*भारतीय मानक*

***Indian Standard***

**IS 12786 : 2024**

# सिंचाई उपकरण — सिंचाई के लिए पॉलीथीन पाइप — विशिष्टि

*( पहला पुनरीक्षण )*

# Irrigation Equipment — Polyethylene Pipes for Irrigation Laterals — Specification

*( First Revision )*

ICS 65.060.35



भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

**February 2024** **Price Group 7**

Farm Irrigation and Drainage Systems Sectional Committee, FAD 17

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Farm Irrigation and Drainage Systems Sectional Committee had been approved by the Food and Agriculture Division Council.

Drip irrigation systems (DIS) is one of the modern irrigation techniques to economise the use of water in agriculture. It has a very high water use efficiency as it applies water directly to the plant root zone. An important component of DIS is irrigation laterals through which water is supplied into the field. Irrigation laterals are polyethylene pipes which may be perforated at regular intervals for mounting the drippers or emitters by means of fittings. As drip irrigation became popular the standard was developed specifying the requirements for the polyethylene pipes intended for irrigation laterals.

The standard was original published in 1989 deriving its assistance from ISO/DIS 8779 'Plastics piping systems — Polyethylene (PE) pipes for irrigation — Specifications' and IS 3076 : 1985 'Specification for low density polyethylene pipes for potable water supplies (*second revision*)'. Since then, seven amendments have been issued to the standard.

The first revision of the standard has been undertaken to incorporate all the earlier issued amendments and following modifications to make the standard more implementable:

a) Laser printing is allowed for marking information on the pipes;
b) Alternate options for surface active reagents used in environmental stress cracking resistance (ESCR) test have been included; and
c) Necessary editorial changes have been made for better comprehension.

The composition of the Committee, responsible for the formulation of this standard is given in Annex G.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard*

# IRRIGATION EQUIPMENT — POLYETHYLENE PIPES FOR IRRIGATION LATERALS — SPECIFICATION

*( First Revision )*

## 1 SCOPE

This standard lays down requirements for polyethylene pipes of outside diameter from 12 mm up to 32 mm to be used for irrigation laterals that is branch supply lines on which sprayers or drippers or emitters are mounted directly or by means of a fitting or formed in the pipe during production.

## 2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

| *IS No.* | *Title* |
|---|---|
| IS 2530 : 1963 | Methods of test for polyethylene moulding materials and polyethylene compounds |
| IS 4905 : 2015/ ISO 24153 : 2009 | Random sampling and randomization procedures (*first revision*) |

## 3 CLASSIFICATION OF PIPES

The pipe shall be classified by pressure ratings (working pressure) as follows:

| *Sl No.* (1) | *Class of Pipe* (2) | *Working Pressure* (3) |
|---|---|---|
| i) | Class 1 | 0.20 MPa |
| ii) | Class 2 | 0.25 Mpa |
| iii) | Class 3 | 0.40 MPa |

NOTE — Normal working conditions of pipes shall be operation of maximum 800 working h per year at the pressure rating of the pipe and at a water temperature up to 35 °C. If these working conditions are exceeded the next higher class of pipe, that is, pipe with greater wall thickness shall be chosen. With these working conditions the life expectancy of the pipe is 10 years.

## 4 MATERIAL

**4.1** Extrusion compounds shall be manufactured from a mixture of the following:

a) Polyethylene, which may include copolymers of ethylene and higher olefins, in which the higher olefin constituent does not exceed 10 percent (*m/m*);

b) Antioxidant in an amount not exceeding 0.5 percent (*m/m*);

c) Carbon black equivalent to a content of 2.5 percent ± 0.5 percent (*m/m*) and complying with the following requirements:

1) Toluene extract, not more than 0.1 percent (*m/m*) (*see* Annex A).

2) Volatile matter, not more than 0.9 percent (*m/m*) (*see* Annex B).

d) Grade of polyethylene

PE 25 or higher grade, a raw material mentioned in **4.1 (a)** having a minimum design creep rupture stress of 2.5 MPa for 10 years life at a maximum of 800 working h per year at 35 °C.

**4.2** Test the carbon content of finished PE lateral pipe in accordance with IS 2530:

a) The percentage of carbon black in the sample shall be in range of 2 percent to 3 percent by mass; and

b) The dispersion of carbon black shall be satisfactory.

**4.3** Addition of not more than 10 percent of the manufactures own rework material produced during the manufacturing and testing of pipe complying with this standard is permitted. No other rework material shall be used.

