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BUREAU OF INDIAN STANDARDS

AGENDA

Technical Textiles for Agrotech Applications Sectional Committee, TXD 35 **22nd Meeting**

Date/Day	Time	Venue
29 August 2024 (Thursday)	11:00 AM	Through Video Conferencing

CHAIRMAN: Dr. Manisha Mathur **(**Joint Director, SASMIRA**)**

MEMBER SECRETARY: Shri Gourav Mishra, Scientist B, Textiles
Bureau of Indian Standards, New Delhi

Item 0 WELCOME AND INTRODUCTORY REMARKS BY THE CHAIRMAN

Item 1 CONFIRMATION OF THE MINUTES OF THE PREVIOUS MEETING

1.1 The minutes of the 21st meeting of the committee held on 03rd May 2024 (Friday) were circulated vide BIS DG letter No. TXD 35/A2.21 dated 10th May 2024. No comments have been received.

1.1.1 The Committee may **APPROVE** the minutes as circulated.

Item 2 SCOPE AND COMPOSITION OF TXD 35

2.1 The present scope and composition of the Committee is given in **Annex 1 (Pages 5-6)**.

2.1.1 The committee may **REVIEW**.

Item 3 ISSUES ARISING OUT OF THE PREVIOUS MEETING OF TXD 35

3.1 Summary of actions taken on the various decisions of the 21st meeting is given in **Annex 2 (Page 7).**

3.1.1 The Committee may **NOTE**.

Item 4 DRAFT AMENDMENT FOR FINALIZATION

4.1 As per the decision of the committee in the 21st meeting, draft amendment to IS **16513 : 2016** was issued under wide circulation for a period of one month for eliciting technical comments.

The wide circulation draft is given in **Annex 3 (P: 8-9).**

Sl No.	Doc No.	Title
1	TXD 35 (25717)	Agro textiles — Insect nets for agriculture and horticulture purposes — Specification (Amendment 3)

Comments have been received from M/s Garware technical fibres Ltd, Pune for inclusion of new variety as (**40 Mesh, 105 GSM with 40x32construction and 310 denier**) in **IS 16513: 2016** and the same are given in **Annex 4 (P: 10-11)** to the agenda**.**

4.1.1 The committee may **DECIDE.**

Item 5 COMMENTS RECEIVED ON PUBLISHED INDIAN STANDARDS

5.1 The comments have been received from **Manak Manthan** conducted by SUBO on **IS 18310 (Part 1) : 2023** 'Agro Textiles Bird Protection Nets for Agriculture and Horticulture Purposes Specification Part 1 Knotted Bird Protection Nets' given in **Annex 5 (P: 12 to 14)**; **IS 18310 (Part 2) : 2023** 'Agro Textiles Bird Protection Nets for Agriculture and Horticulture Purposes Specification Part 2 Knitted Bird Protection Nets' given in **Annex 6 (P: 15)** and **IS 18310 (Part 3) : 2023** 'Agro Textiles Bird Protection Nets for Agriculture and Horticulture Purposes Specification Part 3 Extruded Bird Protection Nets' as given in **Annex 7 (P: 16 to 17)** to the agenda.

5.1.1 The committee may **DECIDE**.

Item 6 NEW WORK ITEM PROPOSAL

6.1 The committee during its 18th Sectional Committee meeting decided to constitute a working group under the convenorship of Dr Manoj Khanna, IARA for deliberations on the new work item proposal as received from M/s VK Packwell Pvt. Ltd., Kanpur on the following subjects:

- Azola Beds
- HDPE Woven laminated grow bag
- HDPE woven laminated straw/jumbo bhusa bag

During the 2nd meeting of the working group held on **27th June, 2024**, the working group finalized the working draft on HPDE woven laminated Azolla Bed, HPDE woven laminated Grow bags and HDPE woven laminated Bhusa bag. The minutes of the working group meeting is given in **Annex 8 (P 18 to 19)** to the agenda and the working drafts finalized by working group are given in **Annex 9A , 9B and 9C (P:20 to 64)** to the agenda.

Further the working drafts finalized by working group were circulated to all committee members for a period of 14 days for inputs/comments.

Comments have been received from **Shri Ajay Pandit** on the working draft of **Grow bags** and **Bhusa Bags** as given in **Annex 10 (Page 65)** to the agenda**.**

6.1.1 The committee may **DECIDE**.

Item 7 REVIEW OF PUBLISHED STANDARDS

7.1 In the last meeting, the committee considered the review perfoma of below listed standards and also decided to circulate review analysis/performas to all committee members. The review analysis/performas were circulated to the committee members for eliciting comments/inputs/suggestions through BIS portal.

Sl No.	IS No.	Title	Status
1.	IS 15907 : 2010	Agro textiles — High density polyethylene (HDPE) woven beds for vermiculture — Specification	Inputs/comments received from Shri Kamlesh Dhoot
2.	IS 15351 : 2015	Agro textiles — Laminated high-density polyethylene (HDPE) woven geomembrane for water proof lining — Specification (*second revision*)	No inputs/comments recieved
3.	IS 16366 : 2015	Glossary of terms used in agrotextile	No inputs/comments recieved
4.	IS 16390 : 2015	Agro textiles — Nylon knitted seamless gloves for tobacco harvesters — Specification	No inputs/comments recieved

Inputs/comments have been received from Shri Kamlesh Dhoot as given in **Annex 11 (P: 66 to 67)** to the agenda.

7.1.1 The committee may **DECIDE.**

7.2 As per procedure of BIS, standards which were published/reaffirmed five years ago are required to be reviewed to assess adequacy of the requirements specified. Review is carried out keeping in view the changes in technology, current industrial practices and the needs/expectations of the consumers/users so as to decide regarding further reaffirmation/ revision/withdrawal/amendment of the standards under review.

7.2.1 Presently, the following Indian standard under the domain of TXD 35 is due for five yearly review:

i) **IS 17070: 2019 Jute agrotextiles for growth of plant and suppression of weeds – Specification**

The detailed review analysis of the above standard has been prepared by BIS is given in **Annex 12 (P: 68-71).**

7.2.1.1 The committee may **DECIDE**.

Item 8 REVIEW OF R&D PROJECT

8.1 In the 20th meeting of TXD 35, the committee prepared the Terms of Reference (ToR) for the R&D project on **draft revision of IS 16202 :2014 Agro Textiles — Woven Ground Covers for Horticulture Application — Specification**. The above-mentioned R&D project was then approved by the review committee after Head (TXD) and Member Secretary (TXD 35) apprised the review committee about the project and explained the rationale behind the proposed R&D project. The approved ToR was then hosted on BIS website for public bidding. After receiving technical and financial bids, the research evaluation committee decided to allocate the project to SASMIRA, Mumbai under the leadership of Smt Ashwini Sudam. The ToR as approved by the review committee is given in **Annex 13 (P- 72 to 75)**. The mid-term progress report, Statement of Expenditure as shared by Smt Ashwini Sudam, SASMIRA, Mumbai is given in **Annex 14 (P-76 to 83)**.

8.1.1 The committee may **REVIEW**.

Item 9 DATE AND PLACE OF NEXT MEETING

Item 10 ANY OTHER BUSINESS

ANNEX 1
(*Item* 2.1)

Scope & Composition of Technical Textiles for Agrotech Applications Sectional Committee, TXD 35

Scope: To formulate Indian Standards for terminology, testing and specifications for technical textiles for agrotech application such as horticulture, agriculture, forestry and animal husbandry, etc.

Meeting(s) held	**Date & Place**
19th Meeting	17 April 2023 (Video Conferencing)
20th Meeting	10 November 2023 (Video Conferencing)
21st Meeting	03 May 2024 (Video Conferencing)

Sl No.	NAME OF THE ORGANISATION	REPRESENTED BY	ATTENDANCE
1.	The Synthetic and Art Silk Mills Research Association, Mumbai	Dr. Manisha Mathur (Chairman)	3/3
2.	Azuka Synthetics LLP, Panchkula	Shri Sushant Gupta	3/3
3.	Central Silk Board, Bengaluru Central	Dr. S Periyasamy Dr. S Nivedita (Alternate)	1/3
4.	Chandra Shekhar Azad University of Agriculture and Technology, Kanpur	Dr Ashok Kumar Dr Jitendra Yadav (Alternate)	1/3
5.	CTM Technical Textiles Limited, Ahmedabad	Shri Amit Agarwal Dr. Vihar V Rakhunde (Alternate)	1/3
6.	Department of Jute and Fibre Technology, University of Kolkata, Kolkata	Dr Swapan Kumar Ghosh Nomination Awaited (Alternate)	2/3
7.	Garware Technical Fibres Limited, Pune	Dr. Vijay Ramakrishnan Shri Sachin P Kulkarni (Alternate)	3/3
8.	ICAR - Directorate of Rapeseed Mustard Research, Bharatpur	Nomination Awaited	1/3
9.	ICAR – National Institute of Biotic Stress Management	Dr Pankaj Sharma	1/1
10.	ICAR - National Institute of Natural Fibre Engineering and Technology, Kolkata	Dr Surajit Sengupta Shri Manik Bhowmick (Alternate)	2/3
11.	Indian Agricultural Research Institute Library, New Delhi	Dr. Manoj Khanna Dr. Susama Sudhishri (Alternate)	3/3
12.	Indian Jute Industries Research	Smt Mahuya Ghosh	1/3

	Association, Kolkata	Shri Debi Prasad Gon (Alternate)	
13.	Indian Technical Textiles Association, Mumbai	Dr Anup Rakshit Smt Ruchita Gupta (Alternate)	2/3
14.	Lamifabs and Papers Private Limited, Aurangabad	Shri Kamlesh Dhoot Shri Kishorilal Dhoot (Alternate)	1/3
15.	National Committee on Precision Agriculture and Horticulture, New Delhi	Shri Anand Zambre Mr. K K Kaushal (Alternate)	2/3
16.	Office of the Jute Commissioner, Kolkata	Shri Soumyadipta Datta Ms. Asuna Mukherjee (Alternate)	3/3
17.	Office of the Textile Commissioner, Mumbai	Shri Sivakumar S. Shri N. K. Singh (Alternate)	2/3
18.	Reliance Industries Limited, Mumbai	Dr. Sunil Mahajan Shri Keshav Pareek (Alternate)	1/3
19.	Rishi Techtex Limited, Daman	Shri Dinesh Chandra Mehta Shri Mavji Savani (Alternate)	3/3
20.	Shri Ambica Polymer Private Limited, Ahmedabad	Smt Jyotika Nagri Shri Parth Nagri (Alternate)	2/3
21.	Texel Industries Limted, Kalol	Shri Shailesh R Mehta Shri Naresh R Mehta (Alternate)	2/3
22.	Textiles Committee, Mumbai	Shri Sanjay Vilas Koravi Shri Brijesh Kumar Shukla (Alternate)	3/3
23.	The Synthetic and Art Silk Mills Research Association, Mumbai	Smt A Sudam Shri Premnath Surwase (Alternate)	3/3
24.	V.K. Packwell Private Limited, Kanpur	Shri Vikesh Kumar Gupta Shri Nitesh Katiyar (Alternate)	2/3

ANNEX 2
(*Item* 3.1)

SUMMARY OF ACTIONS TAKEN ON THE MINUTES OF THE LAST MEETING

Item No.	Decision	Action Taken
2.1	**Updated representation in committee**	Updated scope and composition are given in Annex 1.
5	**NEW WORK ITEM PROPOSAL** • HDPE Woven Azolla Beds • HDPE Woven fabric grow bag • HDPE woven fabric straw/jumbo bhusa bag	Coming up for discussion under agenda item 6**.1**.
6	**REVIEW OF PUBLISHED INDIAN STANDARDS** The committee considered the list of standards due for review the committee decided to circulate the standards due for review along with review proforma for 30 days to all the members of the TXD 35 sectional committee.	Coming up for discussion under agenda item 7**.1**.

