

ANNEXURE - I

**MINIMUM TECHNICAL SPECIFICATIONS OF POLYHOUSE/ NET
HOUSE AND WALK-IN TUNNEL.**

1. NATURALLY VENTILATED GREENHOUSE (TYPE-I)

Sr No.	Items	Description/Specifications
1	Product	Naturally Ventilated Greenhouse
2	Size	500 m ² /1000 m ² /2000 m ² /4000 m ²
3	Bay size	8m x 4m, width of greenhouse should be at least 35 % of the desired length.
4	Ridge height	6.5m to 7m depending upon the climatic conditions and wind
5	Ridge Vent	1m - 1.2m opening fixed with 40 mesh insect Net. Provision should be kept to close the vent with plastic film with manual mechanism for opening & closing the vent. However, if the farmer wants the motorized operation of the same, the agency should implement the same on charging additional cost.
6	Gutter height	4m - 4.5m from floor area
7	Gutter slope	2% slope need be provided in civil foundation work/ structure
8	Gutter frame	20 gauge or 2mm thick GI sheet with perimeter of 0.5 m or more preferably of single length without joint having provision of rain water harvesting system.
9	Structural design	The structural design need to be sound enough to withstand wind speed minimum 140km/hr and having trellis mechanism to withstand minimum crop load of 25kg/m ² . There should be provision for opening one portion at either side for entry of small tractor/power tiller for intercultural practices.

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10	Structure	Complete structure made of galvanized steel tubular pipes /C-channel of light class or equivalent section conforming to Indian Standards IS 1161: 1998 and the structural member should be joined with fasteners properly. Welding of structure is not recommended.
	Columns	76 mm OD, 3.2 mm thick
	Trusses/Corridor	Bottom chord 60 mm OD, 2.9 mm thick
	Trusses member/Top arches	48 mm OD, 2.9 mm thick
	Purlins	Top purlins 48/42 mm OD, 2.6 mm thick
	Purlins member & others	33/25 mm, 2.3 mm thick
	Foundations	Insert GI pipes of minimum 60 mm with 2.9 mm thick to have foundation depth of 75 mm with 3.2mm thick depending upon soil type and prevailing wind velocity, grouting of foundation column with cement concrete mixture of 1:2:4 using telescopic insertion of column is recommended.
	Fasteners	All nuts & bolts must be of high tensile strength and galvanized (120 GSM).
1 1	Entrance room & Door	One entrance room of size 3 m x 3 m x 3 m (L x W x H) need be provided, covered with 200 micron UV stabilized transparent plastic film conforming Indian Standards (IS 15827: 2009). Two hinge doors of size 2m width & 2.5 m height double leaf made in plastic/FRP (fibre reinforced plastic) sheets mounted in suitable frame.
1 2	Cladding material	UV stabilized 200 micron PE film conforming to Indian standards (IS 15827:2009) having properties like Anti dust, Anti-drip, Anti-fog, IR thermic, light diffusion and optional properties like Anti-sulphur, anti-virus, UV blocking and also having minimum 80% level of light transmittance.

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1 3	Fixing of cladding materials	All ends/joints of plastic film need to be fixed with two way aluminum profiles with suitable locking arrangement along with curtain top. Wooden batons or PVC grippers need not be used for fixing the cladding materials.
1 4	Spring Insert	Zigzag high carbon steel spring action wire of 2-3 mm diameter must be inserted for fixing shade net into Aluminum Profile.
1 5	Curtains and insect screen	Roll up UV stabilized 200 micron transparent plastic film as curtains need be provided up to 3.5 m height on all sides having Manual operated crank mechanism for opening and closing of curtains. However, if the farmer wants the motorized operation of the same, the agency should implement the same on charging additional cost. 40 mesh nylon insect proof nets (UV stabilized) of equivalent size need to be fixed inside the curtains, Anti-flapping strips are suggested to ensure smooth functioning of the curtain.
1 6	Shade Net	Use UV stabilized Aluminate of 50% shade factor with motor operated mechanism for expanding and retracting. Size of net should be equal to the floor area of greenhouse.
1 7	Drip Irrigation System with fogging & misting facility	Drip irrigation system inside greenhouse need to be selected based on crop spacing along with fogging and misting facilities. The suggested bill of materials must have Sand Filter, Screen Filter, Control Valves, By-pass Assembly, Air Release Valve, Non Return Valve, Throttle Valve, Flush Valve, Venturi Injector with manifold, PVC pipes, LDPE plane lateral, Emitting pipe, foggers & misters to be fixed w.r.t design. Water tank and fittings & accessories. Provision for micro sprinklers need be kept for top of the vents of the greenhouse (Applicable only BIS standards for all irrigation components as well as water tank).
1 8	Footpath	1m wide and 10 cm thick footpaths made of cement concrete ratio of 1:2:4 should be provided inside the greenhouse for required intercultural operation.