## 5 DIMENSIONS OF PIPES

**5.1** The outside diameters and wall thicknesses of

the pipes shall be as given in Table 1.

**5.1.1** The outside diameter of a pipe shall be average of four measurements taken at 45° round the pipe.

**5.1.2** The outside diameter of a pipe shall be measured with a vernier calliper or taper gauge or pi tape.

**5.1.3** The wall thickness shall be measured with a dial vernier/ball ended micrometer.

**5.1.4** The resulting dimensions shall be expressed to the nearest 0.05 mm.

## 6 VISUAL APPEARANCE

The internal and external surface of the pipes shall be smooth, clean and free from grooving's and other defects. The ends shall be cleanly cut and shall be square with axis of the pipe. Slight shallow longitudinal grooves or irregularities in the wall thickness shall be permissible, provided the wall thickness remains within the permissible limits.

## 7 PERFORMANCE REQUIREMENTS

### 7.1 Hydraulic Characteristics

When subjected to internal pressure creep rupture test in accordance with the procedure given in Annex C, the pipe shall show no signs of localized swelling, leakage or weeping and shall not rupture during the prescribed test duration. The temperatures, durations of test and stresses for quality acceptance test shall be as given in Table 2.

**7.1.1** Acceptance tests carried out at a temperature of 20 °C allow a fast verification of the conformity to requirements of 7.1. For every degree rise in the test temperature the induced stress is to be reduced by 3 percent. Test temperatures for acceptance tests should not exceed 30 °C.

**7.1.2** Quality tests carried out at an elevated temperature of 70 °C allow evaluation of the standard of the procedure and the pipe material used and must be carried out once every year or when change is made in polymer composition or method of manufacture or when a new size of pipe is to be introduced.

**7.1.3** Three samples of same outside diameter and same pressure rating selected at random from a regular lot shall be tested for compliance with the requirements of quality test.

**7.1.4** If all the three samples each of different diameters pass the requirements of the quality test, the type of the pipe under consideration shall be considered eligible for quality approval which will be normally valid for a period of one year.

**7.1.5** In case any of the samples fails in quality test, the testing authority, at its discretion, may call for fresh samples not exceeding the original number and subject them to quality tests. If in repeat tests no single failure occurs, the type of pipe under consideration shall be considered eligible for approval. If any of the samples fails in the repeat tests, the type of pipe shall not be approved. The manufacturers may be asked to improve the design and resubmit the pipe for quality approval.

**Table 1 Dimensions of Polyethylene Pipes for Irrigation Laterals**

(*Clauses* 5.1 *and* F-1.3.2)

All dimensions in millimetres.

| Sl No. | Outside Diameter | Tolerance on Outside Diameter | Class 1 (0.20 MPa) | | Class 2 (0.25 MPa) | | Class 3 (0.40 MPa) | |
|---|---|---|---|---|---|---|---|---|
| | | | *Min* | *Max* | *Min* | *Max* | *Min* | *Max* |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| i) | 12 | + 0.2 | 0.6 | 0.8 | 0.9 | 1.1 | 1.2 | 1.4 |
| ii) | 16 | + 0.2 | 0.8 | 1.0 | 1.1 | 1.3 | 1.4 | 1.6 |
| iii) | 20 | + 0.2 | 0.9 | 1.1 | 1.2 | 1.4 | 1.5 | 1.7 |
| iv) | 25 | + 0.3 | 1.2 | 1.6 | 1.7 | 2.0 | 2.1 | 2.4 |
| v) | 32 | + 0.3 | 1.5 | 1.9 | 2.0 | 2.4 | 2.5 | 2.9 |

NOTE — Wall thickness of pipes are based on a safe working stress of 2.5 MPa at 20 °C. Occasional rise ii temperature has no deleterious effects on the life and working pressure of the pipes.

**Table 2 Requirements for Internal Pressure Creep Rupture Test**

(*Clauses* 7.1 *and* C-4.3)

| Sl No. | Test | Test Temperature, °C | Test Duration (Min Holding) (h) | Induced Stress (MPa) |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| i) | Quality Test | 70 | 100 | 2.5 |
| ii) | Acceptance Test | 20 | 1 | 6.9 |

**7.2 Reversion Test**

A pipe length of 250 mm ± 5 mm shall be taken and two points at a distance of 200 mm shall be marked on the outer surface of the pipe with the help of vernier calliper. The test piece shall be placed horizontally on a support in an air oven or a suitable liquid bath at a temperature of 100 °C ± 2 °C for 60 min in such a way that dimensional changes in the pipe section are not impeded. After cooling to room temperature, the dimensional change of the, pipe section shall be measured in the longitudinal direction and deviation from the initial length shall be calculated and stated in percentage. The dimensions shall not change by more than ± 3 percent in the longitudinal direction.

