# भारतीय मानक ब्यूरो
**BUREAU OF INDIAN STANDARDS**

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भारतीय मानक मसौदा

# कृषि वस्त्रादि — उच्च घनत्व पॉलीएथिलीन (एचडीपीई) से बुने हुए एजोला बिस्तर — विशिष्टि

*Draft Indian Standard*

# AGRO TEXTILES — HIGH DENSITY POLYETHYLENE (HDPE) WOVEN AZOLLA BED — SPECIFICATION

**ICS: 83.140.01, 65.080**

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Technical Textiles for Agro-tech Applications Sectional Committee, TXD 35

last date for receipt of comments is 17 November 2024

**FOREWORD**

(*Formal clauses will be added later*)

The maintenance of sufficient levels of nutrients in soil is important for healthy plant growth. Modern agriculture involves usage of pesticides and chemical fertilizers with an essence of increasing the world's food production. Chemical fertilizers solitary do not contribute all the nutrients in balanced quantities needed by the plants. This result in reduction of soil organic matter content, which in turn, affects the biological activities and physical properties of the soil.

Bio fertilizers are organic substances that contain living microorganisms which when applied to plants, enhance their nutrient uptake and overall growth. Azolla, an aquatic protein-rich fern has a fundamental role in bio fertilizer production due to its nitrogen- fixing ability and nutrient enrichment properties. In addition to its role as a bio fertilizer, azolla is used as livestock fodder which plays a crucial role in supporting the health, growth, and productivity of livestock. Azolla, as a bio fertilizer improves plant growth and soil fertility while as a livestock fodder increases feed efficiency, average daily gain of animals and milk production.

Azolla cultivation in an azolla bed provides a controlled environment for optimized growth and management. Traditionally cement structures were used for the purpos.These synthetic beds enjoy greater advantages over the traditional ones in terms of maintenance, space, portability from one place to another, waterproofing, cost effectiveness etc. Also, use of shade net canopy allow the use of optimum sunlight for the growth of azolla.

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.

## 1 SCOPE

This standard prescribes constructional and other requirements for high density polyethylene (HDPE) woven azolla beds for cultivation of azolla for agriculture and horticulture purpose.

## 2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provision 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 editions of the standards indicated in Annex A.

## 3 TERMINOLOGY

For the purpose of this standard the following definitions shall apply.

**3.1 Azolla** — Azolla is an aquatic fern consisting of a short, branched, floating stem, bearing roots which hang down in the water.

**3.2 Biofertilizer** — It refers to a type of fertilizer that contains living microorganisms, such as bacteria, fungi or algae which help enhance plant growth and soil fertility.

**3.3 Livestock Fodder** — Livestock fodder is also known as animal feed or animal forage, refers to any type of food or plant material that is specifically grown, harvested or prepared to be consumed by domesticated animals. Livestock feed plays a crucial role in the nutrition and overall health of animals raised for milk, eggs, meat or other animal products.

## 4 MATERIALS

### 4.1 HDPE Tapes

Tapes shall be manufactured from HDPE granules (*see* IS 6192), which shall be UV stabilized by adding suitable UV stabilizer (*see* Note). The finished bed shall meet the requirements of UV stability and colour fastness to light as given in Table 1. The width of the tape used in the fabric shall be 1.20 mm minimum and linear density of the tape shall be 88.8 Tex (800 Denier) minimum.

NOTE — Carbon black or black master batch shall not be used for UV stabilization.

### 4.2 HDPE Fabric

Beds shall be manufactured by using suitable HDPE woven fabric (*see* IS 6899) so that finished bed meets the requirements given in Table 1 and **5.1** to **5.4.**

### 4.3 Cord Beading

A jute/polypropylene rope beading of minimum 6.0 mm diameter shall be provided along the top periphery of the bed for reinforcement.