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1 9	Testing	All plastic materials used in the greenhouse to be tested by the CIPET or any other testing Institute for quality assurance (if required).
<p>Note: In place of curtain wall apron, UV stabilized 200 micron transparent sheet can be used and anchored with zigzag high carbon steel with spring action wire of 2-3 mm diameter using aluminum profil. However the cost of the apron should be computed on the basis of material used.</p>		
<ul style="list-style-type: none"> Fogging System: suitable as per the crop, in consist of four way anti leak fogger 10-28 lph flow rate (working pressure should be mentioned at which it be able to get required particle size, fogger spacing along the lateral and lateral spacing) and particle size 80-100 micron, 16 mm lateral class-3, PVC pipe 6kg/cm², valves, filter, pump, panel with volt meter, MCB, relay, temp and humidity sensors etc. complete application rate 3 mm/hr. 		

2. NATURALLY VENTILATED GREENHOUSE (Type-2) 2mm thickness of structural members

Sr . N o.	Ite ms	Description/Specifications
1	Product	Naturally Ventilated Greenhouse
2	Size	500 m ² /1000 m ² /2000 m ² /4000 m ²
3	Bay size	8m x 4m, width of greenhouse should be at least 35 % of the desired length.
4	Ridge height	6.5m to 7m depending upon the climatic conditions and wind
5	Ridge Vent	1m - 1.2m opening fixed with 40 mesh insect Net. Provision should be kept to close the vent with plastic film with manual mechanism for opening & closing the vent. However, if the farmer wants the motorized operation of the same, the agency should implement the same on charging additional cost.
6	Gutter height	4m - 4.5m from floor area
7	Gutter slope	2% slope need be provided in civil foundation work/ structure
8	Gutter frame	20 gauge or 2mm thick GI sheet with perimeter of 0.5 m or more preferably of single length without joint having provision of rain water harvesting system.
9	Structural design	The structural design need to be sound enough to withstand wind speed minimum 140km/hr and having trellis mechanism to withstand minimum crop load of 25kg/m ² . There should be provision for opening one portion at either side for entry of small tractor/power tiller for inter-cultural practices.
10	Structure	Complete structure made of galvanized steel tubular pipes /C-channel of light class or equivalent section conforming to Indian

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		Standards IS 1161: 1998 and the structural member should be joined with fasteners properly. Welding of structure is not recommended.
	Columns	76 mm OD, 2 mm thick
	Trusses/Corridor	Bottom chord 60 mm OD, 2 mm thick
	Trusses member/Top arches	48 mm OD, 2 mm thick
	Purlins	Top purlins 48/42 mm OD, 2 mm thick
	Purlins member & others	33/25 mm, 2 mm thick
	Foundations	Insert GI pipes of minimum 60 mm with 2 mm thick to have foundation depth of 75 mm with 2mm thick depending upon soil type and prevailing wind velocity, grouting of foundation column with cement concrete mixture of 1:2:4 using telescopic insertion of column is recommended.
	Fasteners	All nuts & bolts must be of high tensile strength and galvanized (120 GSM).
11	Entrance room & Door	One entrance room of size 3 m x 3 m x 3 m (L x W x H) need be provided, covered with 200 micron UV stabilized transparent plastic film conforming Indian Standards (IS 15827: 2009). Two hinge doors of size 2m width & 2.5 m height double leaf made in plastic/FRP (fibre reinforced plastic) sheets mounted in suitable frame.
1 2	Cladding material	UV stabilized 200 micron PE film conforming to Indian standards (IS 15827:2009) having properties like Anti dust, Anti-drip, Anti-fog, IR thermic, light diffusion and optional properties like Anti-sulphur, anti- virus, UV blocking and also having minimum 80% level of light transmittance.
1 3	Fixing of cladding	All ends/joints of plastic film need to be fixed with two way aluminum profiles with suitable locking arrangement along with