**7.3 Tensile Test**

The tensile strength of the material and elongation at break of the pipes at 27 °C ± 3 °C shall be as follows:

| *Sl No.* | *Tensile Strength at Break, Min* | *Testing Speed* | *Elongation at Break, Min* |
|---|---|---|---|
| (1) | (2) | (3) | (4) |
| i) | 12.5 MPa | 100 mm/min ± 10 mm/min | 500 percent |

**7.3.1** *Test Piece*

The test piece shall consist of a dumb bell punched from points on the circumference of the pipe 90° apart. The shape of the test piece shall be as shown in Fig. 1.

**7.3.2** *Procedure*

The test piece shall be conditioned for two h in air or one hour in water so that it is at a temperature of 27 °C ± 2 °C immediately before test. The test shall be carried out as given in **6** of IS 2530.

**7.4 Susceptibility to Environmental Stress Cracking**

The susceptibility to Environmental stress cracking shall be tested in accordance with the test method specified in Annex D and the test results shall comply with the requirements of the Annex D.

**8 SUPPLY OF PIPES**

The pipes shall be supplied in coil of nominal lengths 25 m, 50 m, 100 m, 150 m, 200 m, 300 m, 400 m and 500 m unless otherwise agreed to between the purchaser and the supplier. Each coil shall contain not less than one specified nominal length.

**9 COILING**

When the pipe is supplied in coils, the minimum internal diameter of the coil shall be as follows:

| *Sl No.* | *Nominal Size of Pipe, mm* | *Minimum Internal Diameter of Coil, mm* |
|---|---|---|
| (1) | (2) | (3) |
| i) | 12 | 300 |
| ii) | 16 | 300 |
| iii) | 20 | 300 |
| iv) | 25 | 300 |
| v) | 32 | 450 |

NOTE — The pipes may also be supplied in coils of diameter smaller than those recommended, if agreed to between the purchaser and the supplier. However, the pipes should be recoiled to a larger diameter after these are delivered.

**10 SAMPLING AND CRITERIA FOR CONFORMITY**

The sampling procedure to be adopted and the criteria for conformity shall be as given in Annex E.

**11 MARKING**

**11.1** Each pipe shall marked as indicated in **11.1.1** at

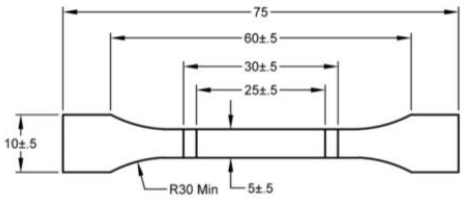
intervals of not more than 15 m with the following information.

a) Manufacturer's name or trade-mark;
b) Outside diameter;
c) Class of pipe;
d) Batch number; and
e) Pipe material PE 25.

**11.1.1** The information specified in 11.1 shall be marked using heat embossing or laser printing or marked indelibly with colour for different classes of pipes.

**11.1.2** In case of marking through colour, the following colour code shall be followed:

| *Sl No.* | *Class of Pipe* | *Colour* |
|---|---|---|
| (1) | (2) | (3) |
| i) | Class 1 | Red |
| ii) | Class 2 | Yellow |
| iii) | Class 3 | Green |




All dimensions are in millimetres.

FIG. 1 SHAPE OF A DUMB-BELL TEST PIECE FOR TENSILE TEST

**11.2 BIS Certification Marking**

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

## 12 SELECTION OF IRRIGATION LATERALS

The principles of the selection of irrigation laterals are given in Annex F for guidance.

## ANNEX A

[*Clause* 4.1 (c)]

## DETERMINATION OF TOLUENE EXTRACT OF CARBON BLACK

### A-l APPARATUS

**A-1.1 Extraction Thimbles** — double thickness, fat extracted.

**A-1.2 Soxhlet Apparatus**

**A-1.3 Shallow Weighing Dish** — 50 ml capacity, of borosilicate glass.

### A-2 REAGENT

**A-2.1 Toluene** — sulphur-free, of AR quality

### A-3 PROCEDURE

**A-3.1** Place 5 g to 8 g of pelletized carbon black or 2 g to 5 g of compressed fluffy black in a paper extraction thimble. Insert the thimble into the soxhlet extractor. Measure 50 ml to 60 ml of toluene into the soxhlet flask.