## 5 MANUFACTURE

**5.1** General design of the azolla bed shall be as shown in Fig. 1.

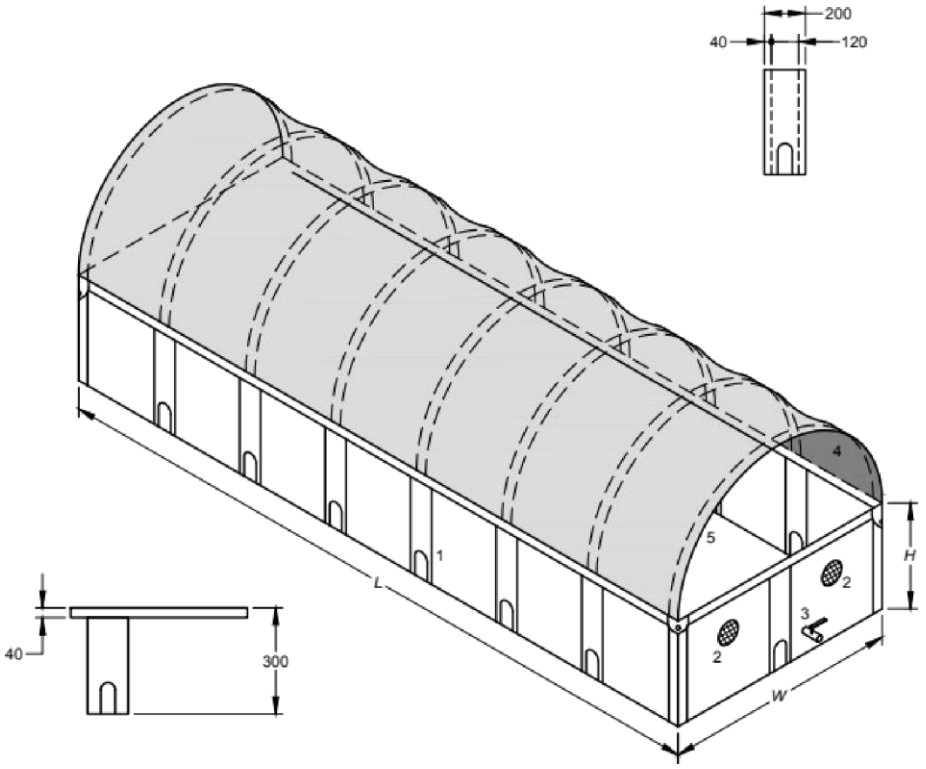
### 5.2 Lamination

**5.2.1** The fabric shall be laminated with the low-density polyethylene (LDPE) or suitable combination of LDPE and linear low-density polyethylene (LLDPE) melt of coating grade on each side having thickness not less than 25 microns and the coating shall be suitable UV stabilized by incorporating UV stabilizer (*see* Note under **4.1**). The coating thickness shall be measured at a pressure of 2 kPa ± 0.01 kPa by method A of IS 13162 (Part 3). The coating film along with colour master batch to get the desired shade shall be such that the finished bed meets the requirements of UV stability and colour fastness to light as given in Table 1.

**5.2.2** A 7-layer laminated fabric is produced using a combination of 3-layers of HDPE fabric and 4-layers of coating film. A 5-layer laminated fabric is produced using a combination of 2-layers of HDPE fabric and 3-layers of coating film The layers of HDPE fabric used to manufacture beds shall be joined by sandwich lamination. The lamination as given above shall be such that the finished bed meets the requirements given in Table 1. The minimum coating thickness of the sandwich lamination shall be 40 microns. The coating thickness shall be measured at a pressure of 2 kPa ± 0.01 kPa by method A of IS 13162 (Part 3).

### 5.3 Construction

**5.3.1** The bed shall be constructed by heat sealing laminated pieces of woven fabric of the desired dimensions. The panels shall be flat (overlap) joined. The top edges of the bed shall be hemmed by heat sealing along with a jute/polypropylene rope of minimum 6 mm diameter placed inside the hem as reinforcement. The width of the hem shall be minimum 40 mm. An outlet at the bottom shall be provided preferably with a discharge valve for draining out the liquor of the azolla cultivation. Minimum one hole of suitable diameter having a sieve mesh/net construction close to the top periphery shall also be provided in the azolla bed to avoid the overflow of the azolla.