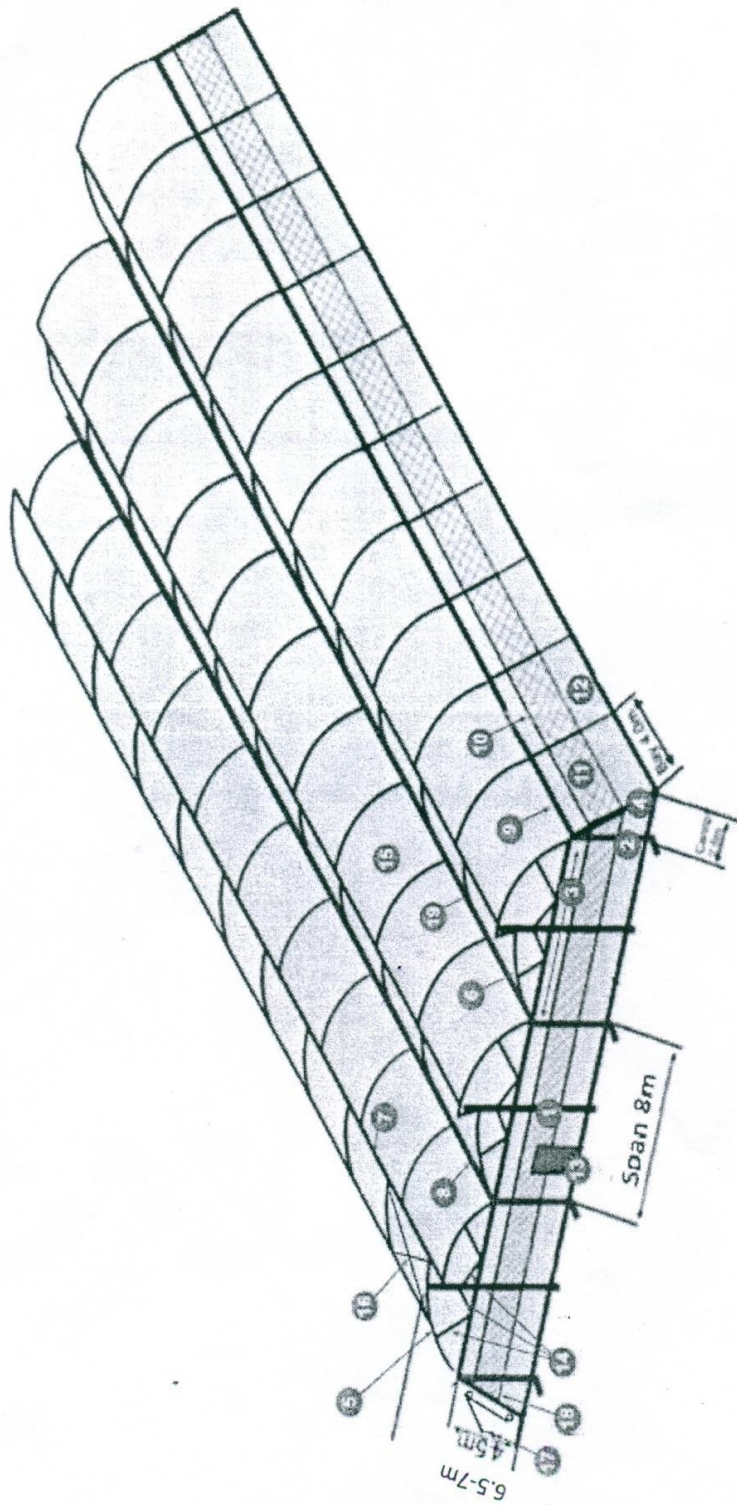
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	materials	curtain top. Wooden batons or PVC grippers need not be used for fixing the cladding materials.
1 4	Spring Insert	Zigzag high carbon steel spring action wire of 2-3 mm diameter must be inserted for fixing shade net into Aluminum Profile.
1 5	Curtains and insect screen	Roll up UV stabilized 200 micron transparent plastic film as curtains need be provided up to 3.5 m height on all sides having Manual operated crank mechanism for opening and closing of curtains. However, if the farmer wants the motorized operation of the same, the agency should implement the same on charging additional cost. 40 mesh nylon insect proof nets (UV stabilized) of equivalent size need to be fixed inside the curtains, Anti-flapping strips are suggested to ensure smooth functioning of the curtain.
1 6	Shade Net	Use UV stabilized Aluminate of 50% shade factor with motor operated mechanism for expanding and retracting. Size of net should be equal to the floor area of greenhouse.
1 7	Drip Irrigation System with fogging & misting facility	Drip irrigation system inside greenhouse need to be selected based on crop spacing along with fogging and misting facilities. The suggested bill of materials must have Sand Filter, Screen Filter, Control Valves, By-pass Assembly, Air Release Valve, Non Return Valve, Throttle Valve, Flush Valve, Venturi Injector with manifold, PVC pipes, LDPE plane lateral, Emitting pipe, foggers & misters to be fixed w.r.t design. Water tank and fittings & accessories. Provision for micro sprinklers need be kept for top of the vents of the greenhouse (Applicable only BIS standards for all irrigation components as well as water tank).
1 8	Footpath	1m wide and 10 cm thick footpaths made of cement concrete ratio of 1:2:4 should be provided inside the greenhouse for required intercultural operation.
1 9	Testing	All plastic materials used in the greenhouse to be tested by the CIPET or any other testing Institute for quality assurance (if

