EXPRESSION OF INTEREST (EOI)

For

EMPANELMENT OF AGENCY FOR CONSTRUCTION OF NET HOUSE / POLYHOUSE/POLY TUNNEL ON TURNKEY BASIS IN THE STATE OF WEST BENGAL AND PROVIDE AGRONOMICAL SERVICES RELATED WITH IT.

EOI No. 83/WBSFPHDCL/1770/2021-22 Date: 15.02.2022

DISCLAIMER

This bid document for empanelment of agency for construction of Net House / Poly house/Poly Tunnel on turnkey basis in the state of West Bengal and to provide agronomical services related with it, contains brief information on the scope of work, eligibility requirements and details of the selection process amongst others for the successful bidder.

Intimation of discrepancies in the bid document, if any, may be given, by the Bidders, to the office of WBSFP&HDCL within 48 hours from the time of publishing of bid. If WBSFP&HDCL receives no written communication, it shall be deemed that the Bidders are satisfied with the information provided in the bid document.

This bid document is not an agreement. The scope of work and other information as well as the right and obligations of the successful Bidder shall be set out in a separate agreement to be executed between WBSFP&HDCL and the successful Bidder.

WBSFP&HDCL reserves the right to accept or reject any or all Bids without giving any reasons thereof.

WBSFP&HDCL shall not entertain or be liable for any claim for costs and expenses in relation to the preparation of the documents to be submitted in terms of this bid document.

WBSFP&HDCL shall not be responsible for any late receipt of applications for any reasons whatsoever. The applications received late will not be considered.

WBSFP&HDCL may include any other item in the Scope of work at any time after consultation with applicants or otherwise.

The WBSFP&HDCL reserves the right to relax or waive any of the conditions stipulated in this document as deemed necessary in the best interest of the WBSFP&HDCL without assigning any reasons thereof.

INVITATION FOR EXPRESSION OF INTEREST (EOI)

WBSFP&HDCL invites bids from Agency for Empanelment of Agency for construction of Net House / Poly house/Poly Tunnel on turnkey basis in the state of West Bengal and to provide agronomical services related with it. Interested Agency with sound financial condition may download the Tender document/Form from WBSFP&HDCL's website/ Government e-procurement portal.

The vision of the Department of FPI & Horticulture, Government of West Bengal is:

- Greater wealth creation for farmers.
- Sustainable increase in productivity of horticultural crops.
- Food Security.
- Higher income from horticulture.
- Higher value addition to horticultural produce.
- Promotion of exports.
- Conservation of water resources through micro irrigation.

To achieve this vision, Department of FPI & Horticulture, Government of West Bengal is very keen to encourage farmers to adopt protected method of cultivation by implementing High Tech Cultivation Technologies such as Shade-net House / Poly house/ Poly Tunnel structures etc. with the following objectives:

1) To provide favourable micro climatic conditions for the plants.
2) To grow crops throughout the year whenever possible.
3) To obtain higher yield with better quality per unit area.

4) To conserve moisture and minimize loss of irrigation water.

5) To cultivate high value / off season crops.

6) To help control pest and diseases.

7) To help in hardening of tissue cultured lants.

8) To help in raising nurseries wherein round the year propagation of planting material is possible.

9) To protect the crops from wind, rain, snow, birds, hail etc.

Department of FPI & Horticulture, Government of West Bengal is providing financial assistance to the farmers for establishment of Poly house/ Net house/ Poly Tunnel etc. under different schemes. Financial Assistance will be as per the Government norms prevailing at the time of sanction of financial assistance.

Following key points need to be addressed for successful large scale implementation of this scheme in the State.

1) Ensuring supply of all components as per the minimum standards specified by **National Committee on Plasticulture Application in Horticulture (NCPAH), Government of India.**
2) Ensuring quality of supply and installation of project components as specified in the guidelines to safe guard farmers from futureloss.
3) Assisting farmers in selection of suitable agency (manufacturer/fabricator) to implement Poly house / Net house / Poly Tunnel etc. based on their requirement.
4) Ensuring training of operation of project as well as the agronomical inputs to farmers to achieve overall objective of increasing productivity and thus improving theirincome.
5) Ensuring trouble free operation of Poly House / Shade net House/Poly Tunnelafter the project has beenimplemented.
6) To derive a reasonable cost for each type of technology through price discovery method this will protect farmers from undue marketpractice.

Hence, the Department of FPI & Horticulture, Government of West Bengal intends to empanel competent manufacturers / fabricators, who can implement projects of Poly House / Net house/Poly Tunnel etc. and provide operational training and required agronomical knowledge to farmers for the successful large-scale implementation of this scheme. West Bengal State Food Processing and Horticulture Development Corporation Limited will act as implementing agency for enlistment of manufacturer/ fabricator.

Proposal in the form of EOIs in duplicate is requested in complete accordance with the documents/attachments as per following guidelines. The agency will have to provide the price offer as per the format through online systemonly.

At the end of this exercise, list of selected agencies will be prepared and the farmers will be advised to execute their project through any of these empanelled agencies.The agency, found eligible at the end of this exercise will be allowed to execute the project.

SCHEDULE FOR INVITATION OF EOI

NAME: Empanelment of Agency for Construction of Net House/Poly house/Poly Tunnel on Turnkey basis in the State of West Bengal and provide agronomical services related to it.

EOI Authority	West Bengal State Food Processing and Horticulture Development Corporation Limited, Benfish Tower, Kolkata – 700 091.
Issue of EOI	**From (15/02/22) at 16.30 hrs to (02/03/22) upto16.00 hrs.**
EOI Due Date	**(02/03/22) upto 16.00 hrs.**
Technical Proposal Opening Date & Time:	**(04/03/22) at 16.00 hrs**
Pre-Bid Meeting	On **(21/02/22) at 15:00 hrs** at the Office of the Managing Director, West Bengal State Food Processing and Horticulture Development Corporation Limited, Benfish Tower, Kolkata – 700 091.
EOI document Fee	**Rs. 5,000/- (Rupees Five Thousand Only**
EOI Fee Payable to	West Bengal State Food Processing and Horticulture Development Corporation Limited,RTGS/NEFT in case of offline payment through bank account in any Bank

Price Offer	The agency shall submit their best possible price offer in electronic format only on website, www.wbtenders.gov.in after digitally signing the same. Offers which are not digitally signed will not be accepted. No offer in physical form will be accepted and any such offer if received will be rejected. Also any reference of the price, quotes etc. in physical submission may result in rejection of the offer of the agency.
Joint Venture/Consortium	Not allowed
EOI currency Setting	Indian Rupee (INR)

1. **BID PROCEDURE**

   a. **Registration of Bidder:**

   Any bidder willing to take part in the process of e-Tendering will have to be enrolled & registered with the **Government e-Procurement System / Portal**:**http:/www.wbtenders.gov.in**

   b. **Digital Signature Certificate (DSC)**

   Each bidder is required to obtain a Class-II or Class-III Digital Signature Certificate (DSC) for submission of tenders from the approved service provider of the National Informatics Centre (NIC).

   c. **Collection of Tender Documents**

   The intending Bidders can search and download NIT and Tender Document(s) electronically / from the **Government e-Procurement System / Portal** using the Digital Signature Certificate. **This is the only mode of collection of Tender Documents**.

d. **Submission of Tenders**

Tenders are to be submitted online on the website **http://www.wbtenders.gov.in** in a single folder before the prescribed date and time using the Digital Signature Certificate (DSC). The documents are to be uploaded in the form of virus scanned copy duly signed. The documents will get encrypted (transformed into non readable formats).

e. **EOI document Fee**

Detailed procedure for online submission of EOI document Fee

Procedure to be followed for online submission of **EOI document Fee** is as below-

i. Login by Bidder

a. A Bidder desirous of taking part in the tender invited by the Corporation shall logon to the e-procurement portal of http://www.wbtenders.gov.in using his login ID and password.

b. He will select the tender to bid and initiate payment of pre-defined **EOI document Fee** for that tender by selecting from either of the following payment modes:

i. Net banking (any of the Banks listed in the ICICI Bank Payment gateway) in case of payment through ICICI Bank payment Gateway.

ii. RTGS/NEFT in case of offline payment through bank account in any Bank.

ii. Payment by Net Banking (any listed Bank) through ICICI Bank Payment Gateway

a. On selection of net banking as the payment mode, the Bidder will be directed to ICICI Bank Payment Gateway webpage (along with a string containing a Unique ID) where he will select the Bank through which he wants to do thetransaction.

b. Bidder will make the payment after entering his Unique ID and password of the Bank to process the transaction.

c. Bidder will receive a confirmation message regarding success/failure of the transaction.

d. If the transaction is successful, the amount paid by the Bidder will get credited to the concerned pooling account maintained with the Focal Point Branch of ICICI for collection of **EOI document Fee.**

e. If the transaction is failure, the Bidder will again try for payment by going back to the first step.

iii. Payment through RTGS/ NEFT

a. On selection of RTGS/NEFT as the payment mode, the e-procurement portal will show a pre-filled challan having the details to process RTGS/NEFT transaction.

b. The Bidder will print the challan and use the pre-filled information to make RTGS/NEFT payment using his bank account.

c. Once payment is made, the Bidder will come back to the e-procurement portal after expiry of a reasonable time to enable the NEFT/RTGS process to complete, in order to verify the payment made and continue the bidding process.

d. If verification is successful, the fund will get credited to the concerned Pooling account maintained with the Focal Point Branch of ICICI Bank for collection of **EOI document Fee.**

e. Hereafter, the Bidder will go to e-procurement portal for submission of his bid.

f. But, if the payment verification is unsuccessful, the amount will be returned to the bidder's account.