1. Support pocket
2. Overflow mesh
3. Discharge
4. Shade net
5. Pipe for canopy

FIG 1 TYPICAL SHAPE OF AZOLLA BED

**5.3.2** Minimum fourteen support pockets for inserting pegs shall also be provided along the periphery of the bed and running across the full height of the bed as shown in Fig. 1. A piece of laminated woven fabric is heat-sealed at the intersection of front/back and bottom panels whereas the other three sides of the fabric for pockets are heat-sealed with the base fabric thus giving the shape of a pocket. The upper end of the pocket thus formed shall be heat-sealed while forming the hemming at the top edge of the bed (*see* **5.3.1**) whereas at the bottom end, a hole of suitable diameter shall be created for inserting pegs. The pockets shall have a finished width of minimum 120 mm.

**5.4 Bonding**

If two or more pieces of fabrics are used for the manufacture of azolla bed, the woven fabrics shall be bonded together by a suitable heat-sealing process keeping an overlap of at least 2.5 cm.

**5.5 Shade Net Canopy** (*Optional*)

The azolla bed may also be provided with a shade net canopy used for shading the azolla bed. The shade net used in the construction of canopy shall conform to the IS 16008 (Part 1 or Part 2). UPVC pipes (*see* IS 4985) shall be used for the arc roof of shade net canopy.

## 6 REQUIREMENTS

**6.1** The laminated HDPE fabric used to manufacture bed shall meet the requirements as given in Table 1. Besides the azolla bed shall meet the requirements stated in **5.1** to **5.5**.

**Table 1 Requirements of Azolla Bed Made from HDPE Woven Fabric**
(*Clauses* 4.1, 4.2, 5.2.1, 5.2.2 *and* 6.1)

| Sl No | Characteristic | Requirements | | | Method of Test, Ref to |
|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) |
| i) | Mass, g/m², *Min* | 340 (7 Layer) | 450 (7 Layer) | 340 (5 Layer) | IS 1964 |
| ii) | Breaking strength before UV exposure, N, *Min* | 1 900 (Warp)<br>1 300 (Weft) | 2 100 (Warp)<br>1 500 (Weft) | 1 400 (Warp)<br>1 300 (Weft) | IS 1969 (Part 1) |
| iii) | Elongation at break, percent | 20 ± 5% | | | IS 1969 (Part 1) |
| iv) | Retention of breaking strength after UV exposure, N, *Min* | 85 percent of original value (fabric) | | | Annex B and IS 1969 (Part 1) |
| v) | Welded seam strength before UV exposure, N, *Min* | 65 percent of original value (fabric) | | | IS 1969 (Part1) |
| vi) | Welded seam strength after UV exposure, N, *Min* | 85 percent of original value | | | Annex B and IS 1969 (Part 1) |

| | | | | | |
|---|---|---|---|---|---|
| vii) | Tear strength, N, *Min* | 100 (Warp)<br>100 (Weft) | 100 (Warp)<br>100 (Weft) | 150 (Warp)<br>150 (Weft) | Method A2 of IS 7016 (Part 3/Sec 1) |
| viii) | Puncture strength, N, *Min* | 325 | 450 | 350 | Annex C |
| ix) | Environmental stress cracking test | There shall be no evidence of stress cracking | There shall be no evidence of stress cracking | There shall be no evidence of stress cracking | Annex D |
| x) | Resistance to chemicals, change in the mass, percent, *Max* | 0.10 percent | 0.10 percent | 0.10 percent | Annex E |
| xi) | Colour fastness to artificial light (*see* Note) | 4 or better | 4 or better | 4 or better | IS/ISO 105 B02 (Xenon lamp method) |
| xii) | Bursting pressure, kgf/cm$^2$, *Min* | 35 | 37 | 35 | IS 1966 (Part 1) |
| NOTE — Applicable for coloured beds only | | | | | |

**6.2 Dimensions**

The dimensions of azolla beds are given in Table 2. Others dimensions may also be agreed as per the agreement between buyer and the seller.

