



## PRODUCT MANUAL FOR GLASS FIBRE REINFORCED PLASTICS (GRP) PIPES, JOINTS AND FITTINGS FOR USE FOR SEWERAGE, INDUSTRIAL WASTE AND WATER (OTHER THAN POTABLE) ACCORDING TO IS 14402: 1996

*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. | <b>Product</b>                                                                                                                                                                                          | : | IS 14402: 1996                                                                                                                                                                                                                                                                                           |
|    | <b>Title</b>                                                                                                                                                                                            | : | Glass Fibre Reinforced Plastics (GRP) Pipes, Joints and Fittings for Use for Sewerage, Industrial Waste and Water (Other than Potable)                                                                                                                                                                   |
|    | <b>No. of Amendments</b>                                                                                                                                                                                | : | 2                                                                                                                                                                                                                                                                                                        |
| 2. | <b>Sampling Guidelines:</b>                                                                                                                                                                             |   |                                                                                                                                                                                                                                                                                                          |
| a) | <b>Raw material</b>                                                                                                                                                                                     | : | 1. Resin - Clause 6.1 of IS 12709 : 1994 and IS 6746<br>2. Glass Fibre Reinforcement – Clause 6.2 of IS 14402 : 1996 and IS 11273, IS 11320 or IS 11551<br>3. Aggregates – Clause 6.3.1 of IS 14402: 1996<br>4. Filler - Clause 6.3.2 of IS 14402: 1996<br>5. Additives - Clause 6.3.3 of IS 14402: 1996 |
| b) | <b>Grouping guidelines</b>                                                                                                                                                                              | : | Please refer <a href="#">Annex A</a>                                                                                                                                                                                                                                                                     |
| c) | <b>Sample Size</b>                                                                                                                                                                                      | : | Qty – 12 Nos x 1 mtr – for all tests                                                                                                                                                                                                                                                                     |
| 3. | <b>List of Test Equipment</b>                                                                                                                                                                           | : | Please refer <a href="#">Annex B</a>                                                                                                                                                                                                                                                                     |
| 4. | <b>Scheme of Inspection and Testing</b>                                                                                                                                                                 | : | Please refer <a href="#">Annex C</a>                                                                                                                                                                                                                                                                     |
| 5. | <b>Possible tests in a day:</b>                                                                                                                                                                         |   |                                                                                                                                                                                                                                                                                                          |
|    | All tests except Long term hydrostatic design pressure test (Clause 15) and Chemical requirements test (Clause 16) shall be carried out in factory as the licence is operated on factory testing basis. |   |                                                                                                                                                                                                                                                                                                          |
| 6. | <b>Scope of the Licence</b>                                                                                                                                                                             | : | Please refer <a href="#">Annex D</a>                                                                                                                                                                                                                                                                     |

## **ANNEX A**

### **Grouping Guideline**

1. IS 14402: 1996 covers Glass Fibre Reinforced Plastics (GRP) Pipes, Joints and Fittings for Use for Sewerage, Industrial Waste and Water (Other than Potable) which are classified as given below:

- a) Based on Pressure class:

|                        |      |      |      |       |       |
|------------------------|------|------|------|-------|-------|
| Pressure class (PN)    | PN 3 | PN 6 | PN 9 | PN 12 | PN 15 |
| Working pressure (kPa) | 300  | 600  | 900  | 1200  | 1500  |

- b) Based on Stiffness class:

|                            |    |     |     |     |
|----------------------------|----|-----|-----|-----|
| Stiffness class (SN)       | A  | B   | C   | D   |
| Pipe stiffness value (kPa) | 62 | 124 | 240 | 496 |

- c) Based on Size Designation and nominal diameter:

|                       |                                                                                                                                     |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Nominal Diameter (DN) | 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1400, 1600, 1800, 2000, 2200, 2400, 2600, 2800 and 3000 mm |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------|

Nominal diameters covered are further grouped as under:

| <b>Group</b> | <b>Nominal Diameter (DN) mm</b> |
|--------------|---------------------------------|
| 1            | 200 mm to 450 mm DN             |
| 2            | 500 mm to 1000 mm DN            |
| 3            | 1100 mm to 2000 mm DN           |
| 4            | 2200 to 3000 mm DN              |