**A-3.2** Assemble the soxhlet apparatus and extract for 22 h.

**A-3.3** Evaporate successive small portions of the extract solution (filtered, if necessary) nearly to dryness in the previously cleaned, dried and tared 50 ml shallow glass weighing dish. Rinse the extraction flask with toluene and add the washings, to the weighing dish. Evaporate the combined extracts on a hot-plate to a volume of approximately 5 ml to 10 ml and finally the dish and contents in an oven at 115 °C until dry.

**A-3.4** Cool in a desiccator to room temperature and weigh.

### A-4 CALCULATION

Calculate the toluene extract percent as follows:

$$Toluene\ extract = \frac{Mass\ of\ Extract}{Mass\ of\ Sample} \times 100$$

## ANNEX B

[*Clause* 4.1 (c)]

## DETERMINATION OF MAXIMUM VOLATILE MATTER IN CARBON BLACK

### B-l APPARATUS

**B-1.1 Electric Furnace**

Capable of temperature regulation of ± 25 °C at 950 °C and equipped with 4 thermocouple-activated indicating pyrometer.

**B-1.2 Platinum Crucibles** — 25 mm × 35 mm

**B-1.3 Petri Dish** — 75 mm diameter

**B-l.4 Oven**

Electrically operated air-circulating type, capable of temperature regulation of ± 1 °C at 100 °C.

**B-1.5 Analytical Balance** — having a sensitivity of 0.1 mg

**B-l.6 Desiccator**

### B-2 PROCEDURE

**B-2.1** Dry 5 g of the sample in an air-oven at 100 °C for 2 h.

**B-2.2** Ignite two platinum crucibles in the electric furnace at 950 °C ± 25 °C for about 30 min. Cool to about 200 °C in an iron plate and place in the desiccator. When these attain the room temperature, weigh them to the nearest 0.1 mg.

**B-2.3** Place 1 g of dried carbon black in the weighed crucible leaving an air space not more than 2 mm.

**B-2.4** Ignite the crucibles and contents in the electric furnace for exactly 7 min at a temperature of 950 °C ± 20 °C.

**B.2.5** Remove the crucible assembly to the desiccator, allow to cool to room temperature and weigh to the nearest 0.1 mg.

### B-3 CALCULATION

Calculate the percentage of volatile matter as follows:

$$\text{Volatile matter} = \frac{Loss\ of\ mass}{Mass\ of\ sample\ taken} \times 100\ percent$$

NOTE — The loss of volatile matter during drying operation is negligible.

## ANNEX C

(*Clause* 7.1)

## INTERNAL PRESSURE CREEP RUPTURE TESTS

### C-l GENERAL

The test shall be carried out not earlier than 24 h after the pipes have been manufactured.

### C-2 TEST SPECIMEN

A specimen of pipe having free length between the end fittings equal to ten times the outside diameter but not less than 250 mm for testing from each pipe to be tested.

### C-3 APPARATUS

Equipment which permits the application of a controlled internal hydraulic pressure to the specimen while being immersed in a thermostatically controlled water-bath shall be used.

### C-4 PROCEDURE

**C-4.1** The pipes shall be fitted with the locking plugs at both ends in such a way that the axial forces due to the internal pressure are transmitted to the pipe. The pipe shall remain free to move in longitudinal direction.

**C-4.2** Through a closable opening in one of the locking plugs, the pipe shall be filled with water at ambient temperature. It shall then be put in a water-bath at the test temperature (permissible deviation ± 1 °C) and kept in the bath for 1 h to adjust the temperature.

**C-4.3** The pressure in the pipe shall then be increased to the test pressure ($P$) gradually and without shock, preferably within 10 s to 30 s in the bath whose temperature has been adjusted in accordance with C-4.2. The pressure, with a permissible deviation of ± 2.5 percent, shall be maintained for the test period laid down in Table 2. The test pressure ($P$) shall be calculated from the minimum dimension and values of induced stress given in Table 2 as follows:

$$P = \frac{2\,S\sigma}{d - S}$$

where

$P$ = test pressure, in MPa;
$S$ = minimum wall thickness, in mm;
$\sigma$ = induced stress, in MPa; and
$d$ = nominal outside diameter, in mm.

### C-5 ASSESSMENT OF RESULTS

The specimen when tested as above shall meet the requirements specified in 7.1. The tests showing rupture within a distance ($d$) from the end cap shall be disregarded and the test repeated.

