

AgroTech Application

AGROTECH SECTOR AT A GLANCE

- Agrotexiles is application of textile materials in the agriculture field, today, agriculture and horticulture has realized the need of tomorrow opting for various technologies to get higher overall yield and quality.
- With the continuous increase in population worldwide, stress on agricultural crops has increased. So it is necessary to increase the yield and quality of agrotech products.
- The multiple uses of agro textiles to boost germination in nurseries, protection of soil from moisture evaporation & erosion, and safety from environmental & climatic factors, such as hail, rain, and sunlight, support the industry growth. Protection from birds, insects, fungus, and other pests has helped increase product adoption in the country.
- The global agro textile market size was estimated at USD 4.62 billion in 2021 and is expected to grow at a compound annual growth rate (CAGR) of 4.7% during the forecast period.

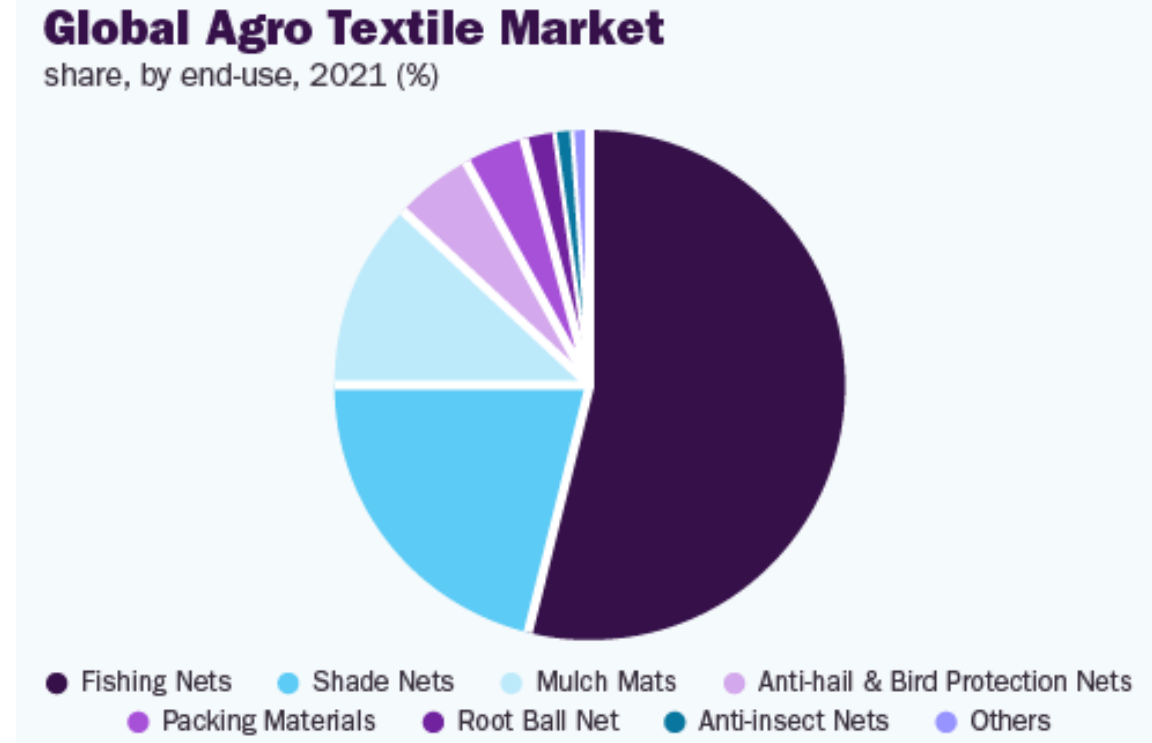
Agro Textile Market Report

Characteristics	Figures
Market size value in 2022	USD 4.82 billion
Revenue forecast in 2030	USD 6.98 billion
Growth rate	CAGR of 4.7% from 2022 to 2030
Largest Growing Markets	Asia Pacific (India, China, Indonesia etc)

(Source: www.grandviewresearch.com)