**Table 2 The Dimensions of Azolla Beds**
(*Clause* 6.2)

| Sl No | Dimensions | Type 1 | Type 2 | Tolerance, Percent |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| i) | Length (mm) | 2400 | 3600 | + 5<br>- 2 |
| ii) | Width (mm) | 1200 | 1200 | + 5<br>- 2 |
| iii) | Height (mm) | 300 | 300 | + 5 |

**6.3 Water Proofness**

**6.3.1** The fabric and joints of the bed shall be tested before and after ageing for water repellency by cone test according to IS 7941 and for resistance to water penetration by the pressure head test according to IS 7940 keeping the height of water column as 900 mm and the time of exposure being 1 h. The test specimen shall be so selected that at least one joint is covered. There shall be no leakage when tested by cone test and does not leak through the bed when tested for resistance to water penetration by the pressure head test from any test specimen.

**6.3.2** The ageing shall be done at 70 °C for 168 h as per the method B given in IS 7016 (Part 8).

**7 MARKING**

**7.1** Each bed shall be legibly marked with the following information at one corner on one side either with tag or by printing on it with the ink:

a) Name and address of the manufacturer;
b) Dimensions and mass ($g/m^2$); and
c) Year of manufacture.

**7.2 BIS Certification Marking**

**7.2.1** The HDPE woven azolla beds conforming to the requirements of thus standard may be certified as per the conformity assessment schemes under the provision of *Bureau of Indian Standards Act,* 2016 and the rules and regulations framed thereunder, and the products may be marked with the Standard Mark.

**8 PACKING**

The beds shall be packed as agreed to between the buyer and the seller.

**9 SAMPLING**

**9.1 Lot**

The quantity of bed of same size and mass ($g/m^2$) manufactured under similar conditions and delivered to a buyer against one dispatch note shall constitute a lot.

**9.2** Unless otherwise agreed to between the buyer and the seller, the number of beds to be selected at random from a lot shall be as given in col (3) of Table 3.

## 10 NUMBER OF TEST SPECIMENS AND CRITERIA FOR CONFORMITY

Number of test specimens and criteria for conformity shall be as given in Table 4.

**Table 3 Scale of Sampling**
(*Clause* 9.2, Table 4)

| Sl No. | No. of Beds in Lot | Sample Size | Sub-sample Size | Permissible No. of Defective Beds |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| i) | Up to 50 | 3 | 2 | 0 |
| ii) | 51 to150 | 5 | 2 | 0 |
| iii) | 151 to 300 | 8 | 3 | 1 |
| iv) | 301 to 500 | 13 | 5 | 2 |
| v) | 501 and above | 20 | 5 | 3 |

**Table 4 Number of Test Specimens and Criteria for Conformity**
(*Clause* 10)

| Sl No. | Characteristic | No. of Beds/Test Specimens | Criteria for Conformity |
|---|---|---|---|
| i) | Dimensions, average mass ($g/m^2$), manufacture and material | According to col (3) of Table 3 | The defective beds shall not exceed the corresponding number given in col (5) of Table 3 |
| ii) | Water proofness | According to col (4) of Table 3 | All the test specimens shall pass the test |
| iii) | All other requirements | According to col (4) of Table 3 | The test specimens shall meet the requirements as given in Table 2 |