iv. Clarification of Bidding Document

a. If there be any discrepancy or obscurity in the meaning of any clause of the bid document or if there be any query of the intending bidder, the bidder shall set forth in writing such discrepancies, doubt, obscurity or queries and submit the same to the Corporation marked to the 'MD, WBSFP&HDCL' prior to the date fixed for pre-bid meeting.

b. The queries may be sent by email also to **wbsfphdcl@gmail.com** up to one day before the date fixed for pre-bid meeting.

c. The queries received by email up to one day before the date fixed for pre-bid meeting only shall be considered for response.

d. Verbal queries will be accepted on the day of the pre-bid meeting. After the pre-bid meeting no query shall be entertained.

e. **The clarification given in response to the queries and issues raised in the pre-bid meeting shall be final and binding on the bidder.**

v. Amendment of Bidding Document

At any time, prior to the deadline for submission of bids, WBSFP&HDCL may, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the bidding documents by issuing amendments. Any such amendment shall form the part of the bidding document. **Such amendments and clarifications in response to pre-bid meeting will be published on the same website and also on the website of the Deptt. of Food Processing Industries & Horticulture (http://www.wbfpih.gov.in). Prospective bidders are requested to visit the mentioned websites on a regular basis to keep abreast of any news. WBSFP&HDCL will bear no responsibility or liability for bidders failing to do so.**

In order to afford the prospective bidders reasonable time in which to take the amendment into account in preparing their bids, WBSFP&HDCL may extend the deadline for submission of bids. Such amendments, clarifications etc. shall be binding on the bidders and will be given due consideration by the bidders while they submit their bids and invariably enclose such documents as a part of the bid.

vi. Penalty for suppression / distortion of fact

If any bidder fails to produce the original hard copies of the documents (especially Credential Certificates and audited balance sheets), or any other documents on demand of the Tender Committee within a specified time frame or if any deviation is detected in the hard copies from the uploaded soft copies or if there is any suppression, the bidder will be suspended / debarred / blacklisted / disqualified from participating in the tenders of the WBSFP&HDCL for a period of 3 (Three) years. Besides, WBSFP&HDCL may take appropriate legal action against such defaulting bidder.

vii. Conditional and incomplete bids will be summarily rejected.

viii. Any type of canvassing by the Bidder in furtherance of a bid is strictly prohibited. Such canvassing may lead to cancellation of its bid.

ix. The Tender Committee reserves the right to accept or reject any offer without assigning any reason whatsoever and is not liable for any cost that might have been incurred by any Bidder at any stage of bidding.

x. The Bidder shall bear all costs associated with the preparation and submission of the Bid and the purchaser will no case be responsible and liable for those cost.

General Instructions

1.0 The Agency shall be responsible for all of the costs associated with the preparation of their Bids and their participation in the Bidding Process. WBSFP&HDCL shall not be responsible or in any way liable for such costs, regardless of the conduct or outcome of the Bidding Process.

2.0 Agency has to submit best price offer in electronic form only. Technical proposal will have to be accompanied by required forms and documents, and instrument for payment of EOI DocumentFee.

3.0 EOI Document Fee and EOI Security shall have to be paid as stated in the Notice Inviting Online Tenders section.

4.0 **SUBMISSION OF BIDS:-**

The bidder shall submit the bid in two separate parts in electronic format only on websitewww.wbtenders.gov.in:

Part-I shall be named "Technical Bid" and shall comprise of as below:

i. Format for No. of Greenhouse/Net House/Poly House/Poly Tunnel Work completed in last three years for **subsidized case**– **Annexure 4 (A)**
ii. Format for Performance Guarantee –Annexure 7
iii. Proforma of General Power of Attorney- Annexure 8
iv. Detail of Competent Personnel – Annexure 9
v. Draft format of Work Order to be given to empanelled agency by farmer – Annexure 10
vi. CA certificate format -Annexure-11
vii. PAN Card
viii. Audited Profit& Loss Statements and Balance Sheets for the last three preceding financial years
ix. **Part-II shall be named "Financial Bid " and shall be in** different type and size of Structures –Annexure 5(A).
x. GST Registration Certificate

5.0 Services offered should be strictly as per specifications mentioned in this EOI Document. The agency is expected tospell out any unavoidable deviations, article-wise, in proposal under the heading"Deviations" with full justification.

TABLE OF CONTENTS

Objective of theEOI

- To ensure that the design of structure meets the guidelines prescribed by National Committee on Plasticulture Applications in Horticulture *(NCPAH)* and the specification as prescribed in thisEOI.
- To ensure that the fabricator/manufacturer delivers the prescribed quality input material /components such as GI pipes, Polythene, Agriculture net, clamps, nuts & bolts etc. and a maximum period of warranty.
- To derive the lowest possible price for each type of technology/structure through price discovery method.
- To ensure that the farmer gets proper after sales service support and agronomical advisory services form thefabricator/manufacturer.
- To scrutinize and empanel the competent fabricators/manufacturers for procuring, erection and commissioning of Net house / Poly-house/Poly Tunnel structures at farmer's place.

Need forEmpanelment

- In present scenario, due to lack of agreement on uniform standards, material specification and quality for construction of Net house / Poly house/Poly Tunnel structures, the farmers are facing troubles such as
  - Not getting quality ofconstruction.
  - Sub-optimal durability of the structures requiring additional cost for repairs.
  - Use of substandardmaterial.
  - Inadequate agronomical services.
  - High Cost of theproject.

- Delay in projectimplementation.
- Lack of after sales services, etc.

Hence to overcome the above problems with an objective to safe guard the interest of farmers it was envisaged to empanel agencies.

Scope ofWork

Erection, Procurement and Commissioning

i.) The agency shall supply the material and construct the Net house / Poly house /Poly Tunnel at farmer's field according to the guidelines prescribed.

ii.) If there are amendments in standards by the National Committee on Plasticulture Applications in Horticulture *(*NCPAH) or any other Government bodyduring the period of empanelment and the specification as prescribed in this EOI the agency shall follow the same subject to approval of the Department of Food Processing Industries and Horticulture.

iii.) The agency shall implement the project using material and components of minimum Indian standards prescribed or of the suggested manufacturersonly. The details areattached**.** The type of polythene/net is to be used based on the crop selected by the farmer, however the quality criteria should fall with the minimum standards suggested in the guideline**.**

iv.) The agency shall construct the Polyhouse/Net house/Poly Tunnel within the time period set by theAuthority.

v.) The agency will take a trial run of the entire project and handover the same to farmer.

vi.) The agency must handover, after commissioning of Green house/ Net house/Poly Tunnel, a complete and updated "Operational Manuals" in locallanguage. Selected

Agency must submit the sample of "Operational Manuals" for all the structures in English and Bengali for necessary approval of the appropriate authority.

After Sales Services, Repair and Maintenance

i.) The warranty period for the components / equipment shall be for three years from the date of completion of the project and handover to beneficiary.

ii.) The agency will provide after sales services at least for 3 years from the date of handover to the farmer.

iii.) The agency can charge for replacement of spare parts and components which are out of warrantyperiod. These should be indicated in the operations manual.

iv.) In the event any instrument / component gets broken or damaged during installation and trial run at the site before handing over the structure to the farmer, the agency shall replace the same at free of cost.

Agronomical Services

i.) The agency shall provide operational training to the farmer or its nominated family member only.

ii.) For the successful implementation of the project and to ensure envisaged benefits out of this project, the agency shall provide agronomical services related with Polyhouse/Nethouse/PolyTunnelcultivationtechnologytothebeneficiary.

iii.) The final decision regarding the selection of crop, marketing *etc.* should only be taken by farmer itself.

iv.) A competent person, deputed by the agency will pay visit at least once in a month to the site upto one year. The list of competent person along with detail of

qualification and experience has to be provided to the Authority as per the format given**.**

v.) The agency will maintain records of such visit and submit the same to the Authority as and when required.

Terms of Reference for the Agency

i.) The price offer discovered would be applicable for a period of at least one year.

ii.) The subsidy shall be released by the Authority to the concerned beneficiary after due verification of the structure as per the technical specifications and fulfillment of terms & conditions specified.

iii.) The Authority may levy a penalty on the empanelled agency if found that supplied component are not conforming to minimum specifications. Any such deviations may also invite removal of agency from the panel for the rest of the period of empanelment.

iv.) The agency should provide help to the interested farmer for settlement of insurance claim and assist in submitting *prima facie* report of the damages sustained within the scope of the insurance policy, if required.

v.) The empanelled agency shall not sub-contract the work of construction of net house/polyhouse/poly tunnel to the associate dealer/distributor/other party. If agency is found to be sub-contracting the work of construction, the empanelment of such agency shall be cancelled by the Authority.

vi.) The Authority has right to cancel the empanelment at any point of time during the contract period without assigning any reason.

vii.) The Authority has right to disengage the empanelment of the agency if is found that work carried out by agency is not satisfactory.

viii.) The Authority will carry out inspection through its nominated agency or officials of the each project. On getting the inspection report and if the project is found to be as per prescribed standards, the Authority will release the subsidy amount to the farmer.

xiv.) The subsidy shall not be released if the structure or any component is not as per the specifications and standards prescribed.

Selection Process

The agency will have to qualify technically based on the eligibility criteria given in this document. EOI of agency not meeting the eligibility criteria will not be processed further. The documents to be submitted for fulfillment of eligibility criteria are given in**Annexure-2.**

i.) The EOI of all such agency who had faced serious complaints about their past work may get rejected before the scrutiny ofEOI.

ii.) The price offer of all eligible agencies will be analyzed. The agencies fulfilling the criteria of EOI document will be considered for empanelment. The list of empanelled agencies will be shared with all districts. The farmer is free to select the agency from the panel only.