ANNEX 3
(*Item* 4.1)

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS

DRAFT FOR COMMENTS ONLY

Doc. No: TXD 35 (25717) WC
May 2024

भारतीय मानक में संशोधन का मसौदा

संसोधन संख्या ३

आई एस 16513 : 2016 कृषि वस्त्रादि — कृषि और बागवानी प्रयोजनों के लिए कीट जाल — विशिष्टि

Draft Amendment to Indian Standard

AMENDMENT NO. 3

TO

IS 16513 : 2016 AGRO TEXTILES — INSECT NETS FOR AGRICULTURE AND HORTICULTURE PURPOSES — SPECIFICATION

Technical Textiles for Agrotech Applications Sectional Committee, TXD 35

Last date for receipt of comment is 19 June 2024

(*Page* 2, *Table* 1) — Substitute the following table for the existing:

Sl No.	Characteristic (s)	Requirements				Tolerance	Method of test
		Type I 30 mesh	Type II 40 mesh	Type II A 40 mesh	Type III 50 mesh		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Mass, g/m^2	90	105	125	125	±5 percent	IS 1964
ii)	a) Ends per inch	30	40	40	50	± 2	IS 1963

	b) Picks per inch	24	24	32	24	± 2	
iii)	Cover factor, percent, *Min*	30	40	45	50	—	Annex B
iv)	Breaking strength of insect nets fabric before UV exposure (ravelled strip method 325 mm × 70 mm)[1)], kg, *Min*:					—	IS 1969 (Part 1)
	a) Warpway	80	120	120	140		
	b) Weftway	50	65	80	70		
v)	Retention in breaking strength after UV exposure, kg, *Min*	85 percent of original actual value of fabric					Annex C and IS 1969 (Part 1)
vi)	Bursting strength, kg/cm^2, Min	10	18	19	20	—	IS 1966 (Part 1) or (Part 2)
vii)	Air permeability in mm/s at 50 pascal water head pressure, *Min*	6 500	5 000	4 000	3 000	—	IS 11056
[1)] Width after ravelling = 50 mm, Gauge length = 200mm							

ANNEX 4
(*Item* 4.1)

Comments from M/s Garware technical fibres Ltd, Pune for inclusion of new variety

Sr. No. : 1174 ORIGINAL

sasmira
The Synthetic & Art Silk Mills' Research Association
(APPROVED BODY OF THE MINISTRY OF TEXTILES, GOVT. OF INDIA)
SASMIRA MARG, WORLI, MUMBAI - 400 030.
TC - 6500
TEL.: 2493 5351 / 52, 2493 2047, 6977 6025 (EPBX)
E-mail : testing@sasmira.org • project@sasmira.org
Fax : 91-22-2493 0225
Web : www.sasmira.org

TEST REPORT

Test Report No : SASMIRA/TR-707(A)/24-25	ULR - TC650024000002524F **Date: 01.08.2024**
Name & Address of Customer :	M/s. Garware Technical Fibres Ltd. (Formerly Garware- Wall Ropes Ltd.) Plot No. D-1, MIDC, Plot No.11, Chinchwad, Pune - 411019
Sample Forwarding letter No :	Letter dated 02.07.2024
Date of Receipt : 04.07.2024	Date of Testing : 04.07. 2024 -- 01.08.2024
Particulars of Sample given by the customer :	One fabric sample for test listed under specification IS 16513: 2016

Discipline: Mechanical /Chemical **Product: Textile**
Sample ID Mark: 2 m X 4m, 40 mesh, 32 Picks, 105 GSM

Sl.No.	Parameter	Method of Test	Test Results
1.	Breaking strength before UVB Exposure Warp Weft	IS 1969 (Part-1) 2018 RA 2023	 115.1 kgf 85.6 kgf
2.	Breaking strength after UVB Exposure Warp Weft		 112.0 kgf 84.7 kgf
3.	Retention % in strength after UVB Exposure Warp Weft	Annex C& IS 1969 (Part 1) 2018 RA 2023	 97.3 % 98.9 %
4.	Air Permeability at 50 Pascals	IS 11056:2013 RA 2022	5372.8 mm/s
5.	Bursting strength	IS 1966 (Part1):2022	20.5 kg/cm^2
6.	Weight per square meter (GSM)	IS 1964:2001 RA 2022	106.5 g/m^2
7	Threads/Unit length Ends/Inch (EPI) Picks/Inch (PPI)	IS 1963:2004 RA 2023	 40 32
8.	Length of fabric	IS 1954 1990 RA 2022	2.5 m
9	Width of fabric	IS 1954 1990 RA 2022	4.2 m
10.	Width (Selvedge)	IS 1954 1990 RA 2022	15.0 mm
11	Identification of material	IS 667 : 1981 RA 2022	Polyethylene (HDPE)

Small portion of the submitted sample is enclosed herewith for reference.

End of the test report

AUTHORISED SIGNATORY
A. A. Sudam
Technical Manager

ANNEX 4
(*Item* 4.1)

Sr. No. : 097 ORIGINAL

sasmira
The Synthetic & Art Silk Mills' Research Association
(APPROVED BODY OF THE MINISTRY OF TEXTILES, GOVT. OF INDIA)
SASMIRA MARG, WORLI, MUMBAI - 400 030.

TEL.: 2493 5351 / 52, 2493 2047, 6977 6025 (EPBX)
E-mail : testing@sasmira.org • project@sasmira.org

Fax : 91-22-2493 0225
Web : www.sasmira.org

TEST REPORT

Report No : SASMIRA/TR-707 (NA)/24-25	**Date: 01.08.2024**
Name & Address of Customer :	M/s. Garware Technical Fibres Ltd. (Formerly Garware- Wall Ropes Ltd.) Plot No. D-1, MIDC, Plot No.11, Chinchwad, Pune – 411019
Sample Forwarding letter No :	Letter dated 02.07.2024
Date of Receipt : 04.07.2024	Date of Testing : 04.07. 2024 -- 01.08.2024
Particulars of Sample given by the customer :	One fabric sample for test listed under specification IS 16513: 2016

Discipline: Mechanical /Chemical **Product: Textile**

ample ID Mark: 2 m X 4m, 40 mesh, 32 Picks, 105 GSM

Sl.No.	Parameter	Method of Test	Test Results
1	Heat shrinkage at 60 degree	IS 16513-2016, Clause 4.1.1	0.2 %
2	Heat shrinkage at 95 degree	IS 16513: 2016 Clause 4.1.1	4.8 %
3	Cover Factor	Annex B	49.3 %
4	Diameter of monofilament Warp Weft	Micrometer	 0.21 mm 0.21 mm
5	Colour	Visual	Milky white
6.	Linear Density of filament yarn Warp Weft	Clause 4.1	 312.5 D 318.2 D

Small portion of the submitted sample is enclosed herewith for reference.

End of the test report

AUTHORISED SIGNATORY
A. A. Sudam
Technical Manager

Note : L / 04 /05
- The test report shall not be reproduced except in full, without written approval of the laboratory.
- The sample/s tested and reported is / are not drawn by the laboratory, unless otherwise specified.
- The report is strictly confidential and for technical information of the customer only and not for Advertisement, Promotion, Publicity or Litigation.

- The result relate only to the samples submitted
- Sample conditioning and testing : a) For IS, IS/ISO Test Method: Temp. of 27±2°C and Humidity of 65±2%, b) For ASTM & AATCC Test Method: Temp, of 21±2°C and Humidity of 65±5% and c) For ISO/DIN/JISL Test Method: Temp, of 20±2°C and Humidity of 65+2%
- The rating for Pilling test varies from 1 to 5, where 1 is "severe pilling" and/or "Dense surface fuzzing" and 5 is "No change"
- The rating for Change in shade/Staining varies from 1 to 5 where 1 is poor and 5 is excellent.
- The rating for Light Fastness Test varies from 1 to 8, where 1 is poor and 8 is excellent.

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ANNEX 5
(*Item* 5.1)

Comments received from **Manak Manthan** on IS 18310 (Part 1) : 2023

Sl No.	Clause No.	Comment	Propose change
1	Table 1, 5.1	The different combinations of twines '5X3, 2X3, 3X3, 8X3 and 2X3' should be added to Table 1 and related requirements should be changed accordingly.	**Given in Annex 5A**
2	5.5	Applicable as per agreement of buyer & seller	Applicable as per agreement of buyer & seller
3	5.6	Applicable as per agreement of buyer & seller	Applicable as per agreement of buyer & seller
4	5.7	Applicable as per agreement of buyer & seller	Applicable as per agreement of buyer & seller
5	6	Different types of gsm "75, 37, 32, 24, 93, 32, 97, 41, 77, 84 and 26" may be added.	File attached.
6	7.1	The + 10/-0 tolerance shall be permissible for length of the net.	The value of the length depends upon stretching of the net. The error caused by human involvement is so high.
7	7.1	The + 7/-0 tolerance shall be permissible for width of the net.	The value of the width depends upon stretching of the net. The error caused by human involvement is so high.
8	Table 2, 7.2	The different types of gsm "75, 37, 32, 24, 93, 32, 97, 41, 77, 84 and 26" should be added to Table 2 and related requirements should also be changed accordingly.	**Given in Annex 5B**

ANNEX 5A
(*Item* 5.1)

Comments received from **Manak Manthan** on IS 18310 (Part 1) : 2023

Table 1 Requirements for Twine
(*Clause* 5.1)

				Already exist	New addition required			
Sl No.	Characteristic(s)	Method of Test, Ref to	Tolerance(s)		Requirement(s)			
1	2	5	4	**3**				
	Denier of filament yarn			**280 D**	280 D	280 D	280 D	720 D
i)	Number of piles	Visual	—	**5*3**	2x3	3x3	8x3	2x3
ii)	Nominal twine diameter, mm	IS 5815 (Part 1)	± 10 percent	**1**	0.5	0.75	1.5	1
iii)	Twist per meter (TPM): a) Ply TPM b) Cable TPM	IS 832 (Part 1)	± 10 percent	**185 (S way)** **185 (Z way)**	280 (S way) 270 (Z way)	260 (S way) 250 (Z way)	170 (S way) 160 (Z way)	370 (S way) 210 (Z way)
iv)	Linear density (runnage), m/kg	IS 5815 (Part 2)	± 8 percent	**1970**	5035	3320	1230	1800
v)	Twine breaking strength, N, *Min*	IS 5815 (Part 4)	—	**160**	64	98	252	158
vi)	Twine knot breaking strength, N, *Min*	IS 5815 (Part 4)	—	**250**	104	156	407	196

ANNEX 5B

(*Item* 5.1)

Table 2 Requirements of Bird Protection Net from Filament yarn Plied Knotted Tarns

(*Clause* 7.2)

Sl No.	Characteristic(s)	Method of Test, Ref to	Tolerance(s)	Requirements(s)												
				Type I (**Already exist**)	Type II (**Already exist**)	**Type III**	**Type IV**	**Type V**	**Type VI**	**Type VI**	**Type VII**	**Type VIII**	**Type IX**	**Type X**	**Type XI**	**Type XII**
1	2	6	5	280D/ 5x3	280D/ 5x3	280D/ 5x3	280D/ 5x3	280D/ 5x3	280D/ 5x3	280D/ 2x3	280D/ 3x3	280D/ 8x3	280D/ 8x3	280D/ 8x3	720D/ 2x3	720D /2x3
i)	Mass, g/m²	IS 1964	+ 5 percent **0 percent**	56	80	75	37	32	24	9.3	32	97	41	77	84	26
ii)	Mesh type	Visual	—	Square	Square	Square	Square	Square	Square	Square	Square	Square	Square	Diamond	Square	Square
iii)	Average mesh size, mm	IS 15789	± 2 mm	25	19	20	35	40	50	50	25	25	50	60	19	50
iv)	Average mesh breaking strength, *Min*, N	IS 5815 (Part 5)	—	125	125	125	125	125	125	53	78	225	225	225	147	147
v)	Retention of breaking strength after UV exposure of 144 hours, percent, *Min*	Annex B and IS 5815 (Part 5)	—	85 percent of original actual value (fabric)												
vi)	Colour fastness to artificial light (*see* Note)	IS/ISO 105-B02	—	4 or better												
	NOTE — Applicable for coloured bird protection nets only.															
5.5	Tie Coed	—	—	Applicable as per agreement of buyer & seller												
5.6	Over Lock Border Rope	—	—	Applicable as per agreement of buyer & seller												
5.7	Stitching Twine	—	—	Applicable as per agreement of buyer & seller												
7.1	Dimensions: Length Width	—	 + 5 percent **0 percent** +3 percent **0 percent**	 Applicable as per agreement of buyer & seller Applicable as per agreement of buyer & seller												

ANNEX 6
(*Item* 5.1)

Comments received from **Manak Manthan** on IS 18310 (Part 2) : 2023

Sl No.	Clause No.	Comment	Propose change
1	7.1, 7.2 and Table 1 (Sl no. i and iii)	The value of the length, width, mesh sizes and gsm depend upon stretching of the net. In case of square net, the mesh side should be straight is principle of measurement of all so there is no difficulty in measurement. But in case of diamond shape net, the mesh knot always lies in a straight-line during stretching. The amount of stretching is not fixed to measurement of length, width, mesh size and gsm. Accordingly, a significant amount can be shown during measurements of all.	For the diamond shape net, a fixed number of mesh may be set in length and width direction for accurate measurement of length, width, mesh size and gsm. Hence a suitable test method may be specified in the standard specially for diamond shape knitted net.
2	7.1	The tolerance value for the length is so tight as the value of the length depends upon stretching of the net.	The + 10/- 0 tolerance may be permissible for length of the net. Since extra length doesn't impact the performance of the product, an increment of positive side tolerance may be considered.
3	7.1	The tolerance value for the width is so tight as the value of the width depends upon stretching of the net.	The + 7/- 0 tolerance may be permissible for width of the net. Since extra width doesn't impact the performance of the product, an increment of positive side tolerance may be considered.