**ANNEX A**
(*Clause* 2)

**LIST OF REFERRED STANDARDS**

| *IS NO* | *Title* |
|---|---|
| IS 1964 : 2001 | Textiles — Methods for determination of mass per unit length and mass per unit area of fabrics (*second revision*) |
| IS 1966 (Part 1) : 2022 | Textiles — Bursting properties of fabrics Part 1: Hydraulic method for determination of bursting strength and bursting distension (*third revision*) |
| IS 1969 (Part 1) : 2018 | Textiles — Tensile properties of fabrics — Part 1 Determination of maximum force and elongation at maximum force using the strip method (*fourth revision*) |
| IS 4985 : 2021 | Unplasticized PVC Pipes for Potable Water Supplies — Specification (*fourth revision*) |
| IS 6192 : 2023 | Textiles — Monoaxially Oriented High-Density Polyethylene (HDPE)/Polypropylene (PP) Tapes — Specification (*third revision*) |
| IS 6899 : 2023 | Textile — High Density Polyethylene (HDPE)/Polypropylene (PP) Woven Fabrics — Specification (*third revision*) |
| IS 7016 (Part3/Sec1) : 2022 | Methods of Test for Rubber or Plastics Coated Fabrics Part 3 Determination of Tear Resistance Section 1 Constant rate of tear methods (*third revision*) |
| IS 7016 (Part 8) : 2023 | Methods of test for Coated and Treated Fabrics Part 8 Accelerated Ageing (*first revision*) |
| IS 7940 : 1976 | Methods for determining resistance to penetration by water of fabrics by static pressure head test |
| IS 7941 : 1976 | Method for determining water repellency of fabrics by cone test |
| IS 13162 (Part 3) : 2021 | Geosynthetics — Determination of thickness at specified pressures (Part 3): Single layers |
| IS 16008 | Agro textiles — Shade nets for agriculture and horticulture purposes — Specification |
| (Part 1) : 2016 | Shade nets made from tape yarns (*first revision*) |
| (Part 2) : 2016 | Shade nets made from mono filament yarns (*first revision*) |

| | |
|---|---|
| IS/ISO 105 (Part B02) : 2014 | Textiles — Test for colour fastness Part B02 colour fastness to artificial light: xenon arc fading test |

## ANNEX B

[*Table* 1, *SI No*. (iv) *and* (vi)]

## UV RESISTANCE TEST

### B-1 TEST SPECIMENS

The test specimens for breaking and seam strength shall be cut from the sample as specified in IS 1969 (Part 1) for modified grab test.

### B-2 TEST CONDITIONS

**B-2.1** The test shall be carried out with fluorescent UVB lamp (313 nanometre or its equivalent).

**B-2.2** The duration of the test shall be 144 h (that is 6 days).

**B-2.3** The test cycle shall be 8 h at 60 ºC + 3 ºC with UV radiation alternating after 4 h at 50 ºC + 3 ºC with condensation.

**B-2.4** Irradiation level throughout the test shall be maintained at 0.63 W/m² ± 0.03 W/m².

### B-3 TEST PROCEDURE

**B-3.1** Determine the original average breaking strength and seam strength of bed specimens separately as per the modified grab test specified in IS 1969 (Part 1).

**B-3.2** Expose the specimens alternately to ultraviolet light alone and to condensation in one respective cycle.

**B-3.2.1** The type of fluorescent UV lamp, the timing of the UV exposure and the temperature of condensation shall be specified in **B-2**.

**B-3.3** Determine the average breaking strength and seam strength of the specimens separately after UV exposure as mentioned above.

**B-3.4** Determine the percent retention of original strength and seam strength as follows:

Percent retention of original breaking strength or seam strength = $\frac{b}{a} \times 100$

Where,

$a$ = average breaking strength or seam strength before UV exposure as obtained in **B-3.1**, and

$b$ = average breaking strength or seam strength after UV exposure as obtained in **B-3.3**.

NOTES

**1** The UV source is an array of fluorescent lamps (with lamp emission concentrated in the UV range).

**2** Condensation is produced by exposing the test surface to a heated, saturated mixture of air and water vapour, while the reverse sideof the test specimen is exposed to the cooling influence of ambient room air.

## ANNEX C

[*Table* 1, *SI No*. (viii)]

## TEST METHOD FOR INDEX PUNCTURE RESISTANCE

### C-1 PRINCIPLE

A test specimen is clamped without tension between circular plates of a ring clamp attachment secured in a tensile testing machine. A force is exerted against the centre of the unsupported portion of the test specimen by a solid steel rod attached to the load indicator until rupture of the specimen occurs. The maximum force recorded is the value of puncture resistance of the specimen.