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	required).
<p><i>Note: In place of curtain wall apron, UV stabilized 200 micron transparent sheet can be used and anchored with zigzag high carbon steel with spring action wire of 2-3 mm diameter using aluminum profile. However the cost of the apron should be computed on the basis of material used.</i></p>	
<ul style="list-style-type: none">• Fogging System: suitable as per the crop, in consist of four way anti leak fogger 10-28 lph flow rate (working pressure should be mentioned at which it be able to get required particle size, fogger spacing along the lateral and lateral spacing) and particle size 80-100 micron, 16 mm lateral class-3, PVC pipe 6kg/cm², valves, filter, pump, panel with volt meter, MCB, relay, temp and humidity sensors etc. complete application rate 3 mm/hr.	

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|---------------------|--------------------------------|--------------------------------|
| 1. Main column | 2. 2 nd main column | 3. Bottom cord |
| 4. Corridor | 5. Long arch | 6. Small arch |
| 7. Top purlin | 8. Gutter | 9. Side purlin |
| 10. Corridor purlin | 11. Inset net | 12. Apron |
| 13. Door | 14. Brassing | 15. UV stabilized Plastic film |
| 16. Cross bracing | 17. Curtain handle | 18. Corridor support |
| 19. Gutter purlin | | |

3. NET HOUSE (Type-1)

S r. N o.	Particular s	Descriptions/Specifications
1	Product	Flat roof net house/ Gable roof net house
2	Size	500 sqm./1000 sqm/2000 sqm/4000 sqm/ (Bay size 4 x 4 m for Gable/parabolic roof and 6 x 4 m / 6 m x 6 m for others)
3	Height	4-4.5 m from floor area. If gable roof, the side height should be in between 3 m - 3.5 m and Centre height 4 m - 4.5 m.
4	Structural design	The structural design must withstand wind speed of minimum 130 km/hr. and withstand crop load up to 25 kg/m ² crop load. The structure must have the provision for opening one portion at either side for entries of small tractor/ power tiller for inter- cultural operations. The aerodynamics shape should be preferred to avoid wind load.
5	Structure	Complete structure should be made of galvanized steel tubular pipes or equivalent section of light class conforming Indian Standards IS: 1161-1998, the structural member should be joined with fasteners properly.
6	Columns	60 mm OD, 2.9 mm thick
	Trusses, purlins and hockey	48 mm OD, 2.9 mm thick
	Member for Truss, purlins & others	42 mm OD, 2.6mm thick
7	Entrance room	Two entrance room of size 2.5 m x 2.5 m x 2.5 m(L x W x H) made