ANNEX 7
(*Item* 5.1)

Comments received from **Manak Manthan** on IS 18310 (Part 3) : 2023

Sl No.	Clause No.	Comment	Propose change
1	4.1	This net is used for protection of crops and plants from birds. As IS 10146 specifies polyethylene for its safe use in contact with foodstuffs, pharmaceutical and drinking water, there is no requirement like Part 1 & Part 2.	Consider the deletion of the requirement for conforming material to IS 10146.
2	6.1	Usually, classifications of any product are based on the performance of the products. However, classification based on the width of the extruded net is not justifiable. It restricts the farmer/consumer's demand for nets of widths other than 3 m and 6 m.	Different types other than 3 m and 6 m width of net may also be considered for inclusion in the standard.
3	Table 1, Sl no. (i, ii, iii, iv and vii)	The value of the length, width and mesh sizes depend upon stretching of the net. In case of square net, the mesh side should be straight is the principle of measurement of all so there is no difficulty in measurement. But in case of diamond shape net, the mesh knot always lies in a straight-line during stretching. The amount of stretching is not fixed to measurement of length, width and mesh sizes. Accordingly, a significant amount can be shown during measurements of all.	For the diamond shape net, a fixed number of mesh may be set in length and width direction for accurate measurement of length, width and mesh size. Hence a suitable test method may be specified in the standard for diamond-shaped knitted net.
4	Table 1, Sl no. (i)	The tolerance value for the width is so tight as the value of the width depends upon stretching of the net.	The + 7/- 0 tolerance may be permissible for width of the net. Since extra width doesn't impact the performance of the product, an increment of positive side tolerance may be considered.
5	Table 1, Sl no. (vii)	The tolerance value for the length is so tight as the value of the length depends	The + 10/- 0 tolerance may be permissible for length of the net.

		upon stretching of the net.	Since extra length doesn't impact the performance of the product, an increment of positive side tolerance may be considered.
6	Table 1, Sl no. (vii)	Usually, length of net is measured in rope form for the extruded net. But as per B-4, length shall be measured in stretched form.	A suitable note may be specified below in Table 1 or clause B-4 which may specify the measurement of length of net in rope form.
7	Table 1, Sl no. (viii & ix)	The unit of the tensile strength should be N/m.	Substitute 'N/m' for 'kN/m'.

ANNEX 8
(*Item* 6.1)

For BIS Use Only
BUREAU OF INDIAN STANDARDS

Minutes

Technical Textiles for Agrotech Applications Sectional Committee, TXD 35 2nd Panel Meeting

Date (day)	**Time**	**Venue**
27th June 2024 (Monday)	1500 h	Through Video Conferencing

Attendance:

Sl No.	**NAME OF THE MEMBER**	**ORGANISATION**
1.	**Dr. Manoj Khanna (Convener)**	**ICAR-IARI, New Delhi**
2.	Smt A Sudam	SASMIRA, Mumbai
3.	Shri Vikesh kumar Gupta	V K Packwell Private Limited, Kanpur
4.	Shri Sachidanand Tiwari	-do-
5.	Shri Rahul Soni	-do-
6.	Shri Kamlesh Dhoot	Lamifabs and Papers Private Limited, Aurangabad
7.	Shri Anish	Shri Ambica Polymer Private Limited, Ahmedabad

BIS DIRECTORATE GENERAL:

8. Shri J.K. Gupta — Scientist E & Head (Textiles)
9. Shri Gourav Mishra — Scientist B & Member Secretary TXD 35

Item 0 WELCOME AND INTRODUCTORY REMARKS BY THE CONVENER

0.1 Dr Manoj Khanna, Convener, TXD 35 P01 welcomed all the members and invitees present in the meeting. He informed that the subjects in hand are important and requested the members to actively participate on the agenda items.

0.2 Shri J K Gupta, Head (textiles) welcome the Convener, and all the members present in the meeting and requested for the precise inputs on the agenda items.

Item 1 COMPOSITION OF PANEL

1.1 The panel reviewed and confirmed the composition of the panel **TXD 35/P01** constituted under TXD 35.

Item 2 FORMULATION OF INDIAN STANDARDS ON NEW SUBJECTS

2.1 a) The panel scrutinized the working draft prepared after including all the inputs on high density polyethylene laminated woven azolla beds as given in **Annex 2** to the agenda. After detailed deliberations, the panel decided to include IS 4985 for UPVC pipes used in shade net canopy, finalized the working draft and further decided to place the final working draft on azolla beds in the next sectional committee of TXD 35 for further deliberations.

2.1 b) The panel scrutinized the working draft prepared after including all the inputs on high density polyethylene woven grow bags as given in **Annex 3** to the agenda. After detailed deliberations, the panel decided to include stitch density of grow bags in working draft and requested M/s V K Packwell to provide data. The panel finalized the working draft with addition of stitch density and decided to place the final working draft on grow bags in the next sectional committee of TXD 35 for further deliberations.

2.3 c) The panel scrutinized the working draft on high density polyethylene woven Bhusa bags as given in **Annex 4** to the agenda. After detailed deliberations, the panel decided as below:

[*Pages no.* 41, *clause* **6.1**, *Table* 2, *Sl No*. (i)] — Delete requirement of Nominal Capacity, Kg from the table and mention separately in the draft text.

[*Pages no.* 41, *clause* **6.1**, *Table* 2, *Sl No*. (v)] — Substitute the following for the existing:

Sl No.	**Characteristic**	**Requirements**			**Tolerance, percent**
(1)	(2)	(3)	(4)	(5)	(6)
5	Discharge tube diameter (mm), Min	300	300	300	

Further, panel decided to place the working draft on Bhusa bags in the next sectional committee of TXD 35 for further deliberations.

Item 3 ANY OTHER BUSINESS

3.1 There being no other business, the meeting ended with a hearty vote of thanks to the Chair and all the members.

ANNEX 9A
(*Item* 6.1)

Preliminary Draft Standard

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 35(26184)
July 2024

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Draft Indian Standard

AGRO TEXTILE —— HIGH DENSITY POLYETHYLENE (HDPE) WOVEN AZOLLA BEDS —— SPECIFICATION

Technical Textiles for Agro-tech Applications Sectional Committee, TXD 35	Last date for receipt of comments is 1st August 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 purpose but of late portable beds made from plastics have made entry into the market. These synthetic beds enjoy greater advantages over the traditional ones in terms of maintenance, space, UV stabilized for lifelong durability, portability, fungus resistance, waterproofing, yield of compost, cost effective etc.

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.

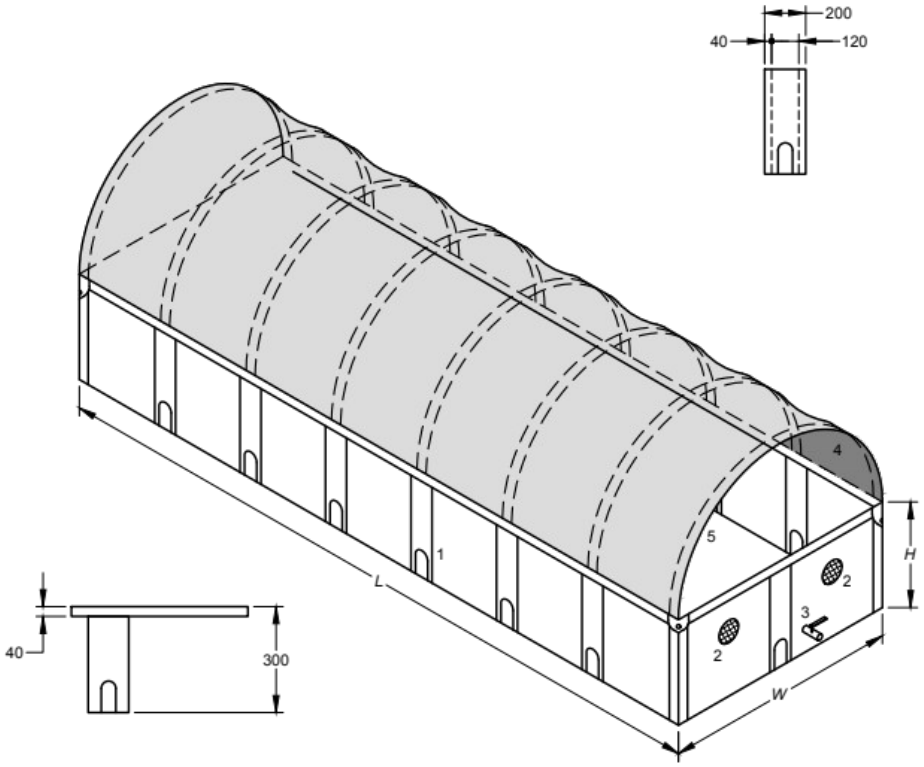

FIG 1 TYPICAL SHAPE OF AZOLLA BED

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. UPVC pipes conforming to IS 4985 shall be used for the arc roof of shade net canopy.

6 REQUIREMENTS

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, 5.3, 5.2.1, 5.2.2 *and* 6)

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

	UV exposure, N, *Min*				
vii)	Tear strength, N, *Min*	100 (Warp) 100 (Weft)	100 (Warp) 100 (Weft)	150 (Warp) 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 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					

6.1 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* 6.1)

Dimensions	**Type 1**	**Type 2**	**Tolerance, Percent**
Length (mm)	2400	3600	+ 5 - 2
Width (mm)	1200	1200	+ 5 - 2
Height (mm)	300	300	+ 5

			- 2

6.2 Water Proofness

6.2.1 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.

6.2.2 The ageing shall be done at 70 °C for 168 h as per the method 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)

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 do 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 INDIAN 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 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/ISO 105 (Part B02) : 2014	Textiles — Test for colour fastness Part B02 colour fastness to artificial light : xenon arc fading test
IS 16008:2016	Agro textiles – Shade nets for agriculture and horticulture purposes – Specification
IS 4985:2021	Unplasticized PVC Pipes for Potable Water Supplies - Specification (Fourth Revision)

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 + 3ºC with UV radiation alternating after 4 h at 50 ºC + 3ºC 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 = $\frac{}{} \times 100$
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 side of 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.

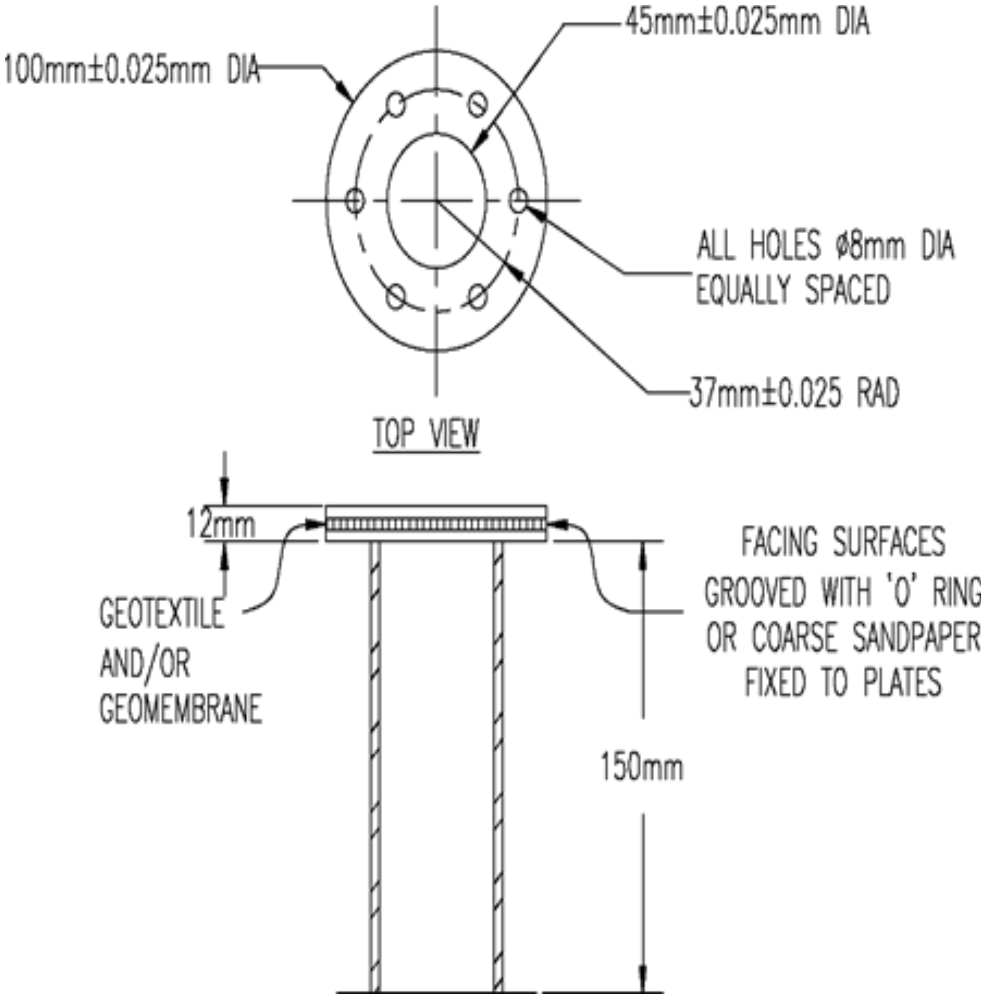

FIG. 2 TEST FIXTURE DETAIL (NOT TO SCALE)