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

- a) One sample of pipe of any size, preferably highest, from each group and each pressure class and stiffness class shall be tested for all requirements except Long term hydrostatic design pressure test (Clause 15) and Chemical requirements test (Clause 16) (which are type tests) to covers pipes of all sizes in that group for the pressure class and stiffness class tested.
- b) Long term hydrostatic design pressure test (Clause 15) by method A and the Chemical requirements test (Clause 16) (which are type tests) shall be conducted on a sample of pipe of any size, pressure class and stiffness class at the time of grant of licence. If manufacturer has evidence that the hydrostatic design basis has already been established for a nominally similar pipe using the same manufacturing process, the manufacture

needs to conduct only the requalification test as described in Method B, else full type testing as described in Method A (Clause F-4 of IS 12709: 1994) shall be performed.

- c) The requalification test by Method B and Chemical requirement test shall be conducted once in every three years. The LTHS test by Method A shall also be conducted whenever a significant change is made in the design, composition or process of manufacturing.
- d) The raw material shall be tested as per Clause 6 of IS 14402 : 1996 to cover all the stiffness classes with declaration, if any.

3. 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.

4. 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       | Dimensions (Clause 7)               | <ul style="list-style-type: none"> <li>- Vernier Calliper</li> <li>- Steel scale</li> <li>- Steel Rule</li> <li>- Measuring Tape</li> <li>- Right angle</li> <li>- Magnetic spirit level</li> <li>- Steel tape</li> <li>- Dial gauge with stand</li> <li>- Mandrel or trunnions stand for rotating pipes on it</li> </ul>                         |
| 2       | Workmanship (Clause 9)              | <ul style="list-style-type: none"> <li>- Vernier caliper</li> <li>- Depth gauge/Dial gauge</li> </ul>                                                                                                                                                                                                                                             |
| 3       | Pipe stiffness (Clause 10)          | <ul style="list-style-type: none"> <li>- Compression testing machine with arrangement to hold the sample between two plates and applying vertical load at specified rate as per Fig 2 of Annex-B of IS 14402 : 1996</li> <li>- Stopwatch</li> <li>- Dial gauge or arrangement for measurement of deflection of sample during the test.</li> </ul> |
| 4       | Soundness (Clause 12.2)             | <ul style="list-style-type: none"> <li>- Hydrostatic test apparatus capable to apply pressure at uniform specified rate with timer</li> <li>- End caps of suitable size and design</li> <li>- Stop watch</li> </ul>                                                                                                                               |
| 5       | Longitudinal strength (Clause13)    | <ul style="list-style-type: none"> <li>- Tensile testing machine with details as per clause D- 2 of IS 14402 ; 1996</li> <li>- Beam load strength testing machine to apply load on pipe at two points as per clause D-1 of IS 14402 : 1996</li> </ul>                                                                                             |
| 6       | Hoop tensile strength (Clause 14)   | <ul style="list-style-type: none"> <li>- Hoop tensile testing apparatus as per clause E-2 of IS 14402 : 1996</li> </ul>                                                                                                                                                                                                                           |

|   |                                                           |                                                                                                                                                                                                                                 |
|---|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7 | Long term hydrostatic design pressure test<br>(Clause 15) | <ul style="list-style-type: none"> <li>- Arrangement for long term hydrostatic strength test (LTHS) as per Annex-F of IS 12709 : 1994</li> <li>- Strain gauge having minimum effective measurement length of 6.35 mm</li> </ul> |
| 8 | Chemical requirement test<br>(Clause16)                   | <ul style="list-style-type: none"> <li>- Stress corrosion test apparatus as per Fig 7, Annex-F of IS 14402 : 1996</li> </ul>                                                                                                    |