## ANNEX D

(*Clause* 7.4)

## ENVIRONMENTAL STRESS CRACKING RESISTANCE TEST

### D-l SCOPE AND FIELD OF APPLICATION

This standard specifies a test method used to detect, in a very short time, pipes which are potentially susceptible to environmental stress-cracking (ESC).

### D-2 TEST METHOD

#### D-2.1 Reagent

A 10 percent diluted (volume/volume) of surface-active agent of the nonyl phenoxy poly (ethyleneoxy) ethanol type, kept in a closed container is used fresh for each test. Igepal CO-630 or antarox CO-630 or teepol 300 or equivalent surface active reagent may be used for reference purpose. This information is given for the convenience of users of this Indian Standard and does not constitute an endorsement by BIS of these products.

NOTE — If used in a bath, the reagent should be replaced every week.

### D-2.2 Apparatus

Forced air circulation oven, maintained at 77 °C ± 3 °C, capable of re-establishing that temperature within five minutes after insertion of test pieces.

NOTE — A constant temperature bath containing the reagent may be used, if it has the same thermal capabilities as the oven described above.

### D-2.3 Test Piece

Five sections of pipe, preferably from different coils,each of length about 20 times the diameter shall constitute the test piece.

NOTES

**1** Test pieces to be taken up to 20 times of the pipe diameter but restricted to maximum size of 400 mm.
**2** Shorter lengths may also be used, but less conveniently. The test pieces shall not initially contain any cracks.

### D-2.4 Procedure

**D-2.4.1** Bend each test piece sharply at two pieces, to form two U-bends, in two different planes perpendicular to each other (*see* Fig. 2). Each bend is worked to the limit, that is until both sides of the fold touch and lie parallel to each other, and then the bend is tightly secured to maintain that deformation throughout the test (*see* Fig. 2).

NOTE — Rings cut of PE pipes of larger diameters can be slipped over the bent pipes to help in of various terms for securing them.

**D-2.4.2** Coat each bend completely with the reagent by dipping and then place all the test pieces in the oven, taking care not to impose any additional stresses on them.

**D-2.4.3** 48 h after the temperature of the oven (bath) has returned to 77 °C ± 3 °C take the test pieces out and release the stress and wipe the bends free of the reagent.

**D-2.4.4** Inspect each bend thoroughly, with the unaided eye for any visible cracks (generally originating at the two ends of the fold).

### D-2.5 Expression of Results

Any bend which contains at least one visible crack (excluding cracks induced by the object used to secure the bend), is classified as failed. The total number of bends which fail shall be noted.

NOTE — Each test piece consists of two bends which should be counted independently.

**D-2.5.1** The definitions of various terms for assessing the failure shall be:

a) Cracking — Any narrow opening or fissure in the surface, that is, visible to the naked eye;

b) Crazing — Apparant fine cracks at or under the surface of the plastic pipes;

NOTE — The crazed areas are composed of polymeric materials of lower density than the surrounding matrix.

c) Bloom — A visible exudation or efflorescence on the surface of the pipe; and

d) Rupture — A break in the pipe wall with immediate loss of test fluid and continued loss of pressure.

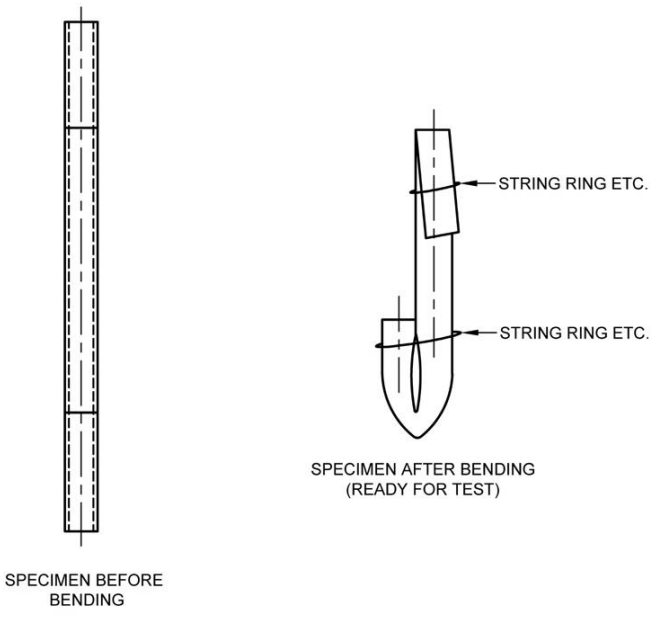



FIG. 2 PREPARING THE U BENDS

### D-3 RE-TEST

If one bend failed while nine others did not, the whole procedure is repeated with five further test pieces (that is ten further bends).