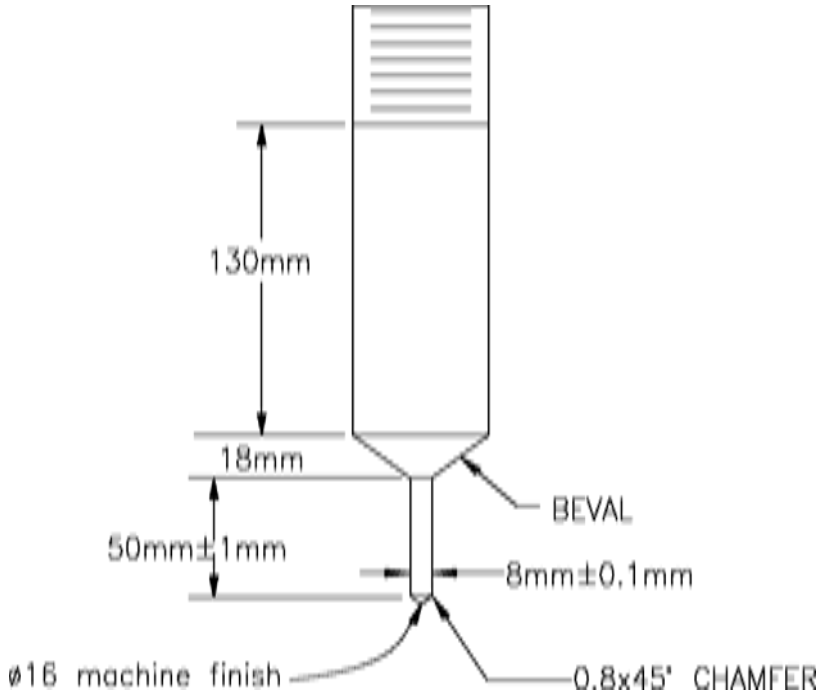

FIG. 3 TEST PROBE DETAIL (NOT TO SCALE)

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

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-3.2 The storage area shall be protected from theft, vandalism, vehicular traffic and any other source which could create potential damage to the beds.

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. 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.

ANNEX 9B
(*Item* 6.1)

Preliminary Draft Standard

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 35 (26188)
July 2024

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भारतीय मानक मसौदा

Draft Indian Standard

भारतीय मानक

कृषि वस्त्रादि - उच्च घनत्व वाले पॉलिइथाईलीन (एच डी पी ई) के बुने हुए ग्रो बैग– विशिष्टि

AGRO TEXTILE – HIGH DENSITY POLYETHYLENE (HDPE) WOVEN GROW BAGS– SPECIFICATION

ICS 65.020.20, 83.140.01

Technical Textiles for Agro-tech Applications Sectional Committee, TXD 35	Last date for receipt of comments is 2nd August 2024

FOREWORD

Formal clauses will be added later.

Horticulture is the branch of agriculture that focuses on the cultivation, production, and management of plants including flower, fruit, vegetables, ornamental plants, and herbs.

Gardening and flower pots often go hand in hand as flower pots provide a convenient and versatile container for growing plants but there are some limitation of traditional flower pots such as warding off root circulation, resistance to binding, drainage issues, portability, poor aeration, oxygen availability and hinder root ball development in pots due to lack of space.

The concept of grow bags originated as a solution to address some of the limitations and challenges associated with traditional flowerpots. Their popularity and uses in gardening have increased over the year.

Grow bags have gained popularity among gardeners for several reason . They are portable and light weight making them suitable for a range of gardening setups including balconies, rooftops and urban gardening by allowing roots to breathe and become air-prune. Grow bags aim to create a more efficient and robust root system. Soil mix improve nutrient uptake grow bag facilitate this process by providing better drainage process and ultimately healthier plants. The fabric construction of grow bag also allows for better temperature regulation, preventing overheating of roots and facilitating better root insulation during colder months.

AGRO TEXTILES — HIGH DENSITY POLYETHYLENE (HDPE) WOVEN GROW BAG —SPECIFICATION

1 SCOPE

This standard prescribes constructional and other requirements for high density polyethylene (HDPE) woven grow bags for agriculture and horticulture purpose including gardening.

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 HDPE Grow Bags -- A grow bag is a container specifically designed for plant cultivation. It is typically made of fabric or plastic material and is used to provide a controlled environment for plants to grow, allowing for efficient root development and optimal growing conditions. HDPE grow bags are made from high-density polyethylene. The material composition of HDPE provides durability, resistance to UV radiation, and a long lifespan, making it suitable for plant cultivation.

3.2 Soil Mix -- The soil mix used in grow bags is a crucial factor for plant health. This soil mix provides the necessary nutrients, balance the pH and enhance the quality of soil for the plants to thrive in the grow bag. Common soil mixes include peat moss, vermiculite, perlite, and compost.

3.3 Root Ball -- The compacted mass of roots that forms within the grow bag as the plant grows. The size and health of the root ball are crucial indicators of a plant's overall root development and ability to absorb nutrients and water.

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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 grow bag 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 2.00 mm minimum and linear density of the tape shall be 700 Denier minimum.

.

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

4.2 HDPE Fabric

Grow bags shall be manufactured by using suitable HDPE woven fabric (*see IS* 6899) so that finished bag meets the requirements given in Table 1 and **5.2**.

4.3 Lamination

4.3.1 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 suitably UV stabilized by incorporating UV stabilizer (*see* Note under **4.1**). The coating film along with colour master batch to get the desired shade shall be such that the finished grow bag meets the requirements of UV stability and colour fastness to light as given in Table 1.

4.3.2 A 3-layer laminated fabric is manufactured using a combination of single layers of HDPE fabric and 2-layers of coating film for type 1 grow bags, a 5-layer laminated fabric is produced using a combination of 2-layers of HDPE fabric and 3-layers of coating film for type 2 grow bags. The layers of HDPE fabric used to manufacture grow bags shall be joined by sandwich lamination. The lamination as given above shall be such that the finished grow bag meets the requirements given in Table 1. The minimum coating thickness of the sandwich lamination shall be 40μ.

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4.4 Cord Beading

A jute / Polypropylene rope beading of minimum 2.0 mm diameter shall be provided along the top periphery of the grow bag for reinforcement.

5 MANUFACTURE

5.1 General design of the grow bag may be as shown in Fig. 1 and Fig. 2.

5.2 Construction

5.2.1 The grow bag shall be constructed by stitching laminated pieces of woven fabric of the desired dimensions. The panels shall be flat (overlap) joined. The top edges of the grow bag shall be hemmed by heat sealing/stitching along with a jute or polypropylene rope of 2 mm diameter placed inside the hem as reinforcement. The width of the top hem shall be minimum 30 mm. Bottom and sides of the grow bags shall be stitched with a suitable yarn of minimum 2000 denier.

FIG. 1 ROUND GROW BAG

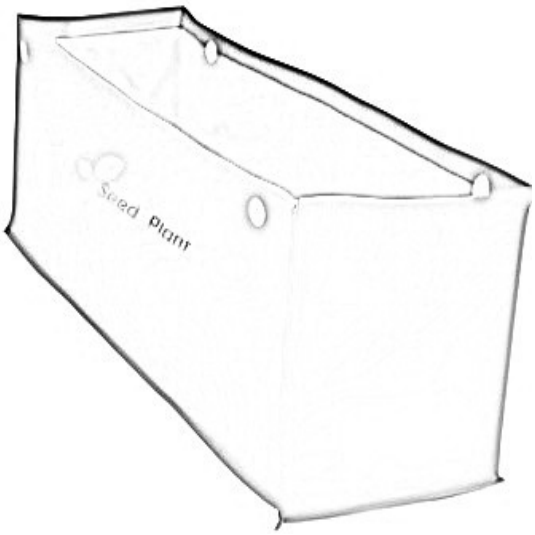

FIG. 2 RECTANGULAR GROW BAG

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6 REQUIREMENTS

The laminated HDPE fabric used to manufacture grow bag shall meet the requirements as given in Table 1. Besides the grow bag shall meet the requirements stated in **5.2**.

Table 1 Requirements of Grow Bag Made from HDPE Woven Fabrics

(*Clauses* 4.1, 4.2, 4.3, 5.2.1 *and* 6)

Sl No.	Characteristic	Requirements		Method of Test, Ref to
		Type 1	Type 2	
(1)	(2)	(3)	(4)	(5)
i)	Mass, g/m², *Min*	200	250	IS 1964
ii)	Breaking strength before UV exposure, N, *Min*	1 000 (Warp) 750 (Weft)	1 100 (Warp) 900 (Weft)	IS 1969
iii)	Elongation at break, percent	20 ±5	20 ±5	IS 1969
iv)	Retention of breaking strength after UV exposure, N, *Min*	85 percent of original actual value (fabric)	85 percent of original actual value (fabric)	Annex B and IS 1969
v)	Seam strength before UV exposure, N, *Min*	65 percent of original actual value (fabric)	65 percent of original actual value (fabric)	IS 1969
vi)	Seam strength after UV	85 percent of original	85 percent of	Annex B and

	exposure, N, *Min*	actual value	original actual value	IS 1969
vii)	Tear strength, N, *Min*	100 (Warp) 100 (Weft)	130 (Warp) 130 (Weft)	Method A2 of IS 7016 (Part 3)
viii)	Puncture strength, N, *Min*	250	300	Annex C
ix)	Environmental stress cracking test	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*	0.1 percent	0.1 percent	Annex E
xi)	Colour fastness to artificial light *(See Note)*	4 or better	4 or better	IS 105(Part B02) (Xenon lamp method)
NOTE— Applicable for coloured bags only				

6.1 Dimensions

The preferred dimensions of the circular and round grow bag shall be as given in tables 2 and 3. Bags of other dimensions may also be manufactured as agreed to between the buyer and the seller.

Table 2 Circular Grow Bags Dimensions

(*Clause 6.1*)

S.No	**Height, mm**	**Diameter, mm**
(1)	(2)	(3)
1	150	150
2	150	230
3	230	230
4	230	300
5	300	300
6	300	380
7	300	455
8	380	150
9	380	230
10	380	380
11	380	455
12	455	610
13	455	455
14	610	610

Tolerance, percent	+2 -2	+2 -2

Table 3 Rectangular Grow Bags Dimensions

(*Clause 6.1*)

S.No	Length, mm	Width, mm	Height, mm
(1)	(2)	(3)	(4)
1	600	450	300
2	900	600	300
3	910	910	300
4	1220	610	300
5	1500	300	300
6	1500	380	380
7	1800	900	300
Tolerance, percent	+2 -2		

7 MARKING

7.1 Each bag 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 high density polyethylene woven grow bags 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 there under, and the products may be marked with the Standard Mark.

8 PACKING

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

9 SAMPLING

9.1 Lot

The quantity of grow bag 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 bags to be selected at random from a lot shall be as given in col 3 of Table 4.

10 NUMBER OF TEST SPECIMENS AND CRITERIA FOR CONFORMITY

Number of test specimens and criteria for conformity shall be as given in Table 5.