MARKET SHARE OF AGRO TEXTILE PRODUCTS

- Market share of products used in agriculture and pisciculture activities:
 - Fishing Nets : More than 50%
 - Shade Nets : 22% - 25%
 - Mulch Mats : 12% - 15%
 - Anti Hail & Bird Protection Nets: 3% -5%
 - Other Products : Less that 5%



Important published standards on Agrotech

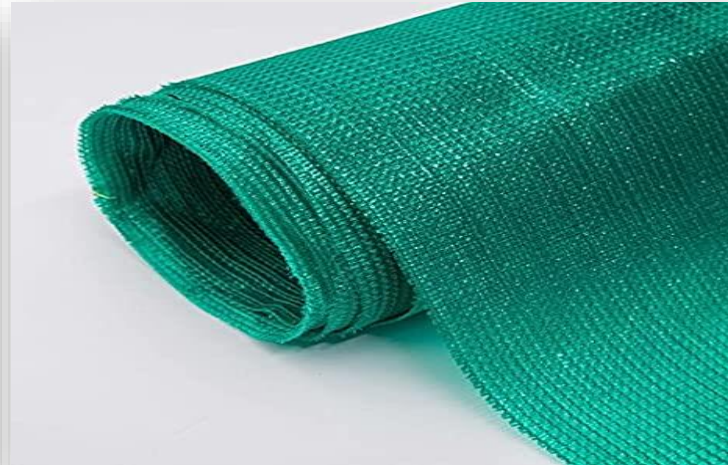
The important standards in TXD 35 are published on following products:

- Shade Nets
 - Fencing Nets
 - Insect Nets
 - Hail Protection Nets
 - Nylon knitted seamless gloves
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- Laminated HDPE Woven Geomembrane for waterproof lining
 - Spun bonded Non woven crop Covers and Fruit Skirting bags
 - Jute Agrotexiles for Growth of plants and suppression of weeds
 - HDPE Laminated Woven Lay Flat Tube

IS 16008 (Part 1 & Part 2) : 2016

IS 16008 : 2016 (Part 1 & Part 2) Shade Nets for Agriculture and Horticulture Purposes - Specification

- This standard prescribes constructional and other performance requirements for synthetic agro shade nets manufactured from tape yarns as well as monofilament yarns for agriculture and horticulture purposes in protecting/increasing crop yield by providing partially controlled climatic conditions for the intended crops.
 - **Part 1 Shade Nets Made from Tape Yarns**
 - **Part 2 Shade Nets Made from Mono Filament Yarns**
- Includes four type of shade nets based on the shading factor of 35, 50, 75 and 90%.



- The standard specifies the basic performance requirements like GSM , Average breaking strength , Retention of breaking strength after UV exposure, Colour fastness to artificial light, Shading percentage etc.

Requirements of Shade Nets Made From Tape Yarns

Sl No.	Characteristic	Requirement(s)			Method of Test, Ref to
		Type I	Type II	Type III	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Mass, g/m ² , Min	100	120	140	IS 1964
ii)	Average breaking strength of shade nets fabric (Strip method, 325 mm × 50 mm test piece with gauge length of 200 mm). N, Min;				IS 1969 (Part 1)
	a) Warpway	200	250	290	
	b) Weftway	200	250	290	
iii)	Retention of breaking strength after UV exposure, N, Min	85 percent of original value (fabric)			Annex B and IS 1969 (part 1)
iv)	Colour fastness to artificial light ¹⁾	4 or better	4 or better	4 or better	IS 2454
v)	Bursting Pressure, Kg/cm ² , Min	5	6	9	IS 1966 (part 1) or IS 1966 (Part 2)
vi)	Shading percentage	45 to 55	70 to 80	85 to 95	Annex C
¹⁾ Applicable for coloured shade nets only					