Minimum Eligibility Criteria

The following are the minimum eligibility criteria for empanelment of agency:

i.) Minimum 03 (three) years of experience in the field of Green house/Polyhouse/Net house/Poly Tunnel installation and maintenance. The agency has to submit a CA certificate to establish experience of minimum three years as performat given at Annexure-11.

ii.) **The agency should have Minimum Average Annual Turnover of Rs. 15 lakhs in the last 3**

years (i.e.2018-19, 2019-20 and 2020-21) from construction activity of greenhouse/ nethouse/poly house/poly tunnel only..

iii.) The agency should have its own manufacturing/assembling facility within the state or the agency shall give an undertaking that they will establish such facility in the state within six months after being empanelled.

Price Offer

i.) To safeguard the interest of farmer and to streamline the cost of specified Polyhouse/Nethouse/Poly Tunnel structure of different size, the authority on behalf of farmer, is asking the agency to submit their best possible price offer for various items of Greenhouse.

ii.) The agency shall offer their best price for construction of play house/net house/ Poly Tunnel and agronomical services as specified in the scope of work of this document as per the format given at **Annexure-5 (A)**

iii.) The agency shall have to offer consolidated price for each project component mentioned in the format for different sizes separately. The price should be inclusive of all applicable taxes.

iv.) The price offer has to be submitted online only. Any mention of price offer in the physical form of EOI will render the offer liable for rejection. Agency shall categorically confirm strict compliance with the following stipulation in respect of their offer.

a) Any effort by Agency or Agency's agent/consultant or representative howsoever described to influence the Authority in any way concerning scrutiny/ consideration/ evaluation/ comparison of the EOI or decision concerning empanelment shall render their offer liable for rejection.

b) Price offer of only qualified agency as per eligibility criteria shall be opened.

v.) Authority reserves the right to seek clarification/ justification from the agency on the price offer in case Authority deems it necessary. Based on the justification provided by the agency, if Authority feels that the price offer is unrealistic/ unfeasible in order to execute a project of this nature, Authority reserves the right to reject the said price offer. The agency shall be governed by the decision of

Authority.

Monitoring mechanism

i.) The empanelled agency will intimate the Authority to carry out inspection after completion of the project in all respect. The Authority will try to carry out the inspection through its nominated agency/ committee or official within 15 working days from the date of the call received from empanelled agency in written.

Performance Security

i.) The empanelled agency shall submit a Performance Security of Rs. 2, 50, 000 (Rupees Two lakh Fifty Thousand only) in the form of Bank Guarantee on successful selection for empanelment. The performance security may be appropriated against breach of the terms and condition of this EOI document. The bank guarantee shall be for a period of threeyears. The Bank Guarantee format is given in the **Annexure-7.**

ANNEXURE –I

COMPANY PROFILE

	Particular	**Detail**
1	Name of Organization	
2	Nature of the Organization	
a	In case of Public/Pvt. Ltd company (Certified copy of Certificate of incorporation for companies & Memorandum and Articles of Associations)	
b	In case of Partnership Firm (Partnership deed)	
c	In case of Proprietorship (Registration certificate, Factory registration, DIC –industrial registration)	
d	In case of society (Certified copy of registration deed with objects of constitution of society)	
e	In case of Corporation (Authenticated copy of theparentstatute)	
3	Address with Phone No.and email ID:	
4	Name and Contact details of the Authorized	

	Person	
5	Any other details in support of your office	
6	PAN (attach attested copy)	

ANNEXURE - 2

CHECKLIST FOR FULFILMENT OF ELIGIBILITY CRITERIA

	Criteria	Documents/Detail required	Documentary Proof attached (Y/N) Pg No.
1	**Minimum 03 (three) years of experience in the field of Greenhouse/Net house in supply, installation and maintenance, in the last 3 years (i.e.2018-19, 2019-20 and 2020-21)**	Certificate of incorporation, Business commencement certificate, Works to be demonstrated by Contract/Agreement/ Work Order from clients showing clearly 3 years of experience	
2	Minimum Average Annual Turnover in the last three financial years (i.e.2018-19, 2019-20 and 2020-21) should not be less than **Rs. 15 lakh.**	**1.** Certificate from Chartered Accountant showing Minimum Average Annual Turnover of the agency in last 3 years (i.e.2018-19, 2019-20 and 2020-21) clearly indicating the Turnover from construction activity of Greenhouse/net house/polyhouse/poly tunnel **2.** Audited Reports for last 3years.	

3	The agency should have its own manufacturing /assembling facility within the State **OR** the agency should give an undertaking that they will establish such facility in the State within six months after beingempanelled.	Factory registration, MSME registration, self-certified list of machine and equipment OR UNDERTAKING.	

ANNEXURE-3 (A)

NATIONAL COMMITTEE ON PLASTICULTURE APPLICATION S IN HORTICULTURE(NCPAH)

MINIMUM TECHNICAL SPECIFICATIONS OF GREENHOUSE/ POLYHOUS/ 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 andclosing the vent. However, if the farmer wants the motorized operation of the same, the agencyshould 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 ofrain water harvesting system.

9	Structural design	The structural design needs to be sound enough to withstand wind speed minimum 140km/hr and having trellis mechanism to withstand minimum crop load of 25kg/m². There should be provision for opening one portion at either side for entry of smalltractor/power tiller for intercultural practices.
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 bejoined 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 isrecommended.
	Fasteners	All nuts & bolts must be of high tensile strength and galvanized (120GSM).

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 200micron UV stabilized transparent plastic film conforming Indian Standards (IS 15827: 2009). Two hinge doors of size 2mwidth&2.5mheightdoubleleafmadeinplastic/FRP(FibreReinforced Plastic) sheets mounted in suitable frame.
12	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.
13	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.WoodenbatonsorPVCgrippersneednotbeusedforfixingthecladding materials.
14	Spring Insert	Zigzag high carbon steel spring action wire of 2-3 mm diameter mustbe inserted for fixing shade net into Aluminum Profile.
15	Curtains and insect screen	Roll up UV stabilized 200 microntransparent plastic film as curtains need be provided up to 3.5 m height on all sides withmanuallyoperated crank mechanism for opening and closing of curtains. However, if the farmer wants the motorized operation of the same, the agencyshould implement the same on charging additional cost. 40 mesh nylon insect proof nets (UV stabilized) of equivalent size need tobefixed inside the curtains, Anti-flapping strips are suggested to ensure smooth functioning of the curtain.

16	Shade Net	Use UV stabilized Aluminate of 50% shade factor with motor operated mechanism for expanding and retracting. Size of net shouldbeequal to the floor area of greenhouse.
17	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 ReturnValve, Throttle Valve, Flush Valve, Venturi Injector with manifold, PVC pipes, LDPE plane lateral, Emitting pipe, foggers &misters to be fixed w.r.t design andwater tank and fittings &accessories. Provision for micro sprinklers need be kept for top of the vents of the greenhouse (Applicable onlyBIS standards forall irrigation components as well as water tank).
18	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 interculturaloperation.
19	Testing	All plastic materials used in the greenhouse to be tested by the CIPETor any other testing Institute for quality assurance (if required).
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 diameterusing aluminumprofile.However,thecostoftheapronshouldbecomputedonthebasisofmaterialused.*		
• 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 3mm/hr.

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

Sr. No.	Items	Description/Specifications
1	Product	**Naturally Ventilated Greenhouse**
2	Size	500 m^2/l000 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 motorized operation of the same, the agencyshould 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 ofrain water harvesting system.
9	Structural design	The structural design needs 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

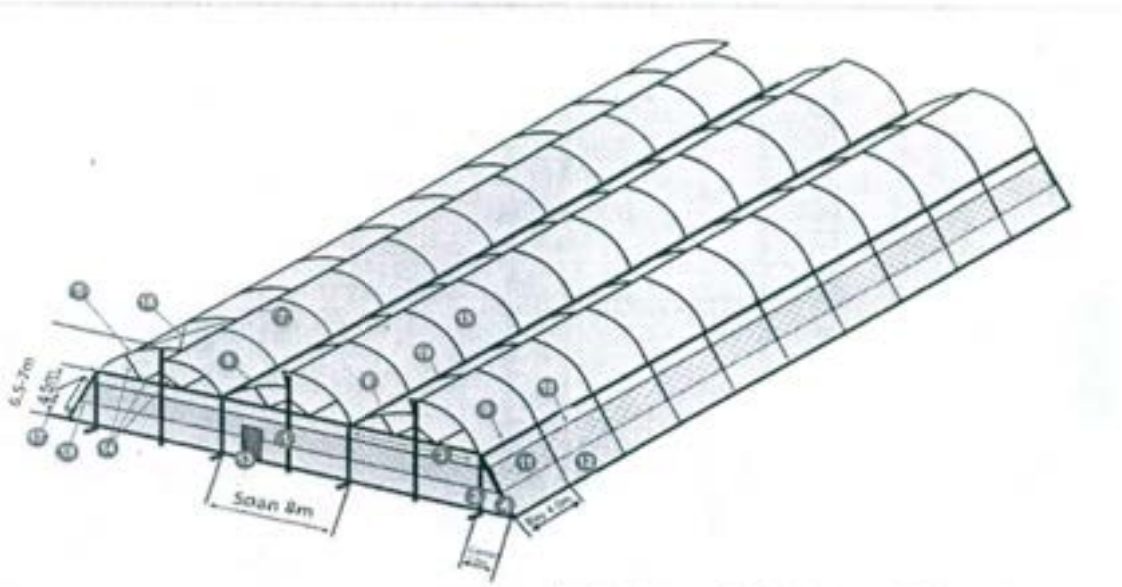
Formatted: Right: 0.07"

		portion at either side for entry of small tractor/power tiller for intercultural practices.
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 bejoined 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 withcement 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 200micron UV stabilized transparent plastic film conforming Indian Standards (IS 15827: 2009). Two hinge doors of size 2m width and2.5 m height double leaf made in plastic/FRP

		(FiberReinforced Plastic) sheets mounted in suitable frame.