Table 4 Scale of Sampling
(*Clause* 9.2)

Sl No.	No. of Bags in Lot	Sample Size	Sub-sample Size	Permissible No. of Defective bags
i)	Up to 50	3	2	0
ii)	51 to 150	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 5 Number of Test Specimens and Criteria for Conformity
(*Clause* 10)

Sl No.	Characteristic	No. of bags/Test Specimens	Criteria for Conformity
i)	Dimensions, average mass (g/m^2), manufacture and material	According to col 3 of Table 4	The defective bags do not exceed the corresponding number given in col 5 of Table 4
ii)	All other requirements	According to col 4 of Table 4	The test specimens shall meet the requirements as given in Table 1

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS NO.	*Title*
1964 : 2001	Textiles — Methods for determination of mass per unit length and mass per unit area of fabrics (*second revision*)
1966 : 1975	Methods for determination of bursting strength and bursting distention of fabrics — Diaphragm method (*first revision*)
1969 (Part-2):2018	Textiles-Tensile properties of fabric Part 2 determination of maximum force using the grab method
6192 : 1994	Textiles — Monoaxially oriented high density polyethylene tapes — Specification (*second revision*)
6899 : 1997	Textiles — High density polyethylene (HDPE) woven fabrics — Specification (*second revision*)
7016	Methods of test for coated and treated fabrics:
(Part 3/Sec 1) : 2017	Determination of tear strength (*Third revision*)
(Part 8) : 2023	Accelerated ageing
7940 : 1976	Methods for determining resistance to penetration by water of fabrics by static pressure head test
7941 : 1976	Method for determining water repellency of fabrics by cone test
13162 (Part 3):2021	Geotextiles – Methods of test : Part 3 Determination of thickness at specified pressures
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, *Sl 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 for modified grab test.

B-2 TEST CONDITIONS

B-2.1 The test shall be carried out with fluorescent UVB lamp (313 nanometer 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 + 3ºC with UV radiation alternating after 4 h at 50 + 3ºC with condensation.

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

B-3 TEST PROCEDURE

B-3.1 Determine the original average breaking strength and seam strength of bag specimens separately as per the modified grab test specified in IS 1969.

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 = $\frac{\quad}{a} \times 100$

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 side of the test specimen is exposed to the cooling influence of ambient room air.

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ANNEX C
[*Table* 1, *Sl 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-2.1Tensile/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 ± 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 ± 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 ± 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 bag.

C-4 CONDITIONING

Bring the specimens to moisture equilibrium in the atmosphere for testing bags (65 ± 5 percent relative humidity and 27 ± 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 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 ± 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.

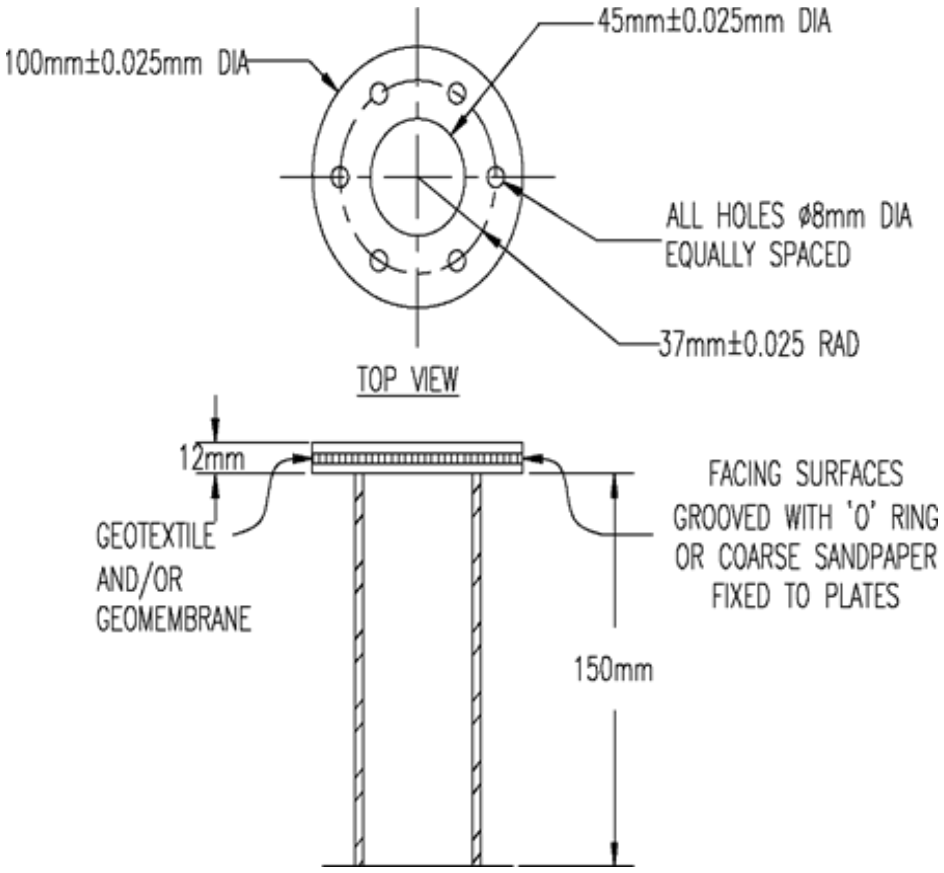

FIG. 2 TEST FIXTURE DETAIL (NOT TO SCALE)

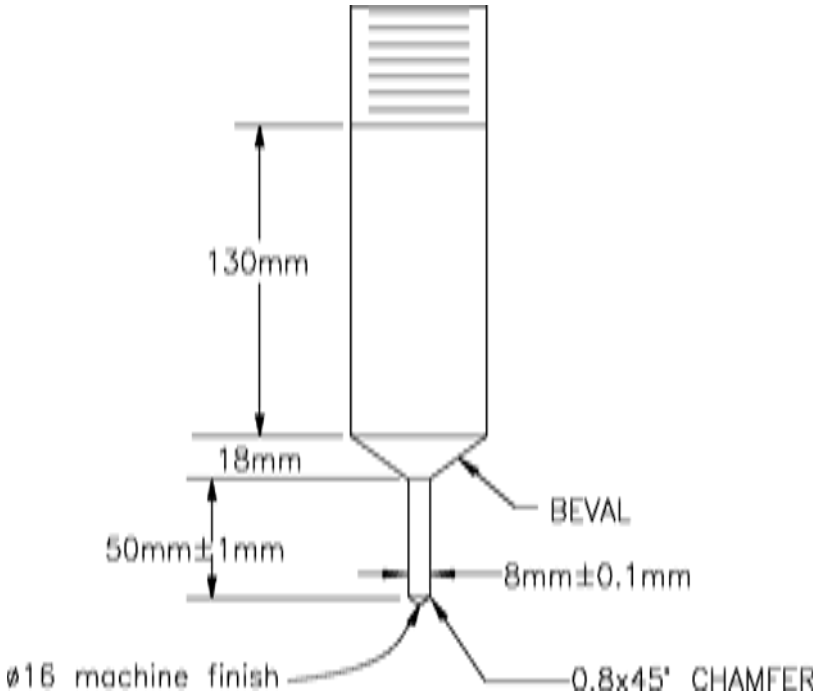

FIG. 3 TEST PROBE DETAIL (NOT TO SCALE)

ANNEX D

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

METHOD OF TEST FOR RESISTANCE TO ENVIRONMENTAL STRESS CRACKING

D-1 APPARATUS

An air oven controlled at 60 ± 2ºC.

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 bag and shall have a length of 150 ± 3 mm and width of 50 ± 3 mm.

D-4 PROCEDURE

The test specimen shall be dipped in the test liquid contained in a beaker at 27 ± 2°C. The beaker along with test specimen shall be kept in the oven at 60 ± 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, *Sl No*. (x)]

TEST FOR RESISTANCE TO CHEMICAL ACTION

E-1 TEST SPECIMEN

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

E-2 PROCEDURE

For test in each solution as mentioned herein under below, three specimens each of length of 150 ± 3 mm and width of 50 ± 3 mm taken from three position of bag 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 Table1.

ANNEX 9C
(*Item* 6.1)

Preliminary Draft Standard

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDRADS

Draft for comments only Doc No.: TXD 35 (26187)
July 2024

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भारतीय मानक मसौदा

Draft Indian Standard

AGRO TEXTILES – HIGH DENSITY POLYETHYLENE (HDPE) WOVEN BHUSA BAGS– SPECIFICATION

Technical Textiles for Agro-tech Applications Sectional Committee, TXD 35	Last date for receipt of comments is 1st August 2024

1 SCOPE

This standard prescribes constructional and other requirements for high density polyethylene (HDPE) woven bhusa bags for storing wheat straw (bhusa).

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 Bhusa Bag — Bhusa bag is a specially designed outer layer coated HDPE fabic storage bag used to transport, store the wheat straw (bhusa). It is provided with a discharge tube at the bottom to take out required quantity of bhusa for use.

3.2 Discharge Tube — Tubular HPDE fabric layer stitched to the discharge hole of bhusa bag to facilitate the easy discharge of wheat straw.

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 bhusa bag 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 2.00 mm minimum and linear density of the tape shall be 700 Denier minimum.

.

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

4.2 HDPE Fabric

Bhusa bag shall be manufactured by using suitable HDPE woven fabric manufactured in tubular form on a circular loom (*see IS* 6899) so that finished bag meets the requirements given in Table 1 and **5.2**.

4.3 Lamination

4.3.1 The tubular HDPE 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 outer side having thickness not less than 25 microns and the coating shall be suitably UV stabilized by incorporating UV stabilizer (*see* Note under **4.1**). The coating film along with colour master batch to get the desired shade shall be such that the finished bhusa bag meets the requirements of UV stability and colour fastness to light as given in Table 1.

4.3.2 A 2-layer laminated fabric is produced using a combination of single layers of HDPE fabric and 1-layers of coating film for bhusa bags.The lamination on the outer side as given above shall be such that the finished bhusa bag meets the requirements given in Table 1.

4.4 Cord Beading

A Polypropylene rope beading of minimum 2.0 mm diameter shall be provided along the top periphery edges of the bhusa bag for reinforcement.

5 MANUFACTURE

5.1 General design of the bhusa bag may be as shown in Fig. 1.

5.2 Construction

5.2.1 The bhusa bag shall be constructed by cutting the tubular laminated pieces of woven fabric according the desired slandered capacity of the bhusa bag.A hole is cut into the main tubular laminated fabric to provide a discharge hole. The discharge tube is stitched on to the discharge hole using a double row of chain stitch with a multifilament yarn.

The bottom edges of the tubular fabric is stitched with a laminated fabric of same quality as tubular fabric using a double row of chain stitch multifilament yarn and with a folded hem of minimum 3 cm.
The top edges of the bhusa bag shall be hemmed by heat sealing/stitching along with a polypropylene rope of minimum 2 mm diameter placed inside the hem as reinforcement. The width of the top hem shall be minimum 30 mm. A protective top flap/canopy shall be stitched to one side of the top edge.

5.2.2 Bhusa bag shall be provided with a discharge hole of minimum 300 mm diameter. The multifilament yarn used for stitching of bhusa bag shall have a minimum liner density of 2000 denier.

FIG. 1 GENERAL DESIGN OF A BHUSA BAG

6 REQUIREMENTS

The laminated HDPE fabric used to manufacture bhusa bag shall meet the requirements as given in Table 1. Besides the bhusa bag shall meet the requirements stated in **5.2**.

Table 1 Requirements of Bhusa Bag Made from HDPE Woven Fabrics

(*Clauses* 4.1, 4.2, 4.3, 5.2 *and* 6)

Sl No.	Characteristic	Requirements	Method of Test, Ref to
(1)	(2)	(3)	(5)
i)	Mass, g/m², *Min*	175	IS 1964
ii)	Breaking strength before UV exposure, N, *Min*	1 000 (Warp) 750 (Weft)	IS 1969
iii)	Elongation at break, percent	20 ±5	IS 1969
iv)	Retention of breaking strength after UV exposure, N, *Min*	85 percent of original actual value (fabric)	Annex B and IS 1969
v)	Seam strength before UV exposure, N, *Min*	65 percent of original actual value (fabric)	IS 1969
vi)	Seam strength after UV exposure, N, *Min*	85 percent of original actual value	Annex B and IS 1969
vii)	Tear strength, N, *Min*	150 (Warp) 150 (Weft)	IS 14293
viii)	Puncture strength, N, *Min*	300	Annex C
ix)	Environmental stress cracking test	There shall be no evidence of stress cracking	Annex D
x)	Resistance to chemicals, change in the mass,percent, *Max*	0.1 percent	Annex E
xi)	Colour fastness to artificial light *(See Note)*	4 or better	IS 105(Part B02) (Xenon lamp method)

6.1 Dimensions

The dimensions of the bhusa bag shall be as given in tables 2. Bhusa bags of other capacity and dimensions may also be manufactured as agreed to between the buyer and the seller. The nominal capacity of bhusa may either be 400 kg , 600 kg or 800 kg.