Requirements of Shade Nets Made From Monofilament Yarns

SI No.	Characteristic	Requirement(s)				Method of Test, Ref to
		Type I	Type II	Type III	Type IV	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Mass, g/m ² , Min	95	125	310	460	IS 1964
ii)	Average breaking strength of shade nets fabric (Strip method,325 mm × 50 mm test piece with gauge length of 200 mm).N, Min; a)Warpway b)Weftway					IS 1969 (Part 1)
		300	300	450	650	
		350	620	1700	4300	
iii)	Retention of breaking strength after UV exposure, N, Min	85 percent of original actual value (fabric)				Annex B and IS 1969 (part 1)
iv)	Colour fastness to artificial light ¹⁾	4 or better	4 or better	4 or better	4 or better	IS 2454
v)	Bursting Pressure, Kg/cm ² ,Min	11	13	30	40	IS 1966 (part 1) or IS 1966 (Part 2)
vi)	Shading percentage	30 to 40	45 to 55	70 to 80	85 to 95	Annex C

¹⁾ Applicable for coloured shade nets only

IS 15351 : 2015

AGRO TEXTILES — LAMINATED HIGH DENSITY POLYETHYLENE (HDPE) WOVEN GEOMEMBRANE FOR WATER PROOF LINING — SPECIFICATION (SECOND REVISION)

- A pond liner is an impermeable geomembrane used for retention of liquids, including the lining of reservoirs, retention basins, hazardous and non-hazardous surface impoundments, garden ponds and artificial streams in parks and gardens.
 - This standard prescribes requirements for (HDPE) woven geomembrane laminated with (LDPE) or suitable combination of LDPE and LLDPE for use as lining for canal, pond and reservoir to control seepage. **However, the material is not suitable for lining of roof/terrace and for proper disposal of industrial effluents, etc.**
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- Type I — having thickness of **0.25 mm** and mass of **250 g/m²**, min
 - Type II — having thickness of **0.50 mm** and mass of **420 g/m²**, min;
 - Type III — having thickness of **0.75 mm** and mass of **650 g/m²**, min;
 - Type IV — having thickness of **1.00 mm** and mass of **950 g/m²**, min.



SI No.	Characteristic(s)	Requirement(s)				Method of Test, Ref to
		Type I	Type II	Type III	Type IV	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Thickness (mm), Min	0.25	0.50	0.75	1.00	IS 7016 (Part 1)
ii)	Mass (g/m2), Min	250	420	650	950	IS 7016 (Part 1)
iii)	Dimensions (length and width)	As declared + 1 percent with no negative tolerance				Annex A of
						IS 11652
iv)	Carbon black content, percent	2.5 ± 0.5				IS 2530
v)	Breaking load on 20 × 10 cm strip,					IS 13162 (Part 5)
	N, Min before U.V exposure:					
	a)Warpway	3 300	6 600	8 200	10 700	
	b)Weftway	3 000	6 000	7 400	9 700	
vi)	Strain at maximum load, percent	20 ± 5	20 ± 5	20 ± 5	20 ± 5	IS 13162 (Part 5)
vii)	Breaking load on 20 × 10 cm strip, N, Min after U.V exposure of 1000 h for warp and weft	80 percent of the actual original value				Annex B and
						IS 13162 (Part 5)
viii)	Impact failure load, at 1524 mm	1 150	1 840	2 875	4 025	Annex C
	drop, Min, gram force at 50					
	percent failure					
ix)	Tear resistance, N, Min	100	250	300	350	Method A1 of
						IS 7016 (Part 3)
x)	Puncture resistance, N, Min	300	500	725	900	Annex D
xi)	Bursting strength (Ball burst),	60	110	135	200	IS 7016 (Part 6)
	N/cm², Min					
xii)	Seam strength before UV exposure (N/mm), Min	15	30	40	42	IS 15060
xiii)	Seam strength after UV exposure	80 percent of the actual original value				Annex B and
	N/mm, Min					IS 15060
xiv)	Hydrostatic resistance	No leakage	No leakage a 15	No leakage at 20	No leakage at 25	Annex E
		at10 Kg/cm²	kg/cm²	kg/cm²	kg/cm²	
xv)	Hydrostatic resistance after UV	80 percent of the actual original value				Annex B and
	exposure of 1000 h					Annex E
xvi)	Ash content, percent, Max	1	1	1	1	Annex F

NOTE — For hydrostatic resistance test, the test specimen shall be selected such that at least one joint is covered, if provided.