12	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 lighttransmittance.
13	Fixing ofcladding materials	All ends/joints of plastic film need to be fixed with two way aluminum profiles with suitable locking arrangement along with curtaintop.WoodenbatonsorPVCgrippersneednotbeusedforfixingthecladding materials.
14	Spring Insert	Zigzag high carbon steel spring action wire of 2-3 mm diameter mustbe inserted for fixing shade net into Aluminum Profile.
15	Curtains and insect screen	Roll up UV stabilized 200 microntransparent 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,theagency 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 stripsare suggested to ensuresmooth functioning of the curtain.
16	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.
17	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, NonReturnValve, Throttle Valve, Flush Valve,Venturi Injector

		with manifold, PVC pipes, LDPE plane lateral, Emitting pipe, foggers andmisters to be fixed w.r.t design, andwater tank and fittings &accessories. Provision for micro sprinklers need be kept fortopoftheventsofthegreenhouse(ApplicableonlyBISstandardsforal l irrigation components as well as water tank).
18	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 interculturaloperation.
19	Testing	All plastic materials used in the greenhouse to be tested by the CIPETor any other testing Institute for quality assurance (if required).
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 aluminumprofile.However,thecostoftheapronshouldbecomputedonthebasisofmaterial used.*		
• Fogging System: suitable as per the crop, 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 3mm/hr.		


6.5-7m
4.5m
Span 8m
1. Main column
2. 2nd 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. Insect net
12. Apron
13. Door
14. Bracing
15. UV stabilized Plastic film
16. Cross bracing
17. Curtain handle
18. Corridor support
19. Gutter purlin

2. MINIMUM TECHNICAL SPECIFICATIONS OF NET HOUSE(Type-1)

Sr. No.	Particulars	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 forGable/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 ofminimum 130km/hr. and withstand crop load up to 25 kg/m² crop load. The structure must have the provision for opening one portion ateither side for entries of small tractor/ power tiller for inter- cultural operations. The aerodynamics shape shouldbe preferredto 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 bejoinedwith 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 & Door	Two entrance room of size 2.5 m x 2.5 m x 2.5 m(L x W x H) made 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 size2.5mwidth&2.5mheightdoubleleafmadeinplastic/FRPsheets mounted in suitable strong frame.
8	Cladding material	UV stabilized shade net having 50 % shading factors having minimum weight 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 meshsize 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 profilewith suitable locking arrangement such as zigzag high carbon steelwithspringactionwireof2-3mmdiameter.WoodenbatonsorPVC 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 sectionsshould be grouted in cement concrete mixture with 1:2:4 ratios.
11	Floor	-
12	Plinth	1 foot plinth protection around the structure.

13	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, BypassAssembly,AirReleaseValve,NonReturnValve,ThrottleValve, Flush Valve, VenturiInjector with manifold, PVC pipes, LDPE plane lateral, Emitting pipe, foggers & misters to be fixed with respect to designand watertank and fittings & accessories (applicable BISstandardsfor all irrigation components as well as water tank).
14	Footpath	1m wide and 10 cm thick footpaths made of cement concrete ratio of 1:2:4 should be provided inside the greenhouse for requiredintercultural operation.
15	Testing	All plastic materials used in the greenhouse to be tested by the CIPET or any other testing Institute for quality assurance (ifrequired).

- **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 3mm/hr.

3. MINIMUM TECHNICAL SPECIFICATIONS OF NET HOUSE (Type-2)- 2mm thickness of structural members

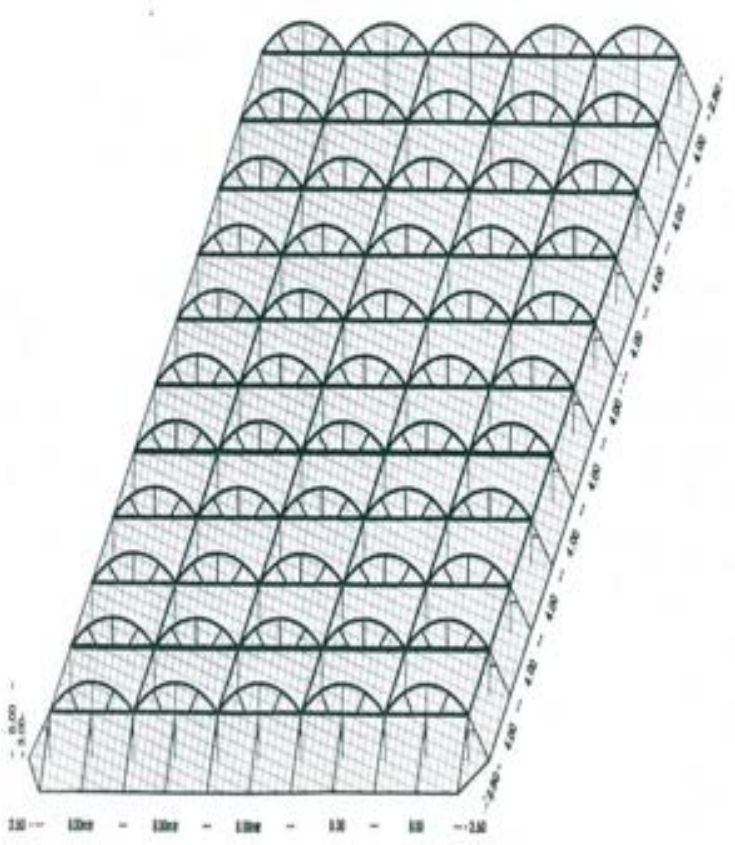
Sr. No.	Particulars	Descriptions/Specifications
1	Product	Flat roof net house/Gable roof net house
2	Size	500 sqm./1000 sqm/2000sqm/4000sqm (Bay size 4 x 4 mforGable/parabolic roof and 6 x 4 m / 6 m x 6 m for others)
3	Height	4-4.5 m from floor area. If gable roof, the side height should be in between 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 entryof small tractor/ power tiller for inter-cultural operations. Anaerodynamic shape shouldbe preferredto 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 membersshould bejoinedwith 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 & Door	Two entrance room of size 2.5 m x 2.5 m x 2.5 m(L x W x H) made of GI square pipe size 38mm x 38 mm having minimumwall thickness 2.6 mm or Aluminum profile need to be provided and covered with UV stabilized net. Two hinge lockable doors of size2.5mwidth&2.5mheightdoubleleafmadeinplastic/FRPsheets 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 meshsize 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 wayaluminum profilewith suitable locking arrangement such as zigzag high carbon steelwithspringactionwireof2-3mmdiameter.WoodenbatonsorPVC 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 sectionsshould be grouted in cement concrete mixture with 1:2:4 ratio.
11	Floor	-

12	Plinth	1 feet plinth protection around the structure
13	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, BypassAssembly,AirReleaseValve,NonReturnValve,ThrottleValve, Flush Valve, VenturiInjector with manifold, PVC pipes, LDPE plane lateral, Emitting pipe, foggers & misters to be fixed with respect todesignand watertank and fittings & accessories (applicable BISstandardsfor all irrigation components as well as water tank).
14	Footpath	1m wide and 10 cm thick footpaths made of cement concrete ratio of 1:2:4 should be provided inside the greenhouse for requiredintercultural operation.
15	Testing	All plastic materials used in the greenhouse to be tested by the CIPET or any other testing Institute for quality assurance (ifrequired).

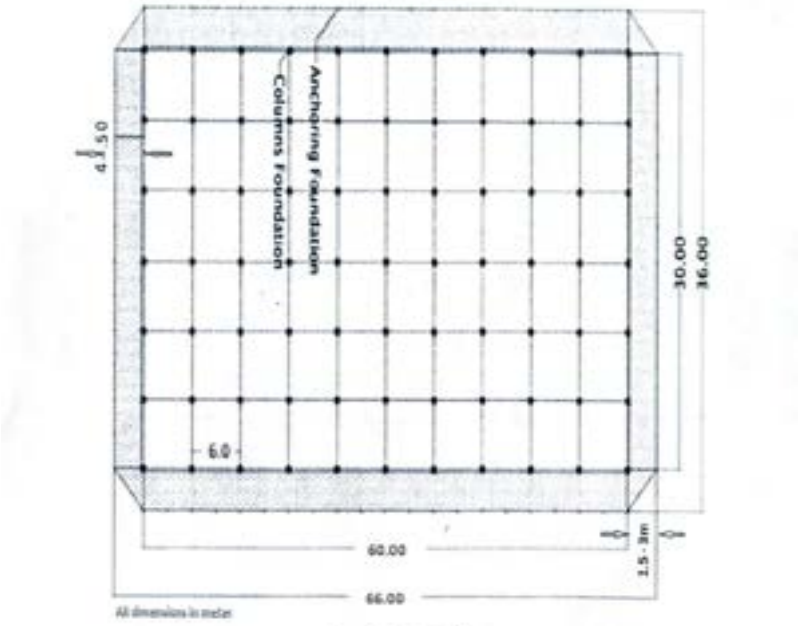
- **Note:** Fogging System: suitable as per the crop, in consist of four wayanti leak fogger 10-28 lph flow rate (working pressure should be mentioned at which it be able to get required particle size, fogger spacing along the lateral and lateral spacing) and particle size 80-100 micron, 16 mm lateral class-3, PVC pipe 6kg/cm2, valves, filter, pump, panel with volt meter, MCB, relay, temp and humidity sensors etc. complete application rate 3mm/hr.

National Committee on Plasticulture Applications in Horticulture (NCPAH)



Gable/parabolic roof type Shadenet house

National Committee on Plasticulture Applications in Horticulture (NCPAH)



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.