### C-2 APPARATUS

**C-2.1 Tensile/Compression Testing Machine**, of the constant-rate-of extension (CRE) type.

**C-2.2 Ring Clamp Attachment**, consisting of concentric plates with an open internal diameter of 45 mm ± 0.025 mm capable of clamping the test specimen without slippage. A suggested clamping arrangement is shown in Fig. 2. The external diameter is suggested to be 100 mm ± 0.025 mm. The diameter of the six holes used for securing the ring clamp assembly is suggested to be 8 mm and equally spaced at a radius of 37 mm. The surfaces of these plates can consist of grooves with a-rings or coarse sandpaper bonded onto opposing surfaces.

**C-2.3 Solid Steel Rod**, with a diameter of 8 mm ± 0.01 mm having a flat end with a 45° × 0.8 mm chamfered edge contacting the test specimen's surface (*see* Fig. 2 and 3).

## C-3 SAMPLING

### C-3.1 Laboratory Sample

For the laboratory sample take a swatch extending the full width of the product, of sufficient length along the selvage from each sample roll so that the requirements of **C-3.2** can be met.

### C-3.2 Test Specimens

Select from the laboratory sample, sufficient number of samples each having a minimum diameter of 100 mm to facilitate clamping. Space the specimens along a diagonal on the unit of the laboratory sample. Take no specimens nearer the selvage or edge of the bed.

## C-4 CONDITIONING

Bring the specimens to moisture equilibrium in the atmosphere for testing beds (65 percent ± 5 percent relative humidity and 27 °C ± 2 °C temperature). Equilibrium is considered to have been reached when the increase in the mass of the specimen, in successive weightings made at intervals of not less than 2 h, does not exceed 0.1 percent of the mass of the specimen.

## C-5 PROCEDURE

**C-5.1** Select the load range of the tensile/compression testing machine such that the rupture occurs between 10 percent and 90 percent of the full-scale load.

**C-5.2** Centre and secure the specimen between the holding plates ensuring that the test specimen extends to or beyond the outer edges of the clamping plates.

**C-5.3** Test at a machine speed of 300 mm/min ± 10 mm/min until the puncture rod completely ruptures the test specimen.

NOTE — The rate of testing specified is not an indication of the performance of the specimen for its end use.

## C-6 CALCULATION

Calculate the average puncture resistance and standard deviation for all tests as read directly from the recording instrument.