IS 17358 (Part 1 & 2) :2020

IS 17358 (Part 1 & 2) Agro textiles – **Fencing nets** for agriculture and horticulture purposes –Specification

- This standard prescribes constructional and other performance requirements for fencing nets manufactured from extruded polymer mesh, mono filament yarns and combination of tape and mono filament yarns for agriculture, horticulture, forestry, animal husbandry (poultry), purposes in protecting from stray animals, for restricted entry.
- This standard is published in two parts:
 - **Part 1 Fencing nets made from extruded polymer mesh**
 - **Part 2 Fencing nets made from mono filament yarns and combination of tape and mono filament yarns**



Requirements of Fencing Nets Made from Monofilament Yarns

Sl No.		Characteristic	Requirement(s)		Method of Test, Ref to
			Type 1, Mono × Mono construction	Type 2, Tape × Mono construction	
(1)		(2)	(3)	(4)	(5)
i)		Mass g/m2, Min	110	100	IS 1964
ii)		Average breaking strength of fencing net fabric (Strip method, 325×50 mm test piece with gauge length of 200 mm), N, Min:			IS 1969 (Part 1)
		a) Warpway	350	350	
		b) Weftway	400	350	
iii)		Retention of breaking strength after UV exposure of 144 h, percent, Min	85 percent of original actual value (fabric)		Annex B and IS 1969 (Part 1)
iv)		Colour fastness to artificial light ¹⁾	4 or better		IS 105-B02
v)		Bursting pressure, kgf/cm2, Min	12	12	IS 1966 (Part 1) or IS 1966 (Part 2)

¹⁾ Applicable for coloured fencing nets only.

IS 16513 : 2016

IS 16513 : 2016 Agrotextiles – **Insect Nets** for Agriculture and Horticulture Purposes – Specification

- This standard prescribes constructional and other requirements for insect nets for agriculture and horticulture purposes in protecting crop from insects such as aphids, white fly, carrot fly, cabbage root fly and caterpillar etc.
- Specifies three types of insect nets based on their mesh size (**30, 40 and 50 mesh size**)
- The standard specifies the basic performance requirements such as Cover factor, Percentage change in Breaking strength after UV exposure, Bursting Strength, Air permeability etc.
- As per the information, in India, the present production figures are about 2000 MT per annum and About 1200 MT insect nets are being imported mainly from Israel, China etc.



Requirements of Insects Nets

SI No.	Characteristic(s)	Requirements			Tolerance	Method of Test, Ref to
		Type I 30 Mesh	Type II 40 Mesh	Type III 50 Mesh		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Mass, g/m ²	90	105	125	± 5 percent	IS 1964
ii)	a) Ends per inch	30	40	50	± 2	IS 1963
	b) Picks per inch	24	24	24	± 2	
iii)	Covers factor, percent, Min	30	40	50	—	Annex B
iv)	Breaking strength of insects nets fabric before UV exposure (ravelled strip method 325 mm × 70 mm) ¹⁾ , kg, Min				—	IS 1969 (Part 1)
	a) Wrapway	80	120	140		
	b) Weftway	50	65	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	20	—	IS1966 (Part 1) or IS 1966 (Part 2)
vii)	Air permeability in mm/s at 50 pascal water head pressure, Min	6 500	5 000	3 000	—	IS 11056

¹⁾ Width after raveling = 50 mm, Gauge length = 200 mm.

IS 16718:2021

IS 16718:2021 Textiles - Polypropylene Spun Bonded Non-Woven Crop Covers and Fruit Skirting Bags for Agricultural and Horticultural Applications - Specification first revision

- This standard prescribes the specification and performance requirements for polypropylene spun bonded non-woven fabric used for crop cover and fruit skirting bags for agricultural and horticultural applications.
- Crop covers are generally placed over plants and seedlings to create a micro-climate which encourages growth and development of crop with improvement in quality and yield, also used to protect plants from cold and frost.
- The standard specifies the basic performance requirements like **thickness, Fabric GSM elongation at break, Trapezoid tear strength, Ash content percentage, Index puncture resistance, Water absorption capacity** etc.