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	& Door	of GI square pipe size 38mm x 38 mm having minimum wall thickness 2.6 mm or Aluminum profile need to be provided and covered with UV stabilized net. Two hinge lockable doors of size 2.5 m width & 2.5 m height double leaf made in plastic/FRP sheets mounted in suitable strong frame.
8	Cladding material	UV stabilized shade net having 50 % shading factors having minimum wt. of 70-80 GSM. The selection of shade net colour depends on the selection of crops. For insect net house GSM should be minimum 120, of 40-50 mesh size insect net, may be used to cover the structure.
9	Fixing of cladding materials	All ends/joints of net house to be fixed with two way aluminum profile with suitable locking arrangement such as zigzag high carbon steel with spring action wire of 2-3 mm diameter. Wooden batons or PVC grippers must not be used.
10	Civil work	Depth of foundation need be kept at 60 mm or more depending upon soil type and prevailing wind conditions. GI pipes of 48 mm light class conforming to Indian Standards IS: 1161-1998 or equivalent sections should be grouted in cement concrete mixture with 1:2:4 ratios.
11	Floor	-
12	Plinth	1 feet plinth protection around the structure

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1 3	Drip irrigation System with fogging & misting facility	Drip irrigation system inside greenhouse need to be selected based on crop spacing along with fogging and misting facilities. The suggested bill of materials must have Sand Filter, Screen Filter, Control Valves, Bypass Assembly, Air Release Valve, Non Return Valve, Throttle Valve, Flush Valve, Venturi Injector with manifold, PVC pipes, LDPE plane lateral, Emitting pipe, foggers & misters to be fixed w.r.t design. Water tank and fittings & accessories (applicable only BIS standards for all irrigation components as well as water tank).
1 4	Footpath	1m wide and 10 cm thick footpaths made of cement concrete ratio of 1:2:4 should be provided inside the greenhouse for required intercultural operation.
1 5	Testing	All plastic materials used in the greenhouse to be tested by the CIPET or any other testing Institute for quality assurance (if required).
<ul style="list-style-type: none"> • Note: Fogging System: suitable as per the crop, in consist of four way anti leak fogger 10-28 lph flow rate (working pressure should be mentioned at which it be able to get required particle size, fogger spacing along the lateral and lateral spacing) and particle size 80-100 micron, 16 mm lateral class-3, PVC pipe 6kg/cm², valves, filter, pump, panel with volt meter, MCB, relay, temp and humidity sensors etc. complete application rate 3 mm/hr. 		

4. NET HOUSE (Type-2)- 2mm thickness of structural members

S r. N o.	Particular s	Descriptions/Specifications
1	Product	Flat roof net house/Gable roof net house
2	Size	500 sqm./1000 sqm/2000 sqm/4000 sqm (Bay size 4 x 4 m for Gable/parabolic roof and 6 x 4 m / 6 m x 6 m for others)
3	Height	4-4.5 m from floor area. If gable roof, the side height should be in between 3 m - 3.5 m and Centre height 4 m - 4.5 m.
4	Structural design	The structural design must withstand wind speed of minimum 130 km/hr. and withstand crop load up to 25 kg/m ² crop load. The structure must have the provision for opening one portion at either side for entries of small tractor/ power tiller for inter- cultural operations. The aerodynamics shape should be preferred to avoid wind load.
5	Structure	Complete structure should be made of galvanized steel tubular pipes or equivalent section of light class conforming Indian Standards IS: 1161-1998, the structural member should be joined with fasteners properly.
6	Columns	60 mm OD, 2 mm thick
	Trusses, purlins and hockey	48 mm OD, 2 mm thick
	Member for Truss, purlins & others	42 mm OD, 2 mm thick
7	Entrance room	Two entrance room of size 2.5 m x 2.5 m x 2.5 m(L x W x H) made