4. Suggested technical specifications of polytunnels:

Sr. No.	**Item**	**Indicative Specifications**
I	**Structures: Structure should withstand to 120 km/hour wind velocity, without weld.**	
1.	Main Column	Tubular structure: Size 48 mm [?] 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 mm diameter of spring wire with cold galvanization/enamel coated.
7.	Side wall curtain	1.5 meter andabove 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 UVstabilized white insect net withminimum 120 gsm.
8.	Bottom apron	Woven polythene 160 GSM/200 micron plastic sheet, UV stabilized, 0.50 m 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 plastic films conforming to Indian Standards (IS 15827: 2009).
2.	Insect Proof Net	40-50 mesh and white in colour on both sides of ventilation

		portionwithgsm 120 andUV stabilized
III.	Trellis System	Support Up to 30 kg/m^2 hanging load. Thick GI wire, 2 mm mainwire 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 from, 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 40cm.
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.Assemblywithmanifold,PVCpipe63mm/6kgcm^2,PVCpipe50mm/6kg/cm^2,PEplanelateral16mm,Emittingpipelateral16mm-@0.30 m spacing, hanging type micro sprinkler nozzle (four-way take off assembly) for very fine water particles (anti leak foggers) tobefixedinPEpipeofdiameter16mm,watertankofcapacity 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.

ANNEXURE-3(B)

LIST OF COMPONENT, INDIAN STANDARDS

ANDINDICATIVE SUPPLIER OF MATERIAL

Sr.	Component	Minimum Standard/specification to be followed	Name of Company
1	GI Pipes	**IS 3601:2006** However,2 mm **thickness of pipes can be allowed only for Type-2 structures**	1. TataStructures, 2. Jindal Pipes Ltd.,Mumbai 3. Asian Tubes Ltd.,Gujarat 4. Swastik Pipes Ltd.,Ahmedabad 5. Surya Roshni Ltd. NewDelhi 6. Bhusan Power & Steel Ltd.,UP. 7. APL Apollo Tubes,Gujarat 8. JTL Infra Ltd.,Delhi 9. GI Pipes India Ltd.,UP.
2	Polythene	IS 15827:2009	1. Ginegar,Israel 2. Politive 3. Agripolyane,France 4. PlasticaKritis , (mktd bySPA Bangalore) 5. Hyplast,Belgium 6. Essen Multipack Ltd,Rajkot
3	Shade Net/ Agri Net	IS 16008: 2012	*Refer Note-1*
4	Insect Net	*Refer Note-2*	

5	Fixtures		
(I)	Nuts, Bolts& Washer	**Galvanised- 120 Micron**	Company manufacturing bolts, nuts and washers as per the IS standard
(II)	Clamps	As per the prescribed guideline and the clamps to be used should be galvanized.	GI sheet to be used for clamps should be made from IS standard material to be sourced from: 1. TATA shaktee,Kolkata 2. JSW Steel,Mumbai 3. SAIL, NewDelhi 4. Asian Tubes Ltd,Gujarat 5. Bhushan Steel, NewDelhi
(III)	Brackets & cleats	As per the prescribed guideline for design.	
6	Foundation	As per the prescribed guideline for design.	Cement to be sourced from: 1. Ambuja CementsLtd. 2. Siddhi, Cement Ltd. 3. Ultratech Cement Ltd. 4. J K Lakshmi, 5. Sanghi CementLtd. 6. Binani CementLtd. 7. BirlaCorporation 8. JKcement 9. JP cementetc.

1. *Note-1:* For Shade Net and Agri Net, a majority of the companies are manufacturing the goods as specified in the IS standard, it is learnt that few manufacturers have started process for getting IS standard for their products. At present following Indian companies are having good presence in Domestic market CTM Agrotech, Rishi Tectex, TuflexIndia, Neocorp International Ltd., Essen Multipack Ltd., SatvaAgrishade Net, Kasturi Agro Net, Kwality Nets, Agro net, etc. There are few Importers/Traders who are supplying Shade net/Agri net/Insect net of International Standard in India. The foreign companies such as Polysack, Growell, Meteor Agriculture Nets, etc. are represented by its dealers in thecountry.

2. *Note-2:*

Insect Net Specifications

Mesh	GSM	Yarn Diameter	Knitting Grid	U.V. Life
50 Mesh	130	0.24 mm	50 x 24	5 Yrs
40 Mesh	120	0.24 mm	40 x 24	5 Yrs
25Mesh	130	0.28 mm	25 x 24	5 Yrs

- Variance (+-) range of 3 to 5% in abovespecs.
- Use of Air Circulating Fans is mandatory with 50Mesh InsectNet.

3. *Note-3*

Foreign companies such as Gineagar, Polysack, AgriPolyane etc. are represented by its dealers in the country. For Polythene, majority of the companies are manufacturing the goods as specified in the IS standard, it is learnt that few manufacturers have started process for getting IS standard for their products.

ANNEXURE-4(A)

FORMAT FOR NUMBER OF GREENHOUSE/NET HOUSE/POLY HOUSE/POLY TUNNEL WORK COMPLETED IN LAST THREE YEARS FOR SUBSIDISED CASES

TO WHOEVER IT MAY CONCERN

This is tocertify thatM/s_____has executed greenhouse/nethouse/polyhouse/polytunnelprojectsintheStateof_____as follows:

ProjectExecuted								**(in Nos.)**
Year	**Greenhouse (1)**	**Greenhouse (2)**	**Net house (1)**	**Net house (2)**	**Poly House (1)**	**Poly House (2)**	**Poly Tunnel (1)**	**Poly Tunnel (2)**
2018-19								
2019-20								
2020-21								

Note:

(1.) Name of Beneficiary for whom the Project is executed in the State.

(2) Area of Project

Agency has to submit separately for each state where work is executed.

Name of Authority of State Nodal Agency:

ANNEXURE-4(B)

CA CERTIFICATE FORMAT FOR

NUMBER OF GREENHOUSE/NET HOUSE/POLY HOUSE/POLY TUNNEL

WORK COMPLETED IN LAST THREE YEARS FOR <u>NON-SUBSIDISED</u>

<u>CASES</u>

TO WHOEVER IT MAY CONCERN

This is tocertify thatM/s_____has executed greenhouse/nethouse/polyhouse/polytunnelprojectsintheStateof_____as follows:

Project Executed (in Nos.)				
Year	**Greenhouse (1)**	**Net house (1)**	**Poly House (1)**	**Poly Tunnel (1)**
2018-19				
2019-20				
2020-21				

Note: No. of projects executed yearwise

ANNEXURE-5 (A)

PRICE OFFER FOR DIFFERENT TYPE AND SIZE OF STRUCTURES AS PER ANNEXURE -3(A), 3(B) and 3(C)

EOI Notice No.:262/WBSFPHDCL/1770/2020-21 Date: 19.02.2021

To:

The Managing Director

West Bengal State Food Processing & Horticulture Development Corporation Limited

Benfish Tower, Kolkata – 700 091

Dear Sir:

I/ We hereby offer best price to the farmer for construction of poly house, Net house, Polythene, Net, Fogger & Misting system and MI system as per the Terms of Reference given in this EOI Document. The rates are quoted in the prescribed format given below:

(Amount in Rs. lakh)

Sr.	Particular	500 Sqmtr	1000 Sqmtr	2000 Sqmtr	4000 Sqmtr
1	**Greenhouse – Naturally Ventilated (Type-1)**				
(a)	Structure				

(b)	Polythene (polythene along with installation mechanism)				
(c)	Shade Net (shade net, curtains, insect screen along with installation mechanism)				
(d)	Fogging System				
(e)	Misting System				
(f)	MI system				
(g)	Agronomical Services				
	Total Cost in Rs. Lakhs				
2	**Net house with Gable roof (Type-1)**	**500 Sqmtr**	**1000 Sqmtr**	**2000 Sqmtr**	**4000 Sqmtr**
(a)	Structure				
(b)	Shade Net (shade net, curtains, insect screen along with installation mechanism)				
(c)	Fogging system				

(d)	Misting system				
(e)	MI system				
(g)	Agronomical Services				
	Total Cost in Rs. Lakhs				
3	**Net house with Flat roof (Type-1)**	**500 Sqmtr**	**1000 Sqmtr**	**2000 Sqmtr**	**4000 Sqmtr**
(a)	Structure				
(b)	Shade Net (shade net, curtains, insect screen along with installation mechanism)				
(c)	Fogging system				
(d)	Misting system				
(e)	MI system				
(g)	Agronomical Services				
	Total Cost in Rs. Lakhs				
4	**Greenhouse – Naturally Ventilated (Type-2)**	**500 Sqmtr**	**1000 Sqmtr**	**2000 Sqmtr**	**4000 Sqmtr**
(a)	Structure				

(b)	Polythene (polythene along with installation mechanism)				
(c)	Shade Net (shade net, curtains, insect screen along with installation mechanism)				
(d)	Fogging System				
(e)	Misting System				
(f)	MI system				
(g)	Agronomical Services				
	Total Cost in Rs. Lakhs				

5	**Net house with Gable roof (Type-2)**	**500 Sqmtr**	**1000 Sqmtr**	**2000 Sqmtr**	**4000 Sqmtr**
(a)	Structure				
(b)	Shade Net (shade net, curtains, insect screen along with installation mechanism)				

(c)	Fogging system				
(d)	Misting system				
(f)	MI system				
(g)	Agronomical Services				
	Total Cost in Rs. Lakhs				
6	**Net house with Flat roof (Type-2)**	**500 Sqmtr**	**1000 Sqmtr**	**2000 Sqmtr**	**4000 Sqmtr**
(a)	Structure				
(b)	Shade Net (shade net, curtains, insect screen along with installation mechanism)				
(c)	Fogging system				
(d)	Misting system				
(f)	MI system				
(g)	Agronomical Services				
	Total Cost in Rs. Lakhs				
7	**Poly Tunnel (Walk in Tunnels)**	**800 Sqmtr**			
(a)	Structure				
(b)	Shade Net (shade				

	net, curtains, insect screen along with installation mechanism)				
(c)	Fogging system				
(d)	Misting system				
(f)	MI system				
(g)	Agronomical Services				
	Total Cost in Rs. Lakhs				

Note:

☐ The price offer quoted is inclusive of all taxes.