IS 17730 (Part 1 &2) : 2021

IS 17730:2021 (Part 1 &2) Agro-Textiles **Hail Protection Nets** for Agriculture and Horticulture Purposes

- This standard prescribes constructional and other performance requirements for knitted and woven hail protection nets manufactured from mono filament yarns for agriculture and horticulture purposes to avoid fruit or flower drop/damage
- This standard is published in two parts:
 - **Part 1 Warp Knitted Hail Protection Nets**
 - **Part 2 Woven hail protection nets**
- Two varieties of hail protection nets are covered in this standard, one having GSM of **60 g/m²** and other having GSM of **70 g/m²**.
- This standard also specifies important performance requirements for agro textile hail protection nets such as breaking strength, Retention of breaking strength after UV exposure, color fastness to artificial light, bursting pressure, Shading percentage, Cold cracking resistance test etc.



IS 16089 : 2013

IS 16089 : 2013 Jute Agro-textile — Sapling Bags for Growth of Seedling/Sapling — Specification

- This standard specifies requirements of jute sapling bag made from hessian cloth to use for growth of sapling in nursery
- **JAT(Jute AgroTextile)** is a natural fabric, made of jute fibre, that helps retain soil humidity at a conducive level, arrest desiccation of soil and attenuates extremes of temperature due to the intrinsic characteristics of jute and capacity to absorb water/moisture up to about 5 times of its dry weight.
- The basic performance requirements specified in the standard includes GSM, **Open area %**, Tensile Strength in warp and weft way etc.



Requirements for Woven Jute Agro-Textile for Sapling Bag

Sl No.	Characteristic(s)	Requirement(s)	Tolerance	Method of Test, Ref to	
				IS No.	Annex
(1)	(2)	(3)	(4)	(5)	(6)
i)	Mass, g/m ² , Min	272	± 10 percent	IS 2387	—
ii)	Thickness, mm	1.2	± 10 percent	IS 7702	—
iii)	Open area, percent	20	± 10 percent	—	B
iv)	Threads/dm:				
	a) Warp	47	+4 percent -2 percent		
	b) Weft	47	+4 percent -2 percent		
v)	Width of Hessian fabric, cm	101	± 10 percent	IS 1954	—
vi)	Length and width of sapling bags, cm, Min	As agreed		IS 9113	—
vii)	Water holding capacity, percent	400	± 10 percent	—	C
Viii)	Tensile strength, kN/m:			IS 1969 (Part 1)	
	a) Warp				
	b) Weft	11	± 10 percent		
		12	± 10 percent		

IS 16390:2015

IS 16390:2015 Agrotextiles-Nylon knitted seamless gloves for tobacco harvesters

- This standard prescribes the constructional details and performance requirements of knitted seamless gloves, white, made from nylon yarn
- Use of these knitted seamless nylon gloves by the workers, while cultivating and harvesting the tobacco plants, can significantly reduce the **Green tobacco sickness**.
- Specifies five sizes of gloves from **Size 0 to Size 4**.
- The standard specifies the basic performance requirements like tenacity, elongation at break, crimp rigidity, boiling water shrinkage percentage etc.



IS 15907:2010

IS 15907:2010 Agro textiles — High density polyethylene HDPE woven beds for vermiculture Specification

- This standard prescribes constructional and other requirements for high density polyethylene (HDPE) woven beds for vermiculture used in producing compost for agricultural purposes.
- Vermiculture beds helps in producing organic compost, **These synthetic beds enjoy greater advantages over the traditional cemented ones in terms of space, durability, ease of handling, yield of compost, cost.**
- Can produce about 800 to 1000 kgs of vermicompost in one cycle of about 45 to 60 days.
- The standard specifies the basic performance requirements like **Breaking strength, Welded seam strength, Tear strength, Puncture strength and environmental stress cracking test.**
- Vermiwash is a Coelomic fluid always secreted from the body of earthworms, and this fluid is composed of different micro-nutrients, vitamins and digestive elements, Vermiwash can be used as growth promoter.
- A specially designed outlet is provided at the bottom of the bed to collect vermiwash