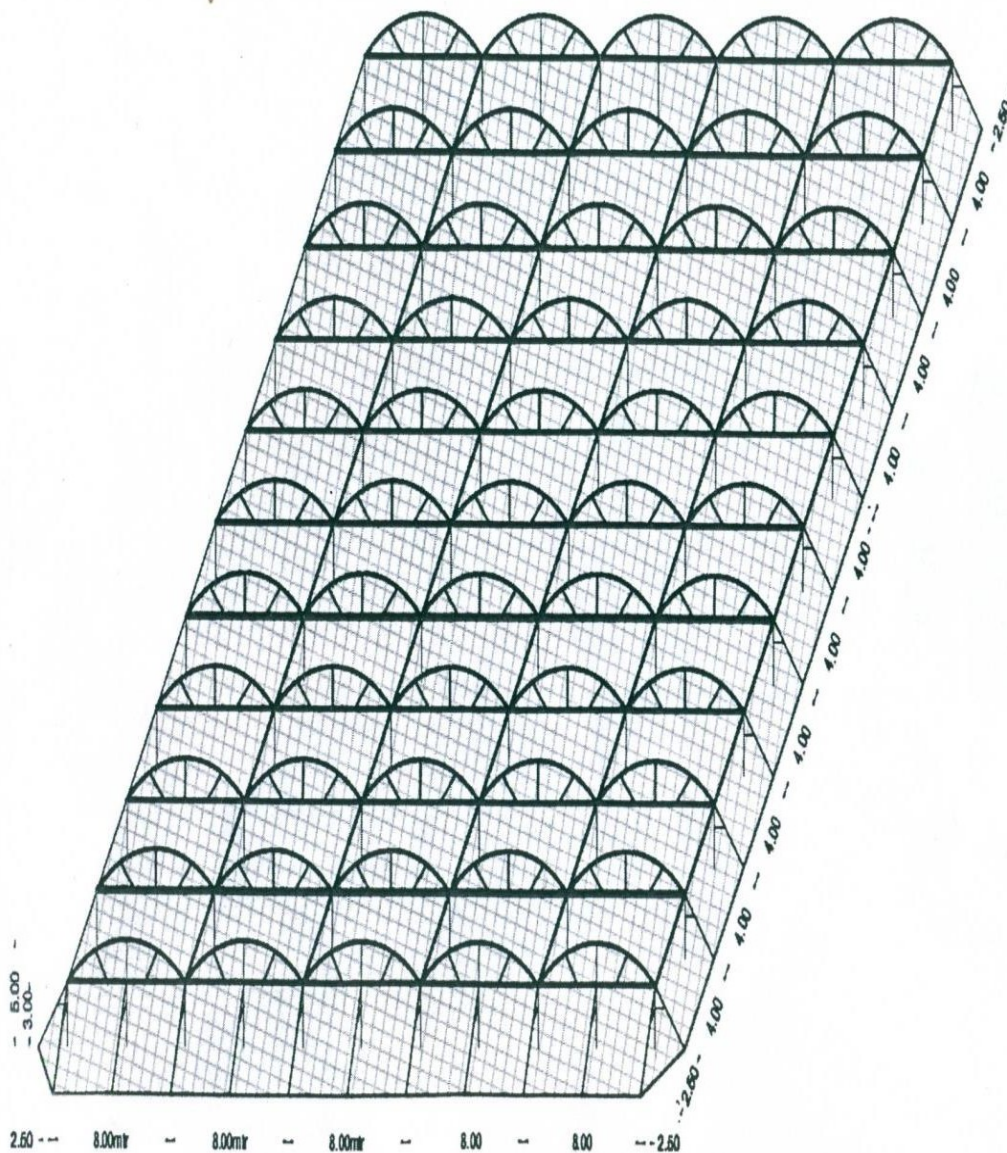
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	& Door	of GI square pipe size 38mm x 38 mm having minimum wall thickness 2.6 mm or Aluminum profile need to be provided and covered with UV stabilized net. Two hinge lockable doors of size 2.5 m width & 2.5 m height double leaf made in plastic/FRP sheets mounted in suitable strong frame.
8	Cladding material	UV stabilized shade net having 50 % shading factors having minimum wt. of 70-80 GSM. The selection of shade net colour depends on the selection of crops. For insect net house GSM should be minimum 120, of 40-50 mesh size insect net, may be used to cover the structure.
9	Fixing of cladding materials	All ends/joints of net house to be fixed with two way aluminum profile with suitable locking arrangement such as zigzag high carbon steel with spring action wire of 2-3 mm diameter. Wooden batons or PVC grippers must not be used.
10	Civil work	Depth of foundation need be kept at 60 mm or more depending upon soil type and prevailing wind conditions. GI pipes of 48 mm light class conforming to Indian Standards IS: 1161-1998 or equivalent sections should be grouted in cement concrete mixture with 1:2:4 ratios.
11	Floor	-