☐ The price offer is inclusive of cost of material, foundation, civil work, fabrication, installation, commissioning, transportation, labour and miscellaneous expenditure upto project completion. The required power and water is to be provided byfarmer.

☐ Structure: The cost of structure includes all item except the sub-items (b), (c), (d), (e), (f) and (g) of Sr.1 to 7 in the above price offer format.

☐ The offer price of the different protected structures should not exceed the cost norms of MIDH Scheme.

Signature of Agency

ANNEXURE-7

FORMAT FOR PERFORMANCE GUARANTEE

(On Non-Judicial Stamp Paper)

To be stamped according to Stamp Act and to be in the name of the executing Bank

To:

The Managing Director

West Bengal State Food Processing & Horticulture Development Corporation Limited

Benfish Tower, Kolkata – 700 091

In consideration of the Managing Director, West Bengal State Food Processing & Horticulture Development Corporation Limited, having its registered office at 6th Floor, Benfish Tower, Sector-V, Salt Lake, Kolkata – 700 091 (hereinafter called the "Authority" which expression shall unless repugnant to the subject or context include its administrators successorsandassigns)havingagreedunderthetermsandconditionsoftheAwardLetterbearingNo_ dated _____issued by the Authority, which has beenunequivocallyaccepted by the Agency(refer NOTE below)work of _____(hereinaftercalledthesaidContract)toacceptaDeed of Guarantee as herein provided for Rs. _____(Rupees _____only) from a Bank, in lieu of the security deposit to be made by the Agency or in lieu of the deduction to be made from the Agency's bill, for the due fulfillment by the saidAgencyofthetermsandconditionscontainedinthesameContract.We _____the

_____(hereinafterreferredtobe"thesaidBank"andhavingourregisteredofficeat do hereby undertake and agree to indemnify and keep indemnified to the Authority from time to time to the extent of Rs._____(Rupees _____only) against any loss or damage, costs charges and expenses misused to or suffered by or that may be caused to or suffered by the Authority by reason of any breach or breaches by the agency and to unconditionally pay the amount claimed bythe Authority on demand and without demand to the extent aforesaid. We,

_____Bank, further agree that the Authority shall be the sole judge of and as to whether the said Agency has committed any breach or breaches of any of the terms and conditions of the said Contract and the extent of loss, damage, costs, charges and expenses caused to or suffered by or that may be caused to or suffered by the Authority on account thereof and the decision of the Authority that the said Agency has committed such breach or breaches and as to the amount or amounts of loss, damage, costs charges and expenses caused to or suffered by or that may be caused to or suffered by the Authority from time to time shall be final and binding onus.

1) We, the said Bank, further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said contract and till all the dues of the Authority under the said Contract or by virtue of any of the terms and conditions governing the said Contract have been fully paid and its claims satisfied or discharged and till the owner certifies that the terms and conditions of the said Contract have been fully and properly carried out by the Agency and accordingly discharges this Guarantee subject, however, that the Authority shall have no claim under the Guarantee after 180 (One Hundred Eighty) days from the date of expiry of the contract period.

2) The Authority shall have the fullest liberty without affecting in any way the liability ofthe Bank under this Guarantee or indemnity, from time to time to vary any of the terms and conditions of the said contract or to extend time of performance by the said Agency or to postpone for any time and from time to time any of the powers exercisable by it against the said Agency and either to enforce or forbear from enforcing any of the terms and conditions governing the said contract or securities available to Authority and the said Bank shall not be released from its liability under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the said Agency or any other forbearance, act or omission on the part of the Authority or any indulgence by the Authority to the said Agency or any other matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so releasing the Bank from its such liability.

3) It shall not be necessary for the Authority to take legal action against the Agency before proceeding against the Bank and the Guarantee herein contained shall be enforceable against the Bank, notwithstanding any security which the Authority may have obtained or obtain from the Agency shall at the time when proceedings are taken against the Bank hereunder be outstanding orunrealised.

4) We, the said Bank, lastly undertake not to revoke this Guarantee during its currency except with the previous consent of the Authority in writing and agree that any change in the Constitution of the said Agency or the said Bank shall not discharge our liability hereunder. If any further extension of this Guarantee is required the same shall be extended to such required periods on receiving instructions from M/s. on

whose behalf this guarantee isissued.

For and on behalf of (the bank)

Signature_____

Name&Designation

_____A

uthorisationNo.

Date and Place

Bank Seal

The above guarantee is accepted by the Authority.

NOTES

FOR PARTNERSHIP CONCERNS

M/s._____apartnershipfirmwithitsoffice_____(hereinafter called "the said Agency" which expression shall unless the context requires otherwise include their heirs, executors, administrators and legal representatives); the name of their partnersbeing

1) Shri_____S/o

2) Shri_____S/o

FOR COMPANIES

M/s._____a company registered under the Companies Act 1956 and having its registered office in the State of_____(hereinafter called "the said Agency" which expression shall unless the context requires otherwise include its administrators, successors andassigns).

FOR TRUST

M/s._____a company registered under the Bombay Public Trust Act 1850 and havingitsregisteredofficeintheStateof_____(hereinafter called "the said Agency" which expression shall unless the context requires otherwise include its administrators, successors andassigns).

FOR SOCIETIES

M/s._____a company registered under the Societies Registration Act, 1860 and havingitsregisteredofficeintheStateof_____(hereinafter called "the said Agency" which expression shall unless the context requires otherwise include its administrators, successors andassigns)

ANNEXURE – 8

PROFORMA OF GENERAL POWER OF ATTORNEY

(To be signed and executed on non- judicial Stamp Paper of Rs. 10/-)

Be it known all to whom it concern that:

1. Shri/Smt_____ S/O_____
   Residingat_____

2. Shri/Smt_____ S/O_____
   Residingat_____

3. Shri/Smt_____S/O_____
   Residingat_____

I/ We all the Partners/ Directors/ Board members/ trustees/ Executive council members/ Leaders of M/S_____having its registered officeat _____HerebyappointSri_____S/O_____ residingat

_____as my/our attorney to act my/our name and on behalf and sign and execute all Documents/ Agreements binding the firm for all contractual obligations (including reference of cases to arbitrators) arising out of contracts to be entered into by the company/ Corporation/ society/ trust/ firm with theOfficeof .....(Authority), KrishiBhavan, Sector-10-A, Gandhinagar -382010 in connection with its EOI no. _____dated_____

For_____due foropeningon_____.

Inshort,heisfullyauthorizedtodoall,eachandeverythingrequisitefortheabovepurpose concerning M/s_____and I/We hereby agreeto confirm and ratify his all and every act of this or any documents executed by my/ our said Attorney within the scope of the authority hereby conferred on him including references of cases to arbitration and the same shall be binding on me/ us and my/ our company/ Corporation/ society/ trust/ firm as if the same were executed by me/ us individually orjointly.

Witness(Withaddress)

Signature of the Partners/ Directors/ Board Members Executives/ Trustees/ Councilmembers

1)

2)

3)

ANNEXURE-9

DETAILS OF COMPETENT PERSONNEL

Sr.	Name of Person	Qualification	Exp. in years in providing agronomical services	Contact No.	Signature
1					

ANNEXURE-10

Draft Format of Work Order To Be Given To Empanelled Agency By Farmer

To,

M/s_____

_____
_____

Sub: Work Order for Construction of Greenhouse/Polyhouse/Net house on turnkey basis along with Agronomical services for three years

Ref: 1. The List of Empanelment published Vide Directorate of Horticulture Letter No.---------- --.

2. Scope of Work and Terms and Condition of theEmpanelment.

3. Your visit to the siteDated----------

1 YourofferDated ---------- for construction of Greenhouse/Net house/ Poly house along with the quotation submitted on the basis of price structure of empanelment.

Dear Sir:

In reference to the above herewith I am confirming and placing an order for construction of greenhouse/poly house /net house at my farm located at Survey no.__, Village_____, Block_____, Dist._____, West Bengal. The other details are givenbelow:

Sr. No.	**Particular**	
1	Name of Farmer	
2	Contact Address:	
3	Contact Nos:	
4	Category	
5	Type/Category of Net House /PolyHouse/Poly Tunnel	
6	Area ofNet House / Poly House/Poly Tunnel	
7	Name of Crops proposed.	
8	Required Documents as attached	
9	Other specific Issues	

Price and Payment Condition:

Sr.	Item Name	Total Price (Amt. in Rs.)	Total Price as per Empanelment (Amt. in Rs.)	Remarks
1	Structure			
2	Polythene			
3	Net			
4	Fogging/Misting System			
5	MI system			
6	Agronomical Services			
	Total			

The other terms and condition will remain as per the terms and condition of your empanelment.

Thanking you,

(_____)

Name of beneficiary _____

Address _____

Mobile: _____

ANNEXURE-11

TO WHOM SO EVER IT MAY CONCERN

CHARTERED ACCOUNTANT CERTIFICATE

On the basis of verification of books of accountants and other documents produced before us and maintained by the Company, we certify that M/s _____is engaged in construction of greenhouse/net house/poly house/poly tunnel. This is to certify that they have turn over from construction activities of greenhouse/net house/poly house/poly tunnel as under for the last 3years.

Sr. No	**Financial Year**	**Turnover (in Rs. Lakhs)**
1	2018-19	
2	2019-20	
3	2020-21	
	Avg. of above	

Section-2 : Components of Green House and General Specifications

In case of permanent poly-house structure steel and fiber made glass are galvanized hallow pipe-having glass or transparent polythene sheet structure is needed. Major Components are listed here below:

Roof: transparent cover of a green house.