Table 2 Bhusa Bags Dimensions

(*Clause 6.1*)

S.No	Characteristic	Requirements			Tolerance, percent
		Type 1	Type 2	Type 3	
(1)	(2)	(3)	(4)	(5)	(6)
1	Main body height, mm	1650	2700	3220	+3
2	Main body diameter, mm	3000	3000	3000	
3	Discharge tube length, mm	1200	1200	1220	-1
4	Discharge tube diameter, Min , mm	300	300	300	

7 MARKING

7.1 Each bag 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 capacity, and
c) Year of manufacture.

7.2 BIS Certification Marking

7.2.1 The high density polyethylene woven bhusa bags 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 there under, and the products may be marked with the Standard Mark.

8 PACKING

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

9 SAMPLING

9.1 Lot

The quantity of bhusa bag of same size, capacity 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 bags 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)

Sl No.	No. of Bags in Lot	Sample Size	Sub-sample Size	Permissible No. of Defective bags
i)	Up to 50	3	2	0
ii)	51 to 150	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 bags/Test Specimens	Criteria for Conformity
i)	Dimensions, average mass (g/m^2), manufacture and material	According to col 3 of Table 3	The defective bags do not exceed the corresponding number given in col 5 of Table 3
ii)	All other requirements	According to col 4 of Table 3	The test specimens shall meet the requirements as given in Table 1

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS NO.	*Title*
1964 : 2001	Textiles — Methods for determination of mass per unit length and mass per unit area of fabrics (*second revision*)
1966 : 1975	Methods for determination of bursting strength and bursting distention of fabrics — Diaphragm method (*first revision*)
1969 (Part-2):2018	Textiles-Tensile properties of fabric Part 2 determination of maximum force using the grab method
6192 : 1994	Textiles — Monoaxially oriented high density polyethylene tapes — Specification (*second revision*)
6899 : 1997	Textiles — High density polyethylene (HDPE) woven fabrics — Specification (*second revision*)
(Part 8) : 2023	Accelerated ageing
7940 : 1976	Methods for determining resistance to penetration by water of fabrics by static pressure head test
7941 : 1976	Method for determining water repellency of fabrics by cone test
13162 (Part 3):2021	Geotextiles – Methods of test : Part 3 Determination of thickness at specified pressures
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, *Sl 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 for modified grab test.

B-2 TEST CONDITIONS

B-2.1 The test shall be carried out with fluorescent UVB lamp (313 nanometer 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 + 3ºC with UV radiation alternating after 4 h at 50 + 3ºC with condensation.

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

B-3 TEST PROCEDURE

B-3.1 Determine the original average breaking strength and seam strength of bag specimens separately as per the modified grab test specified in IS 1969.

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:

$$\text{Percent retention of original breaking strength or seam strength} = \quad \times 100$$

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 side of the test specimen is exposed to the cooling influence of ambient room air.

.

ANNEX C
[*Table* 1, *Sl 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-2.1Tensile/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 ± 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 ± 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 ± 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 bag.

C-4 CONDITIONING

Bring the specimens to moisture equilibrium in the atmosphere for testing bags (65 ± 5 percent relative humidity and 27 ± 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 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 ± 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.

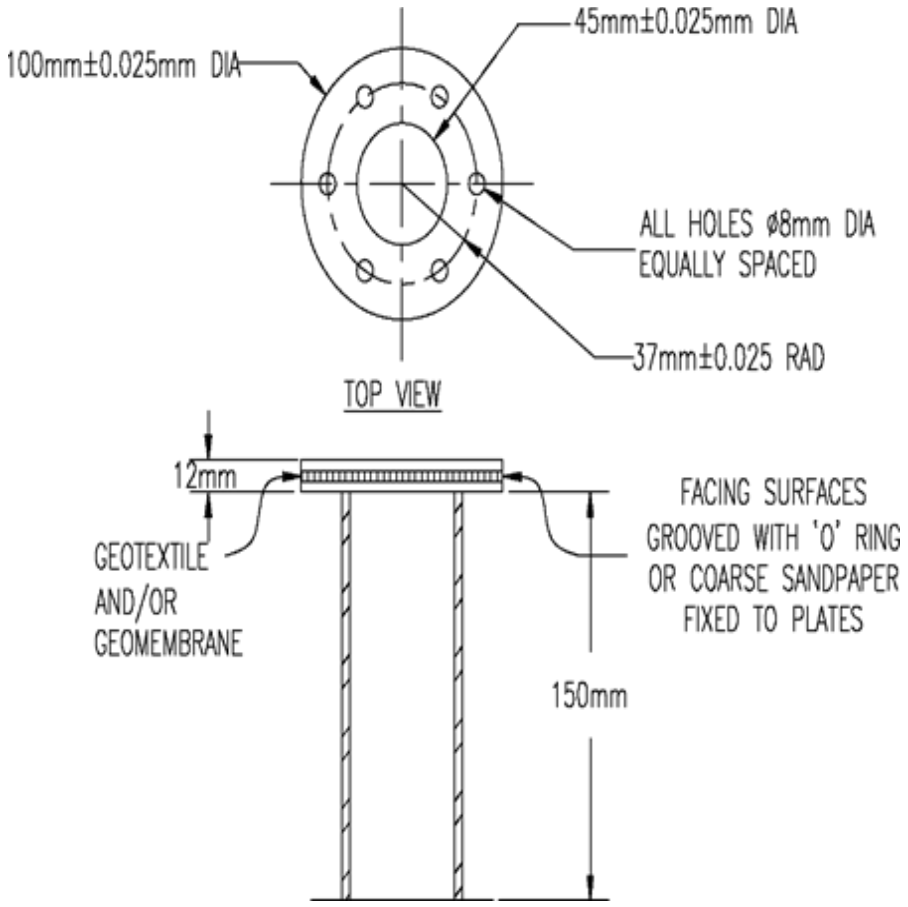


FIG. 2 TEST FIXTURE DETAIL (NOT TO SCALE)

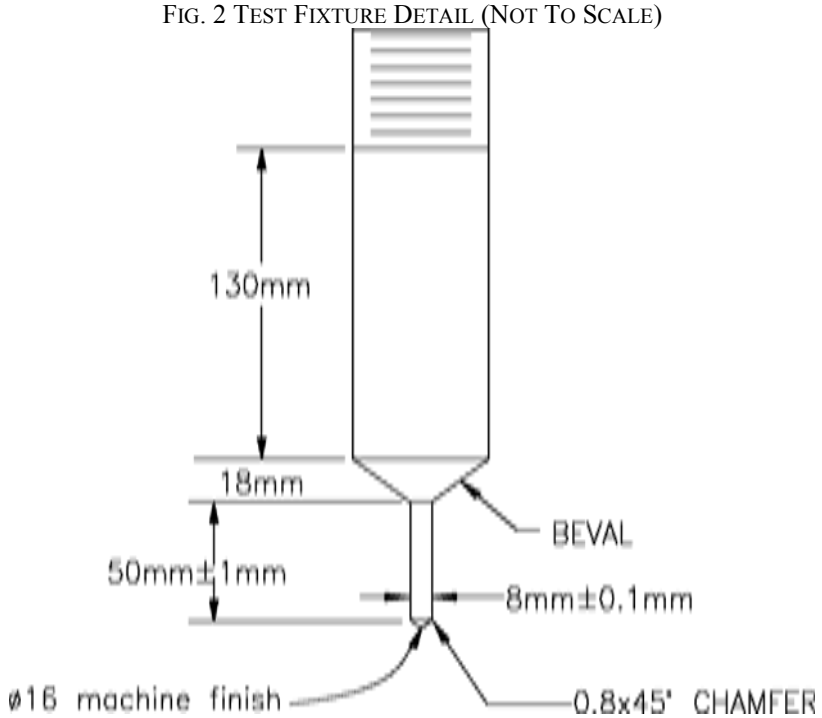


FIG. 3 TEST PROBE DETAIL (NOT TO SCALE)

ANNEX D
[Table 1, *Sl No.* (ix)]

METHOD OF TEST FOR RESISTANCE TO ENVIRONMENTAL STRESS CRACKING

D-1 APPARATUS

An air oven controlled at 60 ± 2ºC.

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 bag and shall have a length of 150 ± 3 mm and width of 50 ± 3 mm.

D-4 PROCEDURE

The test specimen shall be dipped in the test liquid contained in a beaker at 27 ± 2°C. The beaker along with test specimen shall be kept in the oven at 60 ± 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, *Sl No*. (x)]

TEST FOR RESISTANCE TO CHEMICAL ACTION

E-1 TEST SPECIMEN

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

E-2 PROCEDURE

For test in each solution as mentioned herein under below, three specimens each of length of 150 ± 3 mm and width of 50 ± 3 mm taken from three position of bag 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 Table1.

ANNEX 10
(*Item* 6.1)

a) Comments received from **Shri Ajay Pandit** on P draft of Grow bags.

Sl No.	Clause/ Subclause No.	Paragraph No./Figure No./Table No.	Comment
1	Clause 6	Table 1	1. Tolerance for various parameters shall be provided. 2. Colour fastness parameter may not be required as it is not to be used for apparel purpose. 3. The standard may also cover grow bags made out of jute also.

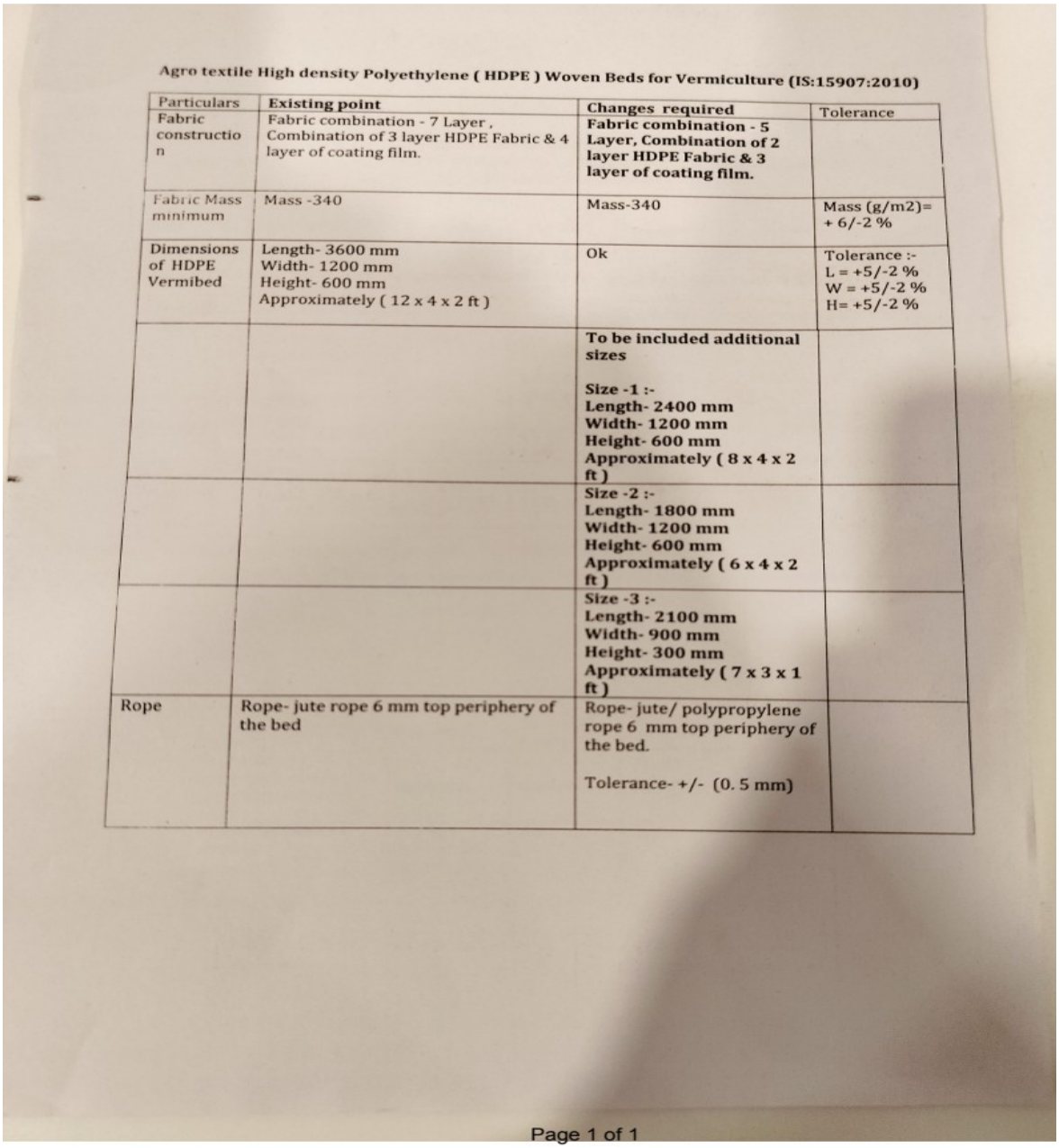
b) Comments received from **Shri Ajay Pandit** on P draft of Bhusa bags.