Requirements of Beds Made from HDPE Woven Fabrics

Sl No.	Characteristic	Requirements	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Mass, g/m ² , Min	340 (see 6.1)	IS 1964
ii)	Breaking strength before UV exposure, N, Min	1 900 (Warp) 1 300 (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)	Welded seam strength before UV exposure, N, Min	65 percent of original actual value (fabric)	IS 1969
vi)	Welded seam strength after UV exposure, N, Min	85 percent of original actual value	Annex B and IS 1969
vii)	Tear strength, N, Min	100 (Warp) 100 (Weft)	Method A2 of IS 7016 (Part 3)
viii)	Puncture strength, N, Min	325	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 ¹⁾	4 or better	IS 2454 (Xenon lamp method)
xii)	Bursting pressure, kgf/cm ² , Min	35	S 1966

¹⁾ **Applicable for coloured beds only.**

IS 17070 : 2019

IS 17070 : 2019 JUTE AGROTEXTILES FOR GROWTH OF PLANTS AND SUPPRESSION OF WEEDS — SPECIFICATION

- This standard provides requirements of nonwoven jute agrotexiles (JAT) for growth of plants and suppression of weeds.

TYPES

- Type 1 — Having mass of 500 g/m², Min;
- Type 2 — Having mass of 800 g/m², Min;
- Type 3 — Having mass of 1000 g/m², Min
- The standard specifies the basic performance requirements like Thickness in mm, **Tear strength, Bursting strength, Index puncture resistance, Air permeability, Water permittivity** etc.



Requirements for Nonwoven Jute Agrotextiles

Sl. No.	Characteristics	Requirement			Method of Test, Ref to
		Type 1	Type 2	Type 3	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Mass at 20 percent moisture regain, g/m ² , Min	500	800	1000	IS 15891 (Part 1)
ii)	Thickness, mm, Min	3.5	6	7	IS 15891 (Part 2)
iii)	Width, cm	150 ± 5 percent	150 ± 5 percent	150 ± 5 percent	IS 1954
iv)	Wide width tensile strength, kN/m, [MD × CD], Min	1.75 × 1.5	2 × 1.5	4.5 × 2	IS 16635
v)	Tear strength, N, [MD × CD], Min	65 × 35	65 × 40	65 × 45	IS 15891 (Part 4)
vi)	Bursting strength, kPa, Min	1100	1400	1600	IS 1966 (Part 1)
vii)	Index puncture resistance, N, Min	175	200	300	Annex B
viii)	Air permeability (at 10 mm WG) cubic foot/square foot/s, Min	2.5	1.25	1.25	IS 11056 or IS 15891(Part 15)
ix)	Water permittivity, s-1, Min	3.0	1.25	1.25	IS 14324

IS 16202 : 2014

IS 16202 : 2014 Woven ground covers for horticulture application

- This standard prescribes constructional and other requirements for **100 gsm woven ground covers** made from **UV stabilised polypropylene tape** yarns for applications in horticulture.
- 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.
- The standard specifies the basic performance requirements like Tensile Strength in war and weft way, **Tear strength, Index puncture resistance, Air permeability, Water permeability** etc.



IS 16190:2014

IS 16190:2014 High Density Polyethylene (HDPE) Laminated Woven Lay Flat Tube For Irrigation Purpose — Specification

- Transportation of the water from ponds, canal or borewell to the various part of the field for agriculture is of paramount importance.
- HDPE lay flat tube can easily transport water in the agriculture field and have an advantage of lighter in weight and do not require fixed installation and can transport water at the place of choice easily.
- Covers HDPE laminated woven lay flat tube of **internal diameter 50, 63, 75, 90, 110, 125, 150, 175 and 200 mm for irrigation purpose.**
- Manufactured from 260 GSM, HDPE **5 layer laminated fabric and can sustain bursting pressure of 2.6 Kg/cm².**



