint dimensions and tolerances for spigot and socket diameters shall be provided by manufacturer. |
| 7 | Design | 7.1 to 7.8 | IS 784 | - | Each pipe | - | - |
| 5.5 8.1.2 8.5.4 10.1.1 | Compressive strength of concrete cubes and mortar cubes | 5.5.1, 5.5.3 8.1.2 8.5.4 10.1.1 | IS 784 | R | One sample consisting of 3 cubes from each consignment of cement | - | Supply of cement executed against order spread over up to three months shall be taken as one consignment for this test only. One sample may be tested in a month in case same mix is used for different size/class of pipes. |
| 8.3 & 8.3.3 | Longitudinal prestressing wire | 8.3, 8.3.3 | IS 784 | R | Each Pipe | - | - |
| 8.4.5 & 8.4.6 | Circumferential prestressing wire | 8.4.5 & 8.4.6 | IS 784 | R | Each pipe | - | - |
| 8.5 | Cover coating | 8.5 | IS 784 | R | Each pipe | - | - |
| 9 | Steel cylinders | 9.1 | IS 784 | R | Each cylinder | - | - |

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| 10 | Specials | 10.1, 10.2 10.3, 10.4 | IS 784 | R | Each special | - | - |
| 12 | Workmanship and finish | | | | | | |
| 12.1 | Deviation from straightness | 12.1, 15.1.4 | IS 784 | R | Each pipe | - | - |
| 12.2 | Finish | 12.2 | IS 784 | R | Each Pipe | - | - |
| 13.1 | Design proving and manufacturing process approval test in factory | 13.1 | IS 784 | R | Two or Three pipes | One set of samples of same diameter and highest-pressure rating, shall be tested as design proving and manufacturing process approval test. The additional test shall be carried out whenever there is change in design parameter or once in three years, whichever is earlier. | |
| 13.2 | Hydrostatic factory test | 13.2.1 13.2.2 | IS 784 IS 3597 | R | Each Pipe | - | - |
| 13.3 | Permeability test on coating | 13.3 | IS 784 IS 3597 | R | Two | Every 10 th control unit | Sample shall be selected in such a manner that all sizes shall be covered over a period. |
| 13.4 | Three edge bearing test (for pipes for drainage, sewerage and culverts) | 13.4 | IS 784 IS 3597 | R | Two | Each control unit | Maximum safe load shall be applied and result (Pass/fail) shall be recorded. |
| 13.7 | Boling absorption test on coating mortar | 13.7 | IS 784 IS 3597 | R | Three | Every 10 th control unit | Sample shall be selected in such a manner that all sizes shall be covered over a period. |
| 13.8 | Pressure permeability test on coating | 13.8 | IS 784 IS 3597 | R | One | Every 10 th control unit | If sample fails after 480 h, two additional samples from same control unit shall be tested and control unit shall be accepted only if both samples pass. |

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

Note 2 - The control unit and levels of control as decided by the Bureau are obligatory to which the licensee shall comply with.