### D-4 REQUIREMENTS

The pipe is considered to have passed the test if none of the first ten bends fails or, not more than two bends fail in the total sample of twenty bends.

## ANNEX E

(*Clause* 10)

## SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

### E-1 LOT

**E-1.1** All pipes in a single consignment of the same outside diameter, same wall thickness, same length and manufactured essentially under similar conditions of manufacture shall constitute a lot.

**E-1.2** For ascertaining the conformity of the material to the requirements of this specification, samples shall be tested from each lot separately.

### E-2 VISUAL AND DIMENSIONAL REQUIREMENTS

**E-2.1** The number of samples to be taken from a lot shall depend on the size of the lot and shall be in accordance with Table 3.

These pipes shall be selected at random from the lot and in order to ensure randomness of selection, procedures given in IS 4905 shall be followed.

**E-2.2** The number of pipes given for the first sample in co1 (4) of Table 3 shall be taken from the lot and examined for dimensional and visual requirements given in **5** and **6** of the specification.

A pipe failing to satisfy any of these requirements shall be considered as defective. The lot shall be deemed to have satisfied these requirements if the number of defectives found in the first sample is

less than or equal to the corresponding acceptance number given in co1 (6) of Table 3. The lot shall be deemed not to have met these requirements, if the number of defectives found in the first sample is greater than or equal to the corresponding rejection number given in co1 (7) of Table 3. If, however, the number of defectives found in the first sample lies between the corresponding acceptance and rejection numbers given in co1 (6) and (7) of Table 3, the second sample of the size given in co1 (4) of Table 3 shall be taken and examined for these requirements.

### E-2.3 Criterion for Conformity

The lot shall be considered to have satisfied these requirements if the number of defectives found in the cumulative sample is less than or equal to the corresponding acceptance number given in co1 (5) of Table 3, otherwise not.

**Table 3 Scale of Sampling and Permissible Camber of Defectives for Visual and Dimensional Requirements**

(*Clause* E-2)

| Sl No. | No. of Pipes in the Lot | Sample Number | Sample Size | Cumulative Sample Size | Acceptance Number | Rejection Number |
|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| i) | Up to 100 | First | 3 | 3 | 0 | 2 |
| | | Second | 3 | 6 | 1 | 2 |
| ii) | 101 to 300 | First | 5 | 5 | 0 | 2 |
| | | Second | 5 | 10 | 1 | 2 |
| iii) | 301 to 500 | First | 8 | 8 | 0 | 2 |
| | | Second | 8 | 16 | 1 | 2 |
| iv) | 501 and above | First | 13 | 13 | 0 | 2 |
| | | Second | 13 | 26 | 1 | 2 |

### E3 REVERSION TEST

**E-3.1** The lot having satisfied visual and dimensional requirements shall be tested for reversion as per 7.2.

For this purpose, the first sample of three pipes shall be taken from the lot. The sample pipe failing in the reversion test shall be considered as defective. If no defective is found in the first sample, the lot shall be deemed to have met the requirements given in the specification for reversion test. If, however, only one defective is found in the first sample, a second sample of three pipes shall be taken from the lot and tested for reversion.

### E-3.2 Criterion for Conformity

The lot shall be deemed to have met the specification requirement for reversion given in 7.2 if not more than one defective is found in the cumulative sample, otherwise not.

### E-4 HYDRAULIC AND TENSILE STRENGTH REQUIREMENTS

**E-4.1** The lot having met the requirements given in E-2.2 and E-3 shall be finally tested for internal pressure creep rupture test specified in 7.1 and tensile strength test specified in 7.3.

**E-4.1.1** For this purpose, the number of pipes to be taken at random (*see* E-2.1) from the lot shall be according to Table 4.

**Table 4 Scale of Sampling for Hydraulic and Tensile Strength Requirements**

(*Clause* E-4.1.1)

| Sl No. | Number of Pipes in the Lot | Sample Size |
|---|---|---|
| (1) | (2) | (3) |
| i) | Up to 100 | 2 |
| ii) | 101 to 300 | 4 |
| iii) | 301 and above | 6 |

**E-4.1.2** The number of pipes selected from the lot according to E-4-1.1 shall be randomly divided into two equal sets. Each of the pipes in the first set shall be tested for internal pressure creep rupture test according to 7.1 and each of the pipes in the second set shall be tested for tensile strength and elongation at break according to 7.3.