Requirements of HDPE Woven Laminated Fabric for Woven Lay Flat Tube

Sl. No.	Characteristics		Requirement(s)	Method of Test, Ref to	
				Annex	IS No.
(1)	(2)		(3)	(4)	(5)
i)	Mass, g/m², Min	260		—	IS 1964
ii)	Breaking strength before UV exposure, N, Min	1 200 (Warp) 900 (Weft)		—	IS 1969 (Part 1)
iii)	Elongation at break, percent	20 ± 5		—	IS 1969 (Part 1)
iv)	Retention of breaking strength after UV exposure of 500 h, N, Min	85 percent of original actual value (fabric)		B	—
v)	Abrasion resistance	Loss in breaking strength shall not be more than 15 percent		—	IS 14714
vi)	Trapezoid tear strength, N, Min	100 (Warp) 100 (Weft)		—	IS 14293
vii)	Puncture strength, N, Min	300		C	—
viii)	Environmental stress cracking test	There shall be no evidence of stress cracking		D	—
ix)	Accelerated ageing test for 72 h at 70 ± 1°C	Loss in breaking strength shall not be more than 1 percent		—	IS 7016 (Part 8) (Oven method)
x)	Cold cracking resistance test at –5°C	No specimen shall damage or broken		E	—

IS 17357:2020

IS 17357:2020 — Harvest Nets For Agriculture And Horticulture Purposes — Specification

- Harvest nets are widely used in modern farming in order to protect the fruits from damage caused during falling from a tree to the ground surface or soil. Harvest nets are spread horizontally from some distance above the ground to catch the ripened fruits like olives, walnuts etc. so that they don't fall on the ground directly.
- In India harvest nets are widely used for olive harvesting in Rajasthan, Jammu and Kashmir, Himachal Pradesh and some regions in Uttar Pradesh
- This standard prescribes constructional requirements for harvest nets manufactured from mono filament yarns for agriculture and horticulture purposes for damage protection of fruits by avoiding their contact with soil/ground.
- This standard is not suitable for fruits with soft peel like mango, guava, plum etc.



IS 17513:2020

IS 17513:2020 PLANT SUPPORT NETS FOR AGRICULTURE AND HORTICULTURE PURPOSES — SPECIFICATION

- Plants with weak stem that need support are called climbers.

Example: Grapevine, money-plant, bean, etc.

- This standard prescribes constructional requirements for plant support nets for agriculture and horticulture purposes to provide support to flora and vegetation.

TYPES

- Type 1 — Twine type 560 D/3 ply and nominal twine diameter of 0.50 mm;
- Type 2 — Twine type 840 D/6 ply and nominal twine diameter of 1.25 mm;
- Type 3 — Twine Type 1120 D/6 ply and nominal twine diameter of 1.50 mm.



IS 17729:2021

IS 17729:2021 FLEXIBLE WATER STORAGE TANK FOR AGRICULTURE AND HORTICULTURE PURPOSES — SPECIFICATION

- The flexible water storage tank is used to store water in remote areas where the land is undulated and usage of rigid tanks or concrete tanks is not feasible.
- These tanks can be easily transportable from one place to another after the water being used at one place. The flexible water storage tanks are generally used for storage of rain water.

TYPES

- Type 1 — Having minimum capacity of 2 kL;
- Type 2 — Having minimum capacity of 6 kL;
- Type 3 — Having minimum capacity of 12 kL;
- Type 4 — Having minimum capacity of 25 kL;
- Type 5 — Having minimum capacity of 50 kL;
- Type 6 — Having minimum capacity of 100 kL

The Flexible storage tank is made with a combination of an outer layer woven from HDPE tapes and an inner layer made up of 3 film layer of which each film is a further combination of seven sub layers made up of (PE/Tie/Nylon/Tie/EVOH/Tie/PE) being extruded simultaneously as one film.



Requirements for Flexible Water Storage Tanks

Sl No.	Characteristics	Requirements	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Tensile strength at break, kg/cm ² , Min		IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 3)
	a) Machine direction	350	
	b) Transverse direction	350	
ii)	Elongation at break, percent, Min		IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 3)
	a) Machine direction	650	
	b) Transverse direction	650	
iii)	Ageing test at (70 ± 1) °C for 7 days	Maximum 30 percent reduction of original values of tensile strength	4 of IS 7016 (Part 8)
iv)	Dart impact strength, g, Min	Shall not fail at 1650 g	Method B of IS 13360 (Part 5/Sec 6)
v)	Moisture vapour transmission rate for single inner layer, g/m ² /day, Max	2	Annex C
vi)	Oxygen transmission rate, cc/m ² /day, Max	1	ISO 15105-2