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

## **ANNEX C**

### **Scheme and 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 requirement of IS 14402: 1996.

**4. CONTROL UNIT** – 100 pipe lengths or part thereof of the same size, pressure class and stiffness class produced under similar conditions of manufacture 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<br>requirement<br>R: required (or)<br>S: Sub-contracting<br>permitted | Levels of Control |                        |                                                                                                    |
| Cl           | Requirement               | Test Methods                      |                                            |                                                                                      | No. of<br>Sample  | Frequency              | Remarks                                                                                            |
|              |                           | Clause                            | Reference                                  |                                                                                      |                   |                        |                                                                                                    |
| 6.1          | Resin                     | 6.1                               | IS 14402<br>IS 6746                        | S                                                                                    | One               | Each batch<br>received | Further testing is not required if<br>material received is with test<br>certificate or ISI marked. |
| 6.2          | Glass Fibre<br>Reinforced | 6.2                               | IS 14402<br>IS 11320<br>IS11273<br>IS11551 | S                                                                                    | One               | Each batch<br>received |                                                                                                    |
| 6.3.1        | Aggregates                | 6.3.1                             | IS 14402                                   | S                                                                                    | One               | Each batch             | Each batch of aggregates received<br>shall be checked for size<br>requirements.                    |
| 6.3.2        | Fillers                   | 6.3.2                             | IS 14402                                   | S                                                                                    | One               | Each batch             | Each batch of fillers received shall<br>be checked for size requirements.                          |
| 6.3.3        | Additives                 | 6.3.3                             | IS 14402                                   | S                                                                                    | One               | Each<br>consignment    | Record of additives used along with<br>their certificate of conformity may<br>be maintained        |
| 7.1          | Diameter of pipes         | 7.1, A-1.1<br>Table 1,<br>Table 2 | IS 14402                                   | R                                                                                    | Each pipe         | -                      | -                                                                                                  |
| 7.2          | Length                    | 7.2, A-2.1                        | IS 14402                                   | R                                                                                    | Each pipe         | -                      | -                                                                                                  |
| 7.3          | Out of squareness         | 7.3, A-3.1                        | IS 14402                                   | R                                                                                    | Each pipe         | -                      | -                                                                                                  |
| 7.4          | Wall thickness            | 7.4, A-4.1                        | IS 14402                                   | R                                                                                    | Each pipe         | -                      | -                                                                                                  |

|                  |                                            |                        |                      |   |           |                                                          |                                                                                                                                                                                                             |
|------------------|--------------------------------------------|------------------------|----------------------|---|-----------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9.1              | Workmanship                                | 9.1, Table 3           | IS 14402             | R | Each pipe | -                                                        | -                                                                                                                                                                                                           |
| 10.1             | Pipe Stiffness                             | 10.1, Table 4, Annex B | IS 14402             | R | One       | Each control unit                                        | -                                                                                                                                                                                                           |
| 12.2             | Soundness                                  | 12.2, Table 5, Annex C | IS 14402             | R | One       | Each control unit                                        | For the pipes of nominal of diameter above 1400 mm, the frequency of soundness test shall be agreed between manufacturer and purchaser                                                                      |
| 13               | Longitudinal Strength                      | 13, Table 6 Annex D    | IS 14402             | R | One       | Each control unit                                        | -                                                                                                                                                                                                           |
| 14               | Hoop Tensile Strength                      | 14, Table 7 Annex E    | IS 14402             | R | One       | Each control unit                                        | -                                                                                                                                                                                                           |
| <b>TYPE TEST</b> |                                            |                        |                      |   |           |                                                          |                                                                                                                                                                                                             |
| 15               | Long Term Hydrostatic Design Pressure test | 15, Table 8 Annex F    | IS 14402<br>IS 12709 | R | One       | Once in three year for each pressure and stiffness class | In case of any significant change in design, composition or process of manufacturer, type test shall be carried out. If no change is envisaged type test shall be carried out at least once in three years. |
| 16               | Chemical Requirements Test                 | 16.1, 16.2, Annex-F    | IS 14402             | S | One       | Once in three year for each pressure and stiffness class | In case of failure of sample in type test, marking shall be stopped under intimation to BIS. Marking to be resumed only if fresh sample tested after corrective actions passes in the type test.            |

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****Scope of the Licence**

|                                                                                          |                                                                                                                                        |
|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| “Licence is granted to use Standard Mark as per IS 14402: 1996 with the following scope: |                                                                                                                                        |
| Name of the product                                                                      | Glass Fibre Reinforced Plastics (GRP) Pipes, Joints and Fittings for Use for Sewerage, Industrial Waste and Water (Other than Potable) |
| Nominal Diameter (DN)                                                                    |                                                                                                                                        |
| Stiffness Class (SN)                                                                     |                                                                                                                                        |
| Pressure Class (PN)                                                                      |                                                                                                                                        |