### E-4.2 Criterion for Conformity

The lot shall be declared as conforming to the requirements of the specification if no failure occurs under E-4.1.2, otherwise not.

## ANNEX F

(*Clause* 12)

## SELECTION OF IRRIGATION LATERALS

### F-1 SELECTION FACTORS

In addition to working pressures, the following factors affect the pipe selection.

**F-1.1** The type of connection between the pipe and various fittings, and between the pipe and various distribution devices.

**F-1.1.1** The type of connection does not affect the selection of the pipe in the following cases:

a) When the connection fitting or the distribution device is of the insert type (serrated insert with or without outside reinforcing clamps); and

b) When a distribution device inserted into the pipe is used, whether or not it is secured by clamp.

**F-1.1.2** The type of connection does affect the selection of pipe in the following cases:

a) When the distribution device is inserted in the wall of the pipe and not secured by means of clamps, the wall thickness of the pipe shall then be not less than 1.2 mm.

NOTE — For greater accuracy, a relationship must be found between nominal wall thickness, the hole diameter and inside diameter of the pipe.

b) When the distribution device is threaded from the side into the pipe wall, the wall thickness shall not be less than 1.5 mm.

NOTE — For greater accuracy, a relationship must be found between minimum wall thickness and diameter of the thread.

c) When the connecting fitting is a compression fitting (external grip fitting), the wall thickness of the pipe shall not be less than 1.4 mm.

NOTE — This limitation does not apply when the pipe is reinforced in the gripping zone with suitable insert.

**F-1.2** The way of linking the lateral as part of a fixed or movable system.

**F-1.2.1** In a semi-mobile sprinkler system, the lateral shall not be less than a Class 3 pipe.

**F-1.2.2** In a trailer-type drip irrigation system, the lateral shall not be less than a Class 2 pipe.

**F-l.3** Effect of water temperature on selection of nominal pressure of pipe.

**F-1.3.1** At temperatures up to 35 °C, the nominal pressure of the pipe is determined according to the maximum marking pressure in the pipe.

**F-1.3.2** At temperatures of 36 °C to 40 °C the pipe shall be selected according to the next higher class of pipe series listed in Table 1, so as to obtain a pipe with greater wall thickness for example if the working pressure is 0.25 MPa use 0.40 MPa pipe.

## ANNEX G

(*Foreword*)

## COMMITTEE COMPOSITION

Farm Irrigation and Drainage Systems Sectional Committee, FAD 17

| *Organization* | *Representative(s)* |
|---|---|
| In Personal Capacity (*D-26, Pusa Campus, Agricultural Research Institute, New Delhi-110012*) | DR T. B. S. RAJPUT **(*Chairperson*)** |
| Automat Industries Private Limited, New Delhi | SHRI DINESH KUMAR<br>SHRI NAWAL KISHORE SHAH (*Alternate*) |
| Central Institute of Petrochemicals Engineering & Technology, CIPET, Chennai | DR SANDESH KUMAR JAIN<br>SHRI VISHAL VERMA (*Alternate*) |
| Finolex Industries Limited, Pune | SHRI VIJAY JADAV<br>SHRI BAJIRAO BHOSALE(*Alternate*) |
| Gujarat Green Revolution Company Limited, Vadodara | DR ASHUTOSH VASANT VADAWALE<br>SHRI R. V. LIMBASHIA (*Alternate* I)<br>SHRI HARDIK PANCHOLI(*Alternate* II) |
| ICAR – Central Institute of Agricultural Engineering, Bhopal | DR RANJAY KUMAR SINGH<br>DR YOGESH A. RAJWADE (*Alternate*) |
| Indian Agricultural Research Institute - Water Technology Centre, New Delhi | DR ANIL KUMAR MISHRA<br>DR SUSAMA SUDHISHRI (*Alternate*) |
| Indian Council of Agricultural Research, New Delhi | DR KONDAPALLY V. RAMANARAO |
| Jain Irrigation Systems Limited, Jalgaon | SHRI SUNIL LODHA<br>SHRI ABHIJEET B. JOSHI (*Alternate*) |
| Mahatma Phule Krishi Vidyapeeth, Rahuri | DR SACHIN KUMAR NANDGUDE<br>DR SHRIMANT RAHOD (*Alternate*) |
| Mahindra EPC Irrigation Limited, Nashik | SHRI RAJEEV DESHPANDE<br>SHRI ASHISH KUMAR (*Alternate*) |
| NITI Aayog, New Delhi | DR NEELAM PATEL<br>SHRIMATI ANURADHA BATANA |
| National Committee on Precision Agriculture and Horticulture, New Delhi | SHRI ANAND ZAMBRE<br>SHRI ROHIT LALL(*Alternate*) |
| Netafim Irrigation Private Limited, Vadodara | SHRI SETHURAMALINGAM S.<br>SHRI MANESH KUMAR PATEL (*Alternate*) |
| Nimbus Pipes Limited, Jaipur | SHRI ASHISH KR LATH<br>SHRI HARIDWAR TIWARI (*Alternate* ) |
| Premier Irrigation Adritec Limited, Nagpur | SHRI A. K. PRADHAN<br>SHRI G. K. KUMAR (*Alternate*) |
| Punjab Agricultural University, Ludhiana | DR J. P. SINGH<br>DR SUNIL GARG (*Alternate*) |