Sl No.	Clause/ Subclause No.	Paragraph No./Figure No./Table No.	Comment
1	Clause 6	table 1	1. Colour fastness parameter may not be of much relevance in my opinion. 2. All parameters in table 1 should have tolerance limits.

ANNEX 11

(*Item* 7.1)

Inputs/Comments from M/s Lamifabs & Papers on IS 15907:2010



Agro textile High density Polyethylene (HDPE) Woven Beds for Vermiculture (IS:15907:2010)

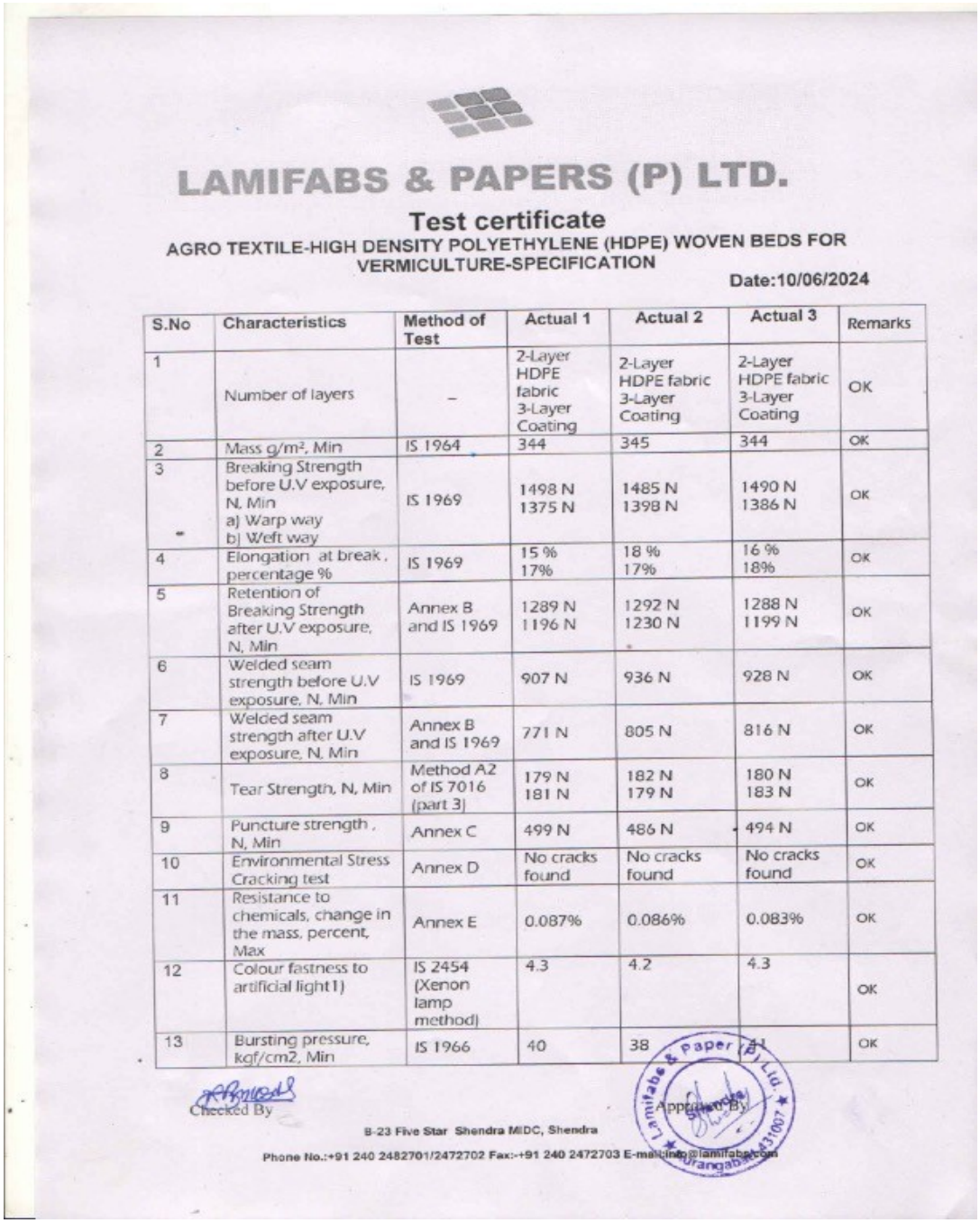
Particulars	Existing point	Changes required	Tolerance
Fabric constructio n	Fabric combination - 7 Layer , Combination of 3 layer HDPE Fabric & 4 layer of coating film.	**Fabric combination - 5 Layer, Combination of 2 layer HDPE Fabric & 3 layer of coating film.**	
Fabric Mass minimum	Mass -340	Mass-340	Mass (g/m2)= + 6/-2 %
Dimensions of HDPE Vermibed	Length- 3600 mm Width- 1200 mm Height- 600 mm Approximately (12 x 4 x 2 ft)	Ok	Tolerance :- L = +5/-2 % W = +5/-2 % H= +5/-2 %
		To be included additional sizes **Size -1 :-** **Length- 2400 mm** **Width- 1200 mm** **Height- 600 mm** **Approximately (8 x 4 x 2 ft)**	
		Size -2 :- **Length- 1800 mm** **Width- 1200 mm** **Height- 600 mm** **Approximately (6 x 4 x 2 ft)**	
		Size -3 :- **Length- 2100 mm** **Width- 900 mm** **Height- 300 mm** **Approximately (7 x 3 x 1 ft)**	
Rope	Rope- jute rope 6 mm top periphery of the bed	Rope- jute/ polypropylene rope 6 mm top periphery of the bed. Tolerance- +/- (0. 5 mm)	

Page 1 of 1

x

ANNEX 11

(*Item* 7.1)



LAMIFABS & PAPERS (P) LTD.

Test certificate

AGRO TEXTILE-HIGH DENSITY POLYETHYLENE (HDPE) WOVEN BEDS FOR VERMICULTURE-SPECIFICATION

Date:10/06/2024

S.No	Characteristics	Method of Test	Actual 1	Actual 2	Actual 3	Remarks
1	Number of layers	–	2-Layer HDPE fabric 3-Layer Coating	2-Layer HDPE fabric 3-Layer Coating	2-Layer HDPE fabric 3-Layer Coating	OK
2	Mass g/m², Min	IS 1964	344	345	344	OK
3	Breaking Strength before U.V exposure, N, Min a) Warp way b) Weft way	IS 1969	1498 N 1375 N	1485 N 1398 N	1490 N 1386 N	OK
4	Elongation at break, percentage %	IS 1969	15 % 17%	18 % 17%	16 % 18%	OK
5	Retention of Breaking Strength after U.V exposure, N, Min	Annex B and IS 1969	1289 N 1196 N	1292 N 1230 N	1288 N 1199 N	OK
6	Welded seam strength before U.V exposure, N, Min	IS 1969	907 N	936 N	928 N	OK
7	Welded seam strength after U.V exposure, N, Min	Annex B and IS 1969	771 N	805 N	816 N	OK
8	Tear Strength, N, Min	Method A2 of IS 7016 (part 3)	179 N 181 N	182 N 179 N	180 N 183 N	OK
9	Puncture strength, N, Min	Annex C	499 N	486 N	494 N	OK
10	Environmental Stress Cracking test	Annex D	No cracks found	No cracks found	No cracks found	OK
11	Resistance to chemicals, change in the mass, percent, Max	Annex E	0.087%	0.086%	0.083%	OK
12	Colour fastness to artificial light1)	IS 2454 (Xenon lamp method)	4.3	4.2	4.3	OK
13	Bursting pressure, kgf/cm2, Min	IS 1966	40	38	41	OK

Checked By

Approved By

Lamifabs & paper (P) Ltd. Aurangabad-431007

B-23 Five Star Shendra MIDC, Shendra

Phone No.:+91 240 2482701/2472702 Fax:-+91 240 2472703 E-mail:info@lamifabs.com

ANNEX 12
(*Item* 7.2)

REVIEW ANALYSIS OF INDIAN STANDARD
(To be submitted to the Sectional Committee)

1. **Sectional Committee No. &Title:** TXD 35, Technical Textile for Agrotech Applications

2. **IS No:** IS 17070 : 2019

3. **Title:** Jute Agrotextiles for Growth of Plants and Suppression of Weeds — Specification

4. **Date of review:** 23 August 2024

5. **Review Analysis**

   i) **Status of standard(s), if any from which assistance had been drawn in the formulation of this IS.**

Standard (No. & Title)	Whether the standard has since been revised	Major changes	Action proposed
NA	NA	NA	NA

   ii) **Status of standards referred in the IS**

Referred standards (No. & Title)	IS No. of these standards since revised	Changes that are of affecting the standard under review	Action proposed
IS 1954 : 1990 Determination of length and width of woven fabrics — Methods (second revision)	IS 1954 : 2024 ISO 22198 : 2006 Textiles — Fabrics — Determination of width and length (third revision)	This standard is superseded to IS 1954 : 2024	Latest version of the standard i.e. IS 1954 : 2024 shall be referred
IS 1966 (Part 1) : 2009 Textiles — Bursting properties of fabrics determination of bursting	IS 1966 (Part 1) : 2022 ISO 13938-1 : 2019 Textiles — Bursting properties of fabrics Part	This standard is superseded to IS 1966 (Part 1) : 2022	Latest version of the standard i.e. IS 1966 (Part 1) : 2022 shall be

strength and bursting distension: Part 1 Hydraulic method (second revision)	1: Hydraulic method for determination of bursting strength and bursting distension (third revision)		referred
IS 4744 : 1991 Textiles — Packaging of jute products in rolls — Specification (first revision)	Same Version	NA	NA
IS 11056 : 2013 Textiles — Determination of the permeability of fabrics to air (first revision)	Same Version	NA	NA
IS 14324 : 1995 Geotextiles — Methods of test for determination of water permeability-permittivity	Same Version	NA	NA
IS 14706 : 1999 Geotextiles — Sampling and preparation of test specimens	Same Version	NA	NA
IS 15891 (Part 1) : 2011 Textiles — Test methods for nonwovens Part 1 Determination of mass per unit area	Same Version	NA	NA
IS 15891 (Part 2) : 2011 Textiles — Test methods for nonwovens Part 2 Determination of thickness	Same Version	NA	NA
IS 15891 (Part 4) : 2011 Textiles — Test methods for nonwovens Part 4 Determination of tear resistance	Same Version	NA	NA
IS 15891 (Part 15) : 2011 Textiles — Test methods for nonwovens Part 15 Determination of air permeability	IS 15891 (Part 15) : 2017 ISO 9073-15 : 2007 Textiles — Test Methods for Nonwovens Part 15 Determination of Air Permeability	This standard is superseded to IS 15891 (Part 15) : 2017	Latest version of the standard i.e. IS 15891 (Part 15) : 2017 shall be referred

IS 16635 : 2017 Geosynthetics — Wide-width tensile test	Same Version	NA	NA

iii) Any other standards available related to the subject& scope of the standard being reviewed (International/regional/other national/association/consortia, etc or of new or revision of existing Indian Standard)

Standard (No. & Title)	**Provisions that could be relevant while reviewing the IS**	**Action proposed**
NA	NA	NA

iv) Technical comments on the standard received, if any

Source	**Clause of IS**	**Comment**	**Action proposed**
NA	NA	NA	NA

v) Information available on technical developments that have taken place (on product/processes/practices/use or application/testing/input materials, etc)

Source	**Development**	**Relevant clause of the IS under review that is likely to be impacted (Clause & IS No.)**	**Action proposed**
NA	NA	NA	NA

vi) Issues arising out of changes in any related IS or due to formulation of new Indian Standard

Related IS and its Title (revised or new)	**Provision in the IS under review that would be impacted & the clause no. or addition of new clause/provision**	**Changes that may be necessary in the Standards under review**	**Action proposed**

NA	NA	NA	NA

vii) Any consequential changes to be considered in other IS

Related IS to get impacted	Requirements to be impacted
NA	NA

Recommendations:

Based on the above observations, the standard may reaffirm for further period of 5 years, the committee shall decide.