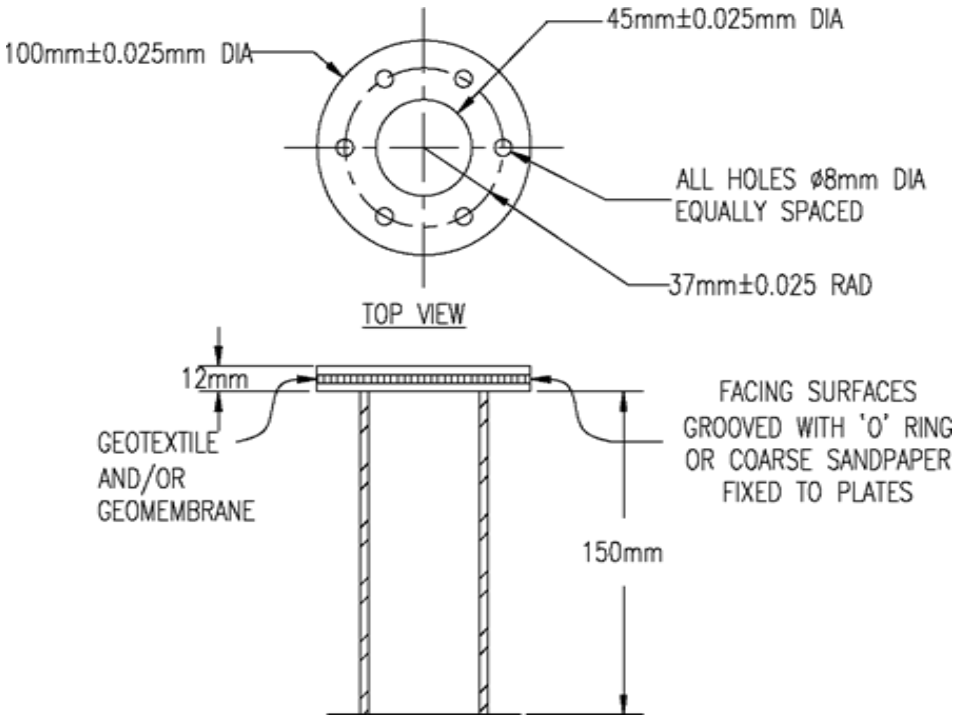



FIG. 2 TEST FIXTURE DETAIL (NOT TO SCALE)

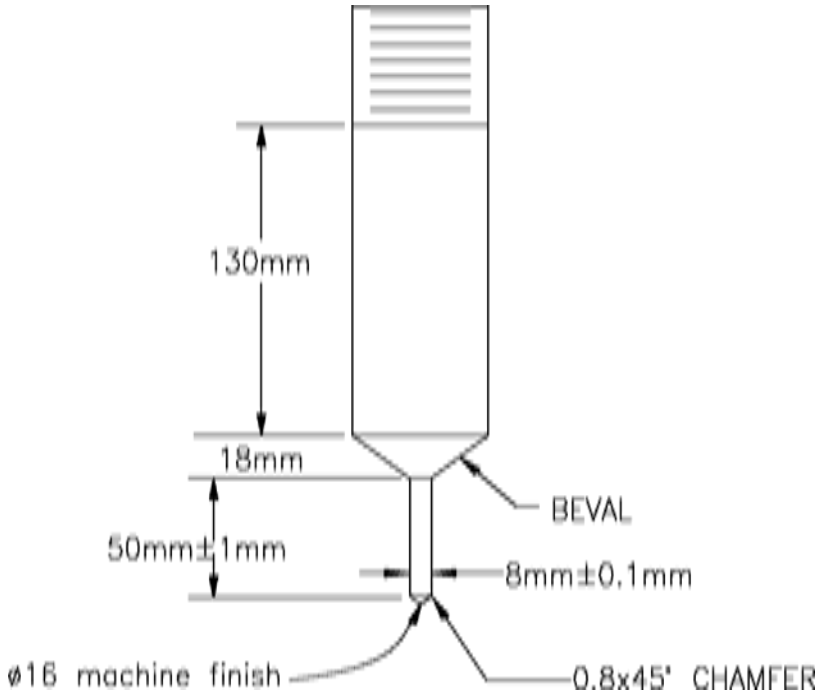



FIG. 3 TEST PROBE DETAIL (NOT TO SCALE)

## ANNEX D

[*Table* 1, *SI No*. (ix)]

## METHOD OF TEST FOR RESISTANCE TO ENVIRONMENTAL STRESS CRACKING

### D-1 APPARATUS

An air oven controlled at 60 ºC ± 2 ºC.

### D-2 TEST LIQUID

A 0.5 percent aqueous solution of polyoxyethylatednonylphenol.

NOTE — Teepol B 300 has been found suitable.

### D-3 TEST SPECIMEN

The test specimens shall be cut from the bed and shall have a length of 150 mm ± 3 mm and width of 50 mm ± 3 mm.

### D-4 PROCEDURE

The test specimen shall be dipped in the test liquid contained in a beaker at 27 ºC ± 2 °C. The beaker along with test specimen shall be kept in the oven at 60 ºC ± 2 °C for 48 h. The test specimen shall then be inspected for cracks, the test specimen being sectioned where necessary.

## ANNEX E

[*Table* 1, *SI No*. (x)]

## TEST FOR RESISTANCE TO CHEMICAL ACTION

### E-1 TEST SPECIMEN

The test specimens shall be cut from the azolla bed and shall have a length of 150 mm ± 3 mm and width of 50 mm ± 3 mm.