| *Organization* | *Representative(s)* |
|---|---|
| Reliance Industries Limited, Mumbai | SHRI AMIT SHAH |
| Rivulis Irrigation India Private Limited, Vadodara | SHRI GOPI KETHAVATH |
| Saurashtra Plastics Manufacturer's Association, Rajkot | SHRI ARUN ROKAD<br>SHRI J. K. PATEL (*Alternate* I)<br>SHRI BHARAT KUMAR V. SIROYA (*Alternate* II) |
| School of Agriculture, Indira Gandhi National Open University, New Delhi | DR MUKESH KUMAR |
| Visvesvaraya Technological University (VTU), Belgaum | DR NAGRAJ S. PATIL |
| BIS Directorate General | SHRIMATI SUNEETI TOTEJA SCIENTIST 'E'/DIRECTOR AND HEAD (FOOD AND AGRICULTURE) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)] |

*Member Secretary*
SHRI VIKRANT CHAUHAN
SCIENTIST 'B'/ASSISTANT DIRECTOR
(FOOD AND AGRICULTURE), BIS

Panel for Review of Indian Standard on Micro-Irrigation Components, FAD 17/P 2

| *Organization(s)* | *Representative(s)* |
|---|---|
| Visvesvaraya Technological University (VTU), Belgaum | DR NAGRAJ S. PATIL **(*Convener*)** |
| Finolex Industries Limited, Pune | SHRI BAJIRAO BHOSALE |
| Jain Irrigation Systems Limited, Jalgaon | SHRI SUNIL LODHA<br>SHRI ABHIJEET B. JOSHI (*Alternate*) |
| Mahindra EPC Irrigation Limited, Nashik | SHRI RAJEEV DESHPANDE<br>SHRI ASHISH KUMAR (*Alternate*) |
| National Committee on Precision Agriculture and Horticulture, New Delhi | SHRI ROHIT LALL |
| Netafim Irrigation Private Limited, Vadodara | SHRI SETHURAMALINGAM S. |
| Premier Irrigation Adritec Limited, Nagpur | SHRI G. K. KUMAR |

**Bureau of Indian Standards**

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

**Copyright**



**Review of Indian Standards**

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: FAD 17 (23623).

## Amendments Issued Since Publication

| Amend No. | Date of Issue | Text Affected |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

**BUREAU OF INDIAN STANDARDS**

**Headquarters:**

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
*Telephones*: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

| **Regional Offices:** | | *Telephones* |
|---|---|---|
| Central | : 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002 | 2323 7617 |
| Eastern | : 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091 | 2367 0012<br>2320 9474 |
| Northern | : Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019 | 265 9930 |
| Southern | : C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113 | 2254 1442<br>2254 1216 |
| Western | : Plot No. E-9, Road No.-8, MIDC, Andheri (East), Mumbai 400093 | 2821 8093 |

**Branches** : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. CHANDIGARH. CHENNAI. COIMBATORE. DEHRADUN. DELHI. FARIDABAD. GHAZIABAD. GUWAHATI. HIMACHAL PRADESH. HUBLI. HYDERABAD. JAIPUR. JAMMU & KASHMIR. JAMSHEDPUR. KOCHI. KOLKATA. LUCKNOW. MADURAI. MUMBAI. NAGPUR. NOIDA. PANIPAT. PATNA. PUNE. RAIPUR. RAJKOT. SURAT. VISAKHAPATNAM.

Published by BIS, New Delhi