ANNEX 13
(*Item* 8.1)

TERMS OF REFERENCE FOR THE R&D PROJECT

[Technical Textiles for Agrotech Applications Sectional Committee TXD 35 under Textiles Department of BIS]

1. Title of the project: — Study construction, performance and safety requirements of prevailing varieties of Woven Ground Covers for Horticulture Application.

2. Background:

2.1 The Woven Ground Covers made up of natural or synthetic materials are used to meet diverse needs of crops in the horticulture sector like suppression of weed growth around the plant, water conservation, soil temperature moderation, increase in yield etc, by blocking extreme climatic conditions of sunlight or cold.

2.2 Woven Ground Covers come in a variety of types, distinguished by their GSM and deniers and other parameters, given their growing demand and diverse applications, it becomes essential to revise the existing Indian standard IS 16202: 2014 *Agro Textiles — Woven Ground Covers for Horticulture Application — Specification* for inclusion of all the major varieties of woven ground covers prevailing in the current market scenario.

3. Objective: To collect the technical data and scientific evidence for constructional, performance and safety requirements of prevailing varieties of Woven Ground Covers from primary and secondary sources of information.

4. Scope:

a) Undertake study and analyze the existing literature which include but not restricted to the following :-

- International and Indian standards and regulation,
- Journals and research papers,
- Standard operating procedures (SOPs)/guidelines of Ministry/regulator/users,
- Studies/research conducted by any organization

- Any other relevant published information.

b) Collection of the database for manufacturers (small, medium and large-scale), testing infrastructure and users of woven ground covers in the country.
c) Collection of import and export data, type of standards and regulation being followed by domestic/foreign manufacturers, comparative analysis of these standards and regulation.
d) Undertake 2 visits to each of small, medium and large-scale manufacturer and collect the information on the following aspects :-

i) Types of raw material being used
ii) Manufacturing process
iii) Good manufacturing practice
iv) In-process controls being exercised during manufacturing
v) Varieties being manufactured
vi) Standards being followed
vii) Testing method being used
viii) Testing infrastructure available
ix) Post manufacturing quality/in-house data for safety, performance and constructional parameter for all the varieties being manufactured
x) Sampling plan being followed
xi) Marking and labelling of the product
xii) Packaging and storage conditions
xiii) Sustainability practices [sustainable raw material, energy efficient processes and methodologies, renewable energy sources, 3Rs (Reduce, Reuse and Recycle), waste management and disposal mechanisms]
xiv) Focused group discussions with teams involved in production, testing, and R&D to address quality issues, discuss challenges faced, and gather suggestions for improvement

The feedback from other manufacturers (where visit is not carried out) shall be collected by circulating suitable questionnaire covering above information through email or any other digital means.

e) Undertake 2 visits to users and 2 visits to testing labs (one govt and one private NABL accredited lab) to collect information including but not restricted to the following: -

User

i) Standards and regulations being followed
ii) Compliance verification mechanism being followed (test certificate from supplier, third party testing)
iii) Focused group discussion on quality issues, challenges being faced and suggestions if any.

Lab

i) Standards and regulation being followed
ii) Testing methods being followed
iii) Testing infrastructure

iv) Focused group discussion on testing related issues, challenges being faced and suggestion

The feedback from other users and labs (govt and private NABL accredited) where visit is not carried out shall be obtained through suitable questionnaire covering the above information.

f) Collection of 2 samples from each from large, medium and small-scale industries of each variety of woven ground covers and carry out testing from 2 NABL accredited labs (1 Govt Lab and 1 Pvt. Lab) for parameters like but not restricted to GSMs, raw materials (HDPE, PE, Nylon etc), deniers and EPcm and PPcm.

g) Preparation of a comprehensive project report covering all the above information.

5. Research Methodology:

i) Collect and analyze the data/information as specified in the scope [4 (a), (b) and (c)].
ii) Visit manufacturers, users and labs and collect data/information as specified in the scope [4 (d) and (e)].
iii) Collect and test the samples as specified in the scope 4 (f).
iv) Analyze the data/information and prepare a comprehensive project report.

6. Expected Deliverables:

a) Comprehensive report in soft/hard form of study covering all the aspects detailed in the scope of the R & D project.
b) Questionnaire feedback, testing report, focused group discussion report, other relevant documents and information shall be appended to the project report.

7. Requirement for the CVs:

Graduate in Textile Technology/Textile Engineering with minimum 5 years of working experience in testing or manufacturing of Agrotextiles.

8. Timeline and Method of Progress Review: The timeline for the completion of the project is 120 days from the date of award of project.

Timeline	Method of progress
0 to 30 days	Literature review, desktop study, collection of data and information Note – The sampling plan for visit and collection of samples shall be discussed and finalized with the nodal officer after literature survey and desktop research.

30 to 60 days	**MID-TERM REVIEW** Visit to manufacturer, user, testing lab and collection of samples
60 to 90 days	Testing of samples (except long duration test with testing time more than 30 days) preparation and submission of first draft report
90 to 120 days	Submission of the final project report.

9. Support BIS will Provide:

a) All the relevant Indian Standards/ISO Standards or any other standards required during the project will be provided by BIS.
b) Facilitate/introduction of the project leader/organization to relevant Industry and industry association, testing lab, institute, academia, user, regulator/ministries.

10. Nodal Point

In case of queries/clarification, nodal officer from BIS Shri Tanishq Awasthi, Scientist B and Member Secretary of TXD 35 may be contacted on txd@bis.gov.in, 011-23231282, 8840979754.

ANNEX 14
(*Item* 8.1)

PROJECT PROGRESS REPORT

Title	Study construction, performance and safety requirements of prevailing varieties of Woven Ground Covers for Horticulture Application
Sponsoring Agency	Bureau of Indian Standards
R& D Project Code	0169
Project work Order	SCMD/R&D projects dated 15.07.2024
Total Project cost (Rs.)	Rs. 9,69,600/-
Project Duration	5 months
Project start date	26th June 2024
Amount of 1st installation received (Rs)/date	Rs. 2,61,792/- 26th June 2024
Project Team	**PI of the Project:** Mrs. Ashwini Sudam, Quality Manager **Co-PI of the Project** Dr. Manisha Mathur, Joint Director **Team member** Ms. Leena Mhatre, Technical Manager
Organisation	The Synthetic and Art Silk Mills' Research Association (SASMIRA)
Address	SASMIRA Marg Worli, Mumbai-400030 Maharashtra

Literature survey

Groundcovers

Mulch mats also known as Ground Cover is a porous material woven from long-lasting polypropylene tapes suitable for using in green houses, open air for big producers as well as for small gardeners Water and air permeable fabrics with UV stabilization for covering ground of greenhouses, gardens, nurseries and landscaped areas with proven effectiveness on weed control, soil climating and even light conditioning**.** It is available in various colors, unit weights and widths and patterns. (**Reference**: Teksenteks Tekstil San.Ve Tic. A.Ş.Turkey)

Uses of Ground covers

Ground cover absorbs sunlight therefore reduces photosynthesis and prevents weed growth. Ground cover is an extremely versatile landscaping and horticultural fabric for long□term weed control, moisture conservation and separation. It effectively suppresses competitive weed growth, conserves ground moisture, maintains a clean surface, protects

from UV rays and creates a favorable environment for healthy plant growth. Ground covers can reduce the costs and minimizes undesirable herbicide use. It is mainly used in mulching.

(Reference: Textile Learner, Agro Textiles: Properties, Manufacturing and Applications April 25, 2014)

Advantages of using Groundcovers

- Absorbs sunlight, reducing photosynthesis and growth of weeds.
- Reduce significantly the evaporation (reducing water consumption).
- Allow the passage of air and water, improving soil conditions.
- Considerable labour saving by avoiding weeding.
- Prevent waterlogging and root putrefaction and fungus growth.
- Eliminates the need of herbicides.
- Gridlines improve the presentation and precise positioning of pots and plants.

(**Reference**: Cotexa)

Functions and characteristics:

- Environmental friendly reduces the need for herbicides and other weed controls.
- Construction allows water to penetrate into soil and maintains soil humidity during dry periods by reducing evaporation.
- Notably reduces time necessary to maintenance flower-beds.
- Is resistant to attack by mildew and bacteria.

- Is resistant to UV-radiation
- In woven coloured tapes in warp and weft direction could be positioned in accordance customer requirements. They allow easy and regular planting of herbs or laying flower-pots

Types of Groundcover

- The groundcovers are produced in many varieties including 90 g/m2, 100 g/m2, and 130 g/m2.
- Basic colour is black. Others are prospectively black-green, brown, reflective white, etc.
- As per customer requirement, marking green tapes or squares are in-weaved per 15 cm.
- Standard widths are 105, 210, 330, 420 and 525 cm. Other widths in accordance with customer requirements and production are possible.

Specifications of Ground Covers:

Internationally there are no known Standard specifications for the testing or technical evaluation of ground cover samples.

However Nationally BIS has published the specification IS 16202:2014 for woven ground covers. Currently there is only one variety of woven ground cover in this BIS Specification viz., 100 gsm. However, the manufacturers are making different varieties depending on usage and consumer requirement.

Hence the present R and D project under the aegis of BIS envisages revision of existing BIS Specification viz., IS 16202: 2014 to include all major varieties of woven ground covers prevailing in the current market scenario.

Objectives of the Project

i. To collect the technical data and scientific evidence for constructional, performance and safety requirements of prevailing varieties of Woven Ground Covers from primary and secondary sources of information
ii. To collect and procure the groundcover samples of different GSM available with the Industry/ manufacturers
iii. Testing and Evaluation of the collected samples for the required test parameters in the specification
iv. Analyze the tested data/information and prepare a comprehensive project report.

Methodology

- Collect and analyse the data/information on woven ground covers from different sources.
- Collection of import and exports data, type of standards and regulation being followed by domestic/foreign manufacturers, comparative analysis of these standards and regulation.
- Collection of the database for manufacturers (small, medium and large-scale), testing infrastructure and users in the country.
- Visit manufacturers, users and labs and collect data/information on test parameters for mechanical and chemical properties of woven ground cover as per IS 16202.
- Analyze the data/information and prepare a comprehensive project report.

Work Done During the period (June 2024 to August 2024)

- A comprehensive literature review was done to collect the information on different type of GSM varieties of ground cover samples available in the market.
- Plan for collection of samples and subsequent visit to the Industries /manufactures of ground cover samples.
- An appropriate questionnaire was prepared and circulated to the manufacturers.
- Procurement and collection of samples was done for the testing purpose.

Industries Visited for Groundcover samples

Sr. No	Name of the Industry Visited	Product manufacturing	Month of Visit	No. of Samples collected	GSM variety
1	M/s. Centenary Geotex Pvt. Ltd., Kheda, Gujarat	Open width woven product	June 2024	6	90 GSM Black 100 GSM Black and white 108 GSM Black 130 GSM Black and white
2	M/s. Macfil Global, Chharodi, Gujarat	Open width woven product	June 2024	4	85 gsm Black 90 gsm Black 100 gsm Black 130 m Black
3	M/s. GES Polymers, Satara Dist. Wai	Circular woven product	August 2024	5	90 GSM Black 100 GSM Black and white 110 GSM Black 140 GSM Black 170 GSM Black
4	M/s Shri Ambica Polymer, Ahmedabad		Planned in September		
5	M/s Shakti Polyweave, Ahmedabad		Planned in September		
6	M/s. Shankar Packagings, Baroda		Planned in September		

The Questionnaire will be sent to other manufacturers as well.

Testing Parameters: The samples collected are being tested at two laboratories for the following parameters

1. Raw material (yarn identification),
2. Heat shrinkage of yarn,
3. Length,
4. Width,
5. Ends/picks,
6. Mass,
7. Tensile strength;
8. Tear strength,
9. UV retention,
10. Air permeability,
11. Index puncture,
12. Water permeability,
13. Water vapour permeability

Points for discussion during the Mid-term review:

It has been understood from the literature survey and visits to the industry that there are presently two types of woven ground covers which are being supplied in the market. These are the open width woven ground covers and the circular woven ground covers which are appropriately slit in required widths. The parameters as laid down in IS 16202 are being met by the circular woven grounds covers except for the ends and picks per inch. There are few such producers and the samples are being sold in the market as woven ground covers.

Should the Revised Standard Specification for the ground covers include these product variety as well with their minimum specification?

Statement of expenditure of fund received from BIS under 1st installment

Sr. No	Amount in Rs. (1st Installment)	Heads for expenditure	Expenses done till 24th August 2024 (Rs.)
1	2,61,792	Manpower	1,63,200
2		Equipment	NA
3		Travelling	27,561
4		Consumables	50,000
5		Overheads @ 20 %	52,358
		TOTAL	2,93,119