### E-2 PROCEDURE

For test in each solution as mentioned herein under below, three specimens each of length of 150 mm ± 3 mm and width of 50 mm ± 3 mm taken from three position of bed shall be cleaned, wiped dry and weighed and then totally immersed without prior conditioning in each of 10 percent aqueous solution of sulphuric acid, hydrochloric acid, sodium hydroxide, sodium chloride and

ammonium hydroxide at ambient temperature for 72 h separately. After the specified time, the specimens shall be removed from each solution, washed in running water for 5 min, dried with a clean cloth and re-weighed immediately.

### E-3 ASSESSMENT OF RESULT

The average change in mass of all three specimen in each solution shall not exceed the value given in Table 1.

## ANNEX F
(Clause)

## INSTALLATION GUIDELINES FOR AZOLLA BEDS

### F-1 PREAMBLE

**F-1.1** The primary function of azolla beds is to cultivate and grow azolla, an aquatic protein-rich fern, widely used as livestock fodder and bio fertilizer. The successful performance of azolla bed is based on a good quality material, installation and appropriate land.

**F-1.2** To improve the service lifetime of azolla beds, it is essential that the azolla beds are placed on the land according to the dimensions and contours of the land ensuring full contact with the sub grade.

### F-2 LOGISTICS

HDPE azolla beds are packed and transported by appropriate means so as to protect them from any type of damage. Flattened or folded form of are loaded manually or with a Trucks and Shipping Containers and can be unloaded in a similar manner at the destination. Use of hook shall be avoided for loading and unloading of the azolla beds in imperative.

### F-3 STORAGE

**F-3.1** The azolla bed shall be stored so as to be protected from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat or other damage. These beds are resistant to many different climatic conditions and can withstand higher temperatures. Its ultraviolet resistance properties make it an extremely durable product. Despite their strength, azolla beds are lightweight and flexible, making them easy to transport and install.

### F-4 EARTHWORK AND SITE PREPARATION

**F-4.1 Site considerations**

The site selected for bed should receive ample sunlight for at least 6-8 hours a day if used without canopy. Azolla thrives in warm temperatures, so choose a site that provides a favourable climate. Additionally, consider the accessibility of the location for maintenance and monitoring purposes.

Clean the installation area thoroughly and remove any unwanted vegetation. Make sure there are no sharp objects or rough surfaces that can damage the bed.

The proposed site shall be free of any decomposable organic materials as it can result in upliftment due to generation of gases beneath the azolla bed.

**F-4.2 Design and sub grade preparation**

To set up an Azolla bed, choose an area with a level surface. The ground surface should be smooth, free from any objects. Mark a layout according to azolla bed dimension. Put Azolla bed in the levelled place and mark each of the supporting pockets. Fix pipe/bamboo on the marked position Install the bed, ensuring all peg is well fitted into the supporting pockets.
Spread sieved fertile soil evenly up to a 0.5-inch layer on the bottom of the bed.

Make a slurry of cow dung, add enough water, and pour slurry into the bed fill the bed with sufficient fresh water Spread 1kg of pure mother azolla culture evenly.

Spray water over the azolla culture, which helps plants keep upright cover azolla bed with a shade net to prevent extra sun heat, rain and dust After 2-3 days, multiply azolla culture by gently rubbing in the hands. It helps break azolla into smaller pieces for faster multiplication.

**F-5 POST INSTALLATION PRECAUTUIONS**

Azolla rapidly grows on water, harvest daily to avoid overcrowding. Once in 5 days add a mixture of Super Phosphate and cow dung. We can also add a mixer containing magnesium, iron, copper, sulphur, etc at weekly intervals to enhance the mineral content of azolla. Replace 25 to 30% old water with fresh water once in 10 days it helps prevent nitrogen build up in the pond. Replace complete water and Soil at least once in six months and add fresh azolla seeds or culture. Maintain the water level of at least 10 cm, so azolla root doesn't grow in the Soil keeping the roots coating makes it easy to harvest. Wash harvested azolla thoroughly to remove dirt and smell of cow dung and then feed them to animals.