Gable: transparent wall of a green house

Cladding material: transparent material mounted on the walls and roof of a green house.

Rigid cladding material: cladding material with such a degree of rigidity that any deformation of the structure may result in damage to it. Ex. Glass

Flexible cladding material: cladding material with such a degree of flexibility that any deformation of the structure will not result in damage to it. Ex. Plastic film

Gutter: collects and drains rain water and snow which is place at an elevated level between two spans.

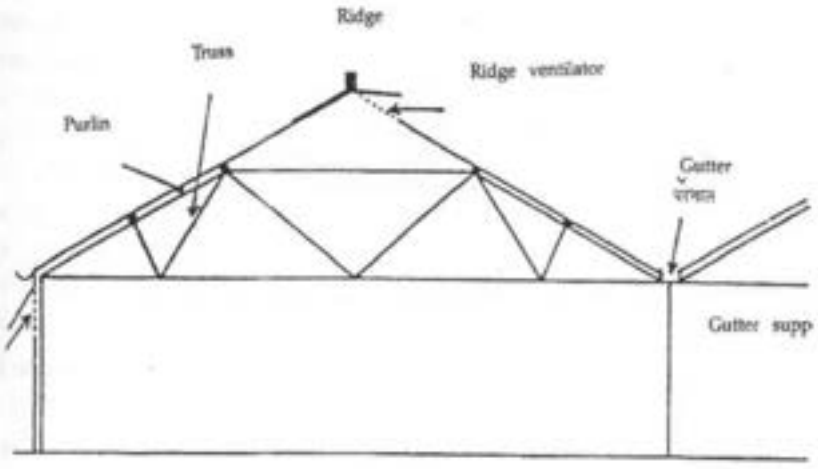
Column: vertical structure member carrying the green house structure

Purlin: a member who connects cladding supporting bars to the columns

Ridge: highest horizontal section in top of the roof

Girder: horizontal structure member, connecting columns on gutter height

Bracings: To support the structure against wind



TECHNICAL STANDARDS FOR POLY HOUSE AND NET HOUSE

Arches: Member supporting covering materials

Foundation pipe: Connection between the structure and ground

Span width: Center to center distance of the gutters in multispan houses

Green house length: dimension of the green house in the direction of gable

Green house width: dimension of the green house in the direction of the gutter

NEED FOR FIRMING UP TECHNICAL STANDARDS OF GREEN HOUSE:- Depending upon various factors viz. Location, crop, budget, size, requirement etc, variable specifications of various components involved in construction of Green House/ Net House are being used. A large number of such Green Houses/ Net Houses have come up with heavy subsidies from Government, Both Central and State including NHB, and loans from Financial Institutions. There are numerous cases of failure of Poly House/ Net House Structures due to use of sub-standard material or non- compliance of Minimum Technical requirement needed for setting up such structure resulting into heavy loss to the beneficiary and also defeating the purpose of providing assistance. This necessitates the need of firming up of Minimum Technical Standards for various types of Poly House / Net Houses with the help of various Stake Holders.

Technical Standards in vogue : Some of the standards being followed for construction of Green Houses are as under :

Indian Standard:- The Bureau of Indian Standards (BIS) has formulated following standards with respect to Poly-House/Green Houses:-

1. IS 14462:1997 - Recommendation for layout, design and construction of green house.
2. IS 14485:1998 – Recommendations for heating, ventilating and cooling of green-house.
3. IS 15827: 2009 – Plastics films for Green house

Section-3: Technical Standards of Naturally Ventilated Polyhouse/Greenhouse

<table>
<tr><th>Sr.No</th><th>Item</th><th>General Specifications</th></tr>
<tr><td>1</td><td>Type</td><td>• Minimum top ventilation should be 10% of total Polyhouse/Greenhouse area and side ventilation depends on requirement of the climatic conditions.
• Preferably Saw tooth design or Even Span, Ridge & Furrow depending upon suitability for naturally ventilated polyhouse/greenhouse</td></tr>
<tr><td>2</td><td>Size</td><td>Area = As per the requirement.
Length = Multiples of 8 Meter + 4 Meter. Ex. 8x2+4 or 8x3+4. (Length is side along the gable or side along the truss lines)
Width = Multiples of 4 Meter. Ex. 4x2 or 4x3. (Width is side along the gutter or side along the Purlin lines)</td></tr>
<tr><td>3</td><td>Grid</td><td>8M x 4M. 2 Meter corridors/balcony along all four sides.
If the area is ≤250 Sq m then it is better to go for single span green house</td></tr>
<tr><td>4</td><td>Shape</td><td>To reduce the impact of wind and consequent damage to greenhouse structure; Green house will be aero dynamic along all four sides with curvature shaped balcony pipes of 48 mm OD/2 mm thick G I pipes</td></tr>
<tr><td>5</td><td>Structure</td><td>Hot Dip Galvanized Tubular Structure. Galvanization of the structural members of BIS standards should not be less than 300 GSM (grams per square meter).</td></tr>
<tr><td>6</td><td>Stability of Structure</td><td>Structure should withstand to minimum wind velocity of 80.6 miles per/hr or 130 Km/hr or 36 Meter per second.
Note:- In case of high wind velocity zones, structure should withstand wind velocity upto 94 miles per/hr or 150 Km/hr or 42 Meter per second.</td></tr>
<tr><td>7</td><td>Sizes of the structural members</td><td>Refer sequence as =
<table>
<tr><th>Members Name</th><th>Outside Diameter (mm)</th><th>Thickness (mm)</th><th>Wt. per meter length (kg)</th></tr>
<tr><td>Columns</td><td>76</td><td>2</td><td>3.75</td></tr>
<tr><td>Top Purlins</td><td>48</td><td>2</td><td>2.30</td></tr>
<tr><td>Gutter Purlins</td><td>42</td><td>2</td><td>2.10</td></tr>
<tr><td>Top Arches of the truss</td><td>42</td><td>2</td><td>2.10</td></tr>
<tr><td>Bottom Chord of the truss</td><td>60</td><td>2</td><td>2.85</td></tr>
<tr><td>Internal Bracings of the truss</td><td>33</td><td>2</td><td>1.60</td></tr>
<tr><td>Coridors/Balconies</td><td>60</td><td>2</td><td>2.85</td></tr>
<tr><td>Curtain Runner</td><td>42</td><td>2</td><td>2.10</td></tr>
<tr><td>Flap control pipe</td><td>21</td><td>2</td><td>1.08</td></tr>
<tr><td>Curtain Shaft</td><td>27</td><td>2</td><td>1.30</td></tr>
<tr><td>Cross Bracing</td><td>33</td><td>2</td><td>1.60</td></tr>
<tr><td colspan="4">Not:- Welded pipes should not be used for structure erection except bottom pipe of 8 m length.</td></tr>
</table></td></tr>
</table>

8	Fixtures to join structural Members	Different type of fixtures are used to join structural members of poly-house like brackets, cleats, clamps, nut & bolts, washers, self tapping & drilling screw etc. The entire iron fixture should be galvanized and strong enough.
	a) Brackets and cleats	Made from the section like angle, channel, I beams and should be cold galvanized with minimum coat of 120 GSM
	b) Clamps	Different type of clamps like 76/60/48/42/33 mm OD full, 76/60/48/42/33 mm OD half are used which should be made from min. 42 mm wide and 2.1 mm thick GP Coil having minimum 120 GSM Galvanization. Curtain clamp should be made from high carbon steel strips of min.30mmwide and 0.8mm thick. Such clamp should have proper spring action so that after fixing at the place they should not change the location.
	c) Nut, bolt and Washers	From M12 to M6 Bolts, Nuts, washers should be used and they should be cold galvanized with min. 120 GSM Coat.
	d) Self tapping and drilling Screw	These screws should be used to assure extra safety. They prevent dislocation of clamps from its place. Distance between tapping screw specially for fixing profile to gutter should be 30-40 cm.
9	Gutter	Gutter should be made of Galvanized sheet of 2 mm thickness in trapezoidal shape having 500 mm wide perimeter (Preferably of single length without joint) Coil having 120 GSM Galvanization. It should be leak proof. Min. 1% slope required for the gutter. Assure uniform slope to gutter to avoid stagnant water in gutter to achieve maximum life of gutter. Gutter Orientation – North- south and may change according to wind direction.
	(a) Gutter Height	Gutter height should be 4 to 4.5 meter from foundation formation level
10	Ridge Height	Ridge height should be 6 to 6.5 meter from foundation formation level.
12	Arches Overlap	Minimum overlap of top arch over second (small) arch should be 600mm to avoid direct rain entrance into the greenhouse from the vent.
13	Foundations	Pit size should be min.450mm dia. Depth 750 to 900mm or suitably altered depending upon Ground strata / level so as to ensure safety and stability of the structure even under extreme wind conditions. Columns are fitted over ground "Inserts" and bolted to Insert pipe of 60 mm OD/3mm thick G I Pipe. Length of Insert 1200 to 1300 mm. & filling the pit with 1:2:4 concrete hand mixed with appropriate Grade cement.