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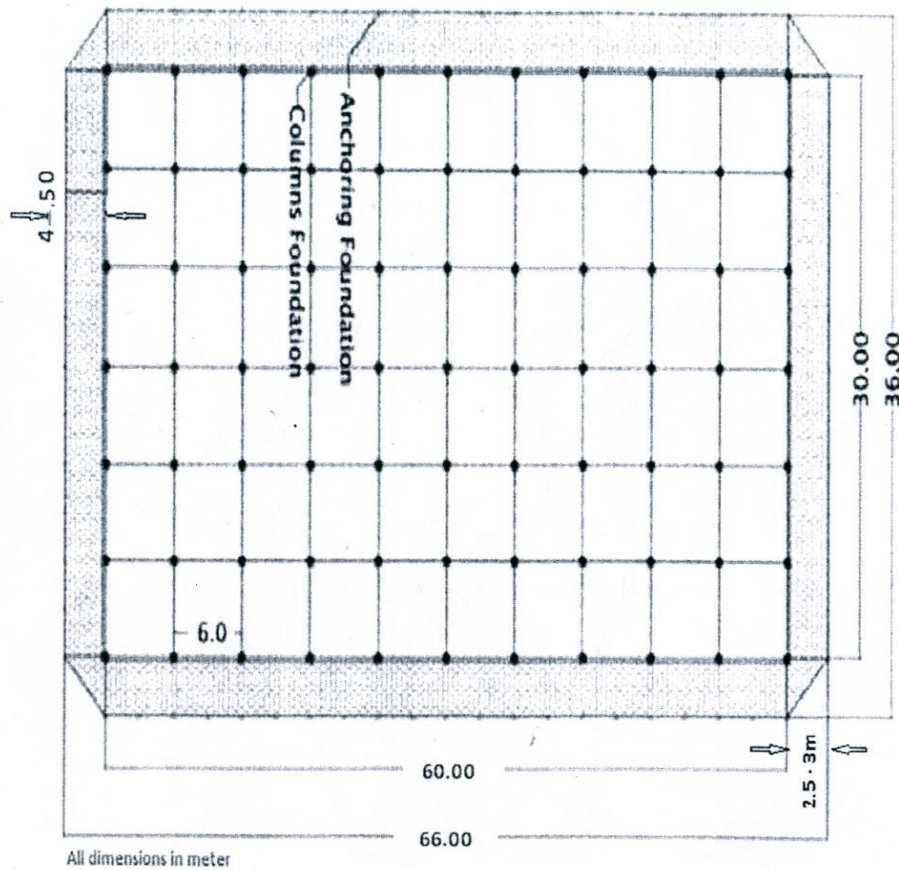
1 2	Plinth	1 feet plinth protection around the structure
1 3	Drip irrigation System with fogging & misting facility	Drip irrigation system inside greenhouse need to be selected based on crop spacing along with fogging and misting facilities. The suggested bill of materials must have Sand Filter, Screen Filter, Control Valves, Bypass Assembly, Air Release Valve, Non Return Valve, Throttle Valve, Flush Valve, Venturi Injector with manifold, PVC pipes, LDPE plane lateral, Emitting pipe, foggers & misters to be fixed w.r.t design. Water tank and fittings & accessories (applicable only BIS standards for all irrigation components as well as water tank).
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1 5	Testing	All plastic materials used in the greenhouse to be tested by the CIPET or any other testing Institute for quality assurance (if required).
<ul style="list-style-type: none"> Note: Fogging System: suitable as per the crop, in consist of four way anti leak fogger 10-28 lph flow rate (working pressure should be mentioned at which it be able to get required particle size, fogger spacing along the lateral and lateral spacing) and particle size 80-100 micron, 16 mm lateral class-3, PVC pipe 6kg/cm², valves, filter, pump, panel with volt meter, MCB, relay, temp and humidity sensors etc. complete application rate 3 mm/hr. 		

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Gable/parabolic roof type Shadenet house

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Flat roof type Shadenet house

Note: The suggestive technical specifications can be modified wrt agro- climatic conditions, locations etc. However the cost per square varies with the type of structure.

5. Poly Tunnels:

Sr · N o.	Item	Indicative Specifications
I	Structures: Structure should withstand to 120 km/hour wind velocity, without weld.	
1.	Main Column	Tubular structure: Size 48 OD, Thickness 2.0 mm, Length- 4 m, or Square Closed Pipe structure: Size 40 mm × 40 mm, thickness 2.0 mm, Length- 4 m; Made up of Hot dip galvanized having minimum 300 GSM Zinc galvanizing
2.	Purlins	Tubular structure: Size 33/32 OD, Thickness 2.0 mm, length- 4 m, Channel/Square Closed Pipe Structure: Size 37 mm, thickness 1.8 mm, Length-4 mm Made up of Hot dip galvanized having minimum 300 GSM Zinc galvanizing
3.	Trusses	Tubular structure: Bottom horizontal 42/43 mm OD/2.0 mm thick, top chords and truss members 32 mm OD 2.0 mm thick, Bracing 25 mm OD/2.0 mm thick. Channel/Square Closed Pipe Structure: Bottom horizontal 40 mm × 20 mm/2.0 mm thick, top chords, truss & bracing members 37 mm× 37 mm/1.8 mm thick. Made up of Hot dip galvanized having minimum 300 GSM Zinc galvanizing
4.	Height	Centre height 4.5 meter, dome type structure.
5.	Profile	C type Aluminum/GI profile to fix plastic film to the structure by means of self-tapping screws. Weight of aluminum/GI profile is 200-220/400-450 GSM.
6.	Spring Insert	Zigzag spring insert to fix shade net to Aluminum profile 2.3

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		mm diameter of spring wire with cold galvanization/enamel coated. Wire
7.	Side wall curtain	1.5 meter & above with rolling flap of poly film 200 micron thick, U.V. stabilized, diffused, thermic, anti-drip and anti-dust made up of multi layer plastics. All the sides, 40-50 mesh uv stabilized white insect net having minimum 120 gsm
8.	Bottom apron	Woven polythene 160 GSM/200 micron plastic sheet, UV stabilized, 0.50 mtr. Height
9.	Entrance	Double doors, Polycarbonate sheet door with 2 m width and 2 m height and another door of 1 m × 2 m Box section frame is embedded inside for the strength.
II	Film & Nets	
1.	Poly film	200 micron thick, U.V. stabilized, diffused, thermic, anti-drip and anti-dust made up of multi layer plastics conforming Plastics films conforming Indian Standards (IS 15827: 2009).
2.	Insect Proof Net	40-50 mesh and white in colour on both sides of ventilation

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		portion. Gsm 120 ; VU stabilized
II I.	Trellis System	Support Up to 30 kg/m ² hanging load. thick GI wire, 2 mm main wire to the plant and 4 mm cross wire to support the trellis system. The GI Wire shall move parallel as per the design and orientation of structure. The plant support wire should be parallel and above the plantation bed-to and fro, 120 cm apart or as per bed width.
IV	Civil Works	
1.	Foundation	Columns area fitted over ground “inserts” and bolted to suitable insert pipe of 3.0 mm thickness. Length of insert 1/10 meter, PCC of CM ratio 1:2:4 of 40 cm × 40 cm × 100 cm sizes & filling the pit with 1:2:4 concrete mixed with appropriate grade cement. It is clarified that in case of round filling the diameter of foundation will be 40 cm.
V	Drip Irrigation System with fogging & misting facility	Drip irrigation system under poly tunnel should match design on spacing 30cm x 30 cm along with fogging facilities. Assembly with manifold, PVC pipe 63 mm/6 kg cm ² , PVC pipe 50 mm/6kg/cm ² , PE plane lateral 16 mm, Emitting pipe lateral 16mm- @0.30 m spacing, hanging type micro sprinkler nozzle (four-way take off assembly) for very fine water particles (anti leak foggers) to be fixed in PE pipe of diameter 16mm, Water tank of capacity 500 liter and fittings & all necessary accessories also 10 HP submersible three phase motor should be provided. Roof Sprinkler System to wash the plastic film with uniform overlapping.

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JAYANTA KUMAR AIKAT, DIR(ADMIN)(JKA)(DH), O/o DIRECTOR(DOH)

Director

23/07/2021