		Before doing the line out for the foundation, ensure that slope of greenhouse ground along the gable should be 0% to 1% and along gutter min. 1% and max. 3%. If slope of ground exceeds this limit then ask grower to do the land development and maintain the slopes of the ground within the limits. Slope along the gable and gutter should be uniform. If developed ground has filling depth more than 200 mm then ask grower to do the flooding of water over the ground so that it should settle down. If the flooding is not done then there are chances of foundation piercing into the ground after application of structural load even foundation may dislocate.
14	Civil Works	Cement concrete 1:2:4 blocks of size 30 cm x 30 cm x 80 cm for embedding vertical pipe/poll in brick work for wall around poly house will be 23 cm thick, 0.5 meter high (0.3 m below GL and 0.2 m above GL) in cm 1:6 with 10 cm thick with PCC 1:4:8 in foundation of wall. Wall will be plastered in cm 1:4 on top and sides. 80 cm to 1m wide and 10cm thick footpaths made of cement concrete ratio of 1:2:4 should be provided
15	Curtain opening	In general temperature inside the poly-house is more than ambient. To reduce the inside poly-house temperature increase, side ventilation, minimum 20% of floor area is necessary. Minimum 1.5m clear side curtain opening is required. Side curtain should have min. 200mm overlap to the bottom apron. This overlap is necessary to avoid direct entrance of rain into the greenhouse and also to stop direct air entry in the nights.
16	Bottom Apron	To tap the CO_2 inside the greenhouse, bottom apron is necessary. It should have min.0.6m height from the ground and max 1.5 meter depending upon the crop and climatic conditions.
17	Doors	Double door entry, Doors should be made of form FRP Sheets or polycarbonate sheets. Opening and closing is either hinged or sliding. Min. width of door should be 1M and min height 2M.The door area should have 50 mm PCC Flooring over 75 mm thick sub base.
18	Top Shading and Side shading	Top shading can be done by using following material: a) Shading net: Shading net made from HDPE should be used. The selection of shade net depends upon the selection of crops grown and the light spectrum. It should not be more than 50% shade factor. It should be UV stabilized so that it should last long for min. three years. GSM should be minimum 100. Opening and closing arrangement either manual or auto should be provided to the shading net to increase its utility.

		b) Thermal screen/Aluminate: This is better option to create the shading. It reflects the light back and by the means controls the temperature also. This defuses the light also. This is made from HDPE with hot dip aluminium coating. Minimum GSM should be 100 and minimum aluminium coating should 25 micron. Opening and closing arrangement either manual or auto should be provided to the thermal screen to increase its utility. Side Shading: Shade net of 35% should be used to create side shading. This is useful to avoid direct entry of sunlight into the polyhouse/greenhouse when curtain is open. Minimum GSM should be 75. or Use of 40mesh UV stabilized insect proof net is also recommended to protect direct entry of insects into the polyhouse/greenhouse. This should have minimum 100 GSM weight. The shade factor (opening) in colour shadenet depends on the spectrum of light through which light is passing through. So right kind of shadenet is major challenge that depends on grower's choice as well to take advice from the experts. The manually operated crank mechanism should be provided for expending and retracting the shadenet.
19	Polythene	Technical Specifications of polythene should be as per Indian standard (IS 15827: 2009) To select the proper film for poly-house is very important and which have direct relation with quality of the crop as well quantity of the produce. Polythene should be properly UV stabilized and pro rated warranted for at least three years. Thickness of polythene should be minimum 200 micron (0.2mm). Polythene quantity accommodate maximum 5.4 sq. meter area in its 1 Kilogram weight. (For example, 5.5m x 100 m polythene roll should have minimum weight of 5.5x100/5.4 = 101.85 Kg or 4.5m x 100m one roll should have minimum weight of 4.5x100/5.4= 83.33 Kg.). **Options in green house film:** Compulsory Properties: *UV stabilization *Diffusion/Clear (Light Transmission) Optional Properties: *UV Blocking /Antivirus *Sulphur Resistant *Thermic

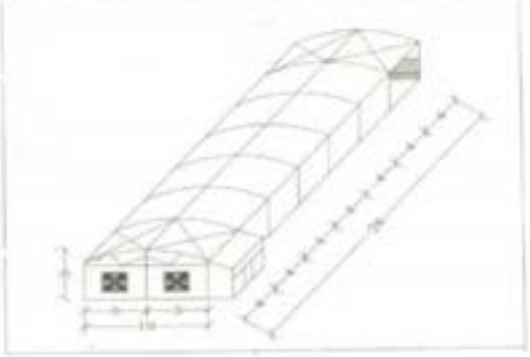
19.	Polythene	*Anti Drip *Anti Mist *Anti Dust Manufacturing Process: Three Layer/Five layer NHB also recommends (not mandatory) polythene with gas bubbles inside because in India high temperature is the problem in front of maximum growers. Our crop wise recommendation of minimum properties of polythene is: 1. Dutch Roses: 200 micron thick, UV Stabilized, UV Blocking (Not for bi color roses), anti dust, anti sulpher, with cooling effect. Light diffusion should be maximum (upto 75%) but it should not be less than 50%. 2. Gerbera, Coloured Capsicum, Anthurium and orchids: 200 micron thick, UV Stabilized, anti dust, with cooling effect. Light diffusion should be maximum (upto 75%) but it should not be less than 50%. 3. Carnation: 200 micron thick, UV Stabilized, anti dust, with cooling effect. Where altitude is high polythene should be with IR protection.
20	Aluminum Profile/ Poly fixing	C type profile made from Alloy Aluminum should have - high strength with light weight – (approx 220-250 gm/rmtrs), smooth edges, curve bottom proper for 1.25" to 3" pipes, Proper Channel for spring and suitable for double spring locking 0.9mm thick. Self Drilling Screw should be fixed on profile every 40 cm along the full length of the profile.
21	Spring Insert	A plastic coated GI wire spring of 2.2mm diameter, having good elasticity should be used for longer life that transferring less heat to the cladding materials as plastic films or shade net. If we are using GI spring it is better to use a two inch strip of new poly film to be placed over the main plastic in the profile and then lock it with GI profile. This will help in longer life of the plastic as the rusted spring will not directly come in contact with the main plastic. All spring must end inside the profile. Any spring outside profile must be either fixed inside or should be cut so that it does not damage the plastic in strong wind as it will initiate all the plastic being pulled out of profile.

22	Air circulation by 'air circulating fans':	In hot and humid climate, when ambient temperature and humidity are in higher side, it is very natural that both these factors have a tendency to increase further inside a greenhouse. Under such condition 'air-circulating fans' inside the greenhouse will do a good job to reduce the harmful effect of high humidity and temperature on plant. The increased airflow inside the plant canopy reduces the leaf temperature and disperses the high humidity around leaves, which maintain the transpiration pull of crop. This will work best when coupled with exhaust fans that will throw out the accumulated hot and humid air. In cool climate, during winter when the greenhouse is heated, you need to maintain air circulation in such a way that temperature remains uniform throughout the greenhouse. Without air mixing fans, the warm air rises to top and cool air settles around the plants on the floor. During rainy season, when humidity is high and high ambient temperature cools down due to rain, this air circulating fans may be used judicially to disperse the higher humidity around plant canopy. Small fans with a cubic-foot-per-minute (ft3/min) air-moving capacity of one quarter of the air volume of greenhouse are sufficient. Place the fans in diagonally opposite corners but out from ends and sides. The goal is to develop circular (oval) pattern of air movement. Operate fans continuously during required period of a day.

General Conditions:

1. Green house structural design should be sound enough to withstand wind speed of 130 km/hr.
2. The companies should be asked to get their structural design verified from the structural engineer because the proposed design is based on the functional requirements and field experience.
3. The firm should guarantee for free maintenance/damage to the structural material for ONE year.
4. The firm should be able to construct the entire green house within eight weeks of the issue of work order.

Section-4 : Fan & Pad Controlled Poly-houses



Fan and pad

Selection of fan

The fans should deliver the required air at 15mm static pressure. The maximum center to center spacing between the two fans should be of 7.5m. The height of the fans is to be determined based on the plant height which is proposed to be grown in the greenhouse. The fan blades and frame are to be made of non-corrosive materials like aluminum/stainless steel.

Design

The cross fluted cellulose pad is preferred. These are available mostly in 100mm thickness. One meter of pad height is given for every 20m of pad to fan distance. However, the fan to pad distance should not exceed 60m. The air flow rate should be of 75 cubic meter/minute/sq.m of pad. The water flow rate should be of 9 litres per minute/linear meter pad. The uniform distribution of water on pad is to be maintained.

Type 2:- Technical Standard of Fan and Pad cooling system Green House: With Fan Pad / Fogging System:

<table>
<tr><th>Sr.No.</th><th>Item</th><th>Departmental Description</th></tr>
<tr><td>01</td><td>Size ;</td><td>According to requirement (As given in page no. 13)</td></tr>
<tr><td>02</td><td>Shape</td><td>- Aero Dynamic along all four sides with curvature shaped hockey pipes of 48.0 mm OD G.I. Pipes with a view to reduce the impact of wind and consequent damage of Poly House Structure.
- Gutter Orientation – North South and may change according to wind direction.
- PAD should be in Wind direction and must have covered elevated balcony for shade.</td></tr>
<tr><td>3.</td><td>Structure</td><td>Hot Dip Galvanized Tubular Structure of BIS standards. Galvanization of the structural members should not be less than 300 GSM (grams per square meter).</td></tr>
<tr><td></td><td>Withstand to Wind Velocity</td><td>Structure should withstand to minimum wind velocity of 80.6 miles per/hr or 130 Km/hr or 36 Meter per second.
Note:- In case of high wind velocity zones, structure should withstand wind velocity upto 94 miles per/hr or 150 Km/hr or 42 Meter per second.</td></tr>
<tr><td></td><td>Sizes of the structural members</td><td>
<table>
<tr><th>Members Name</th><th>Outside Diameter (mm)</th><th>Thickness (mm)</th><th>Wt. per meter length (kg)</th></tr>
<tr><td>Columns</td><td>76</td><td>2</td><td>3.75</td></tr>
<tr><td>Top Purlins</td><td>48(Ridge)</td><td>2</td><td>2.30</td></tr>
<tr><td>Gutter Purlins</td><td>42/43 (Centre)</td><td>2</td><td>2.10</td></tr>
<tr><td>Top Arches of the truss</td><td>42</td><td>2</td><td>2.10</td></tr>
<tr><td>Bottom Chord of the truss Horizontal (G I pipe)</td><td>60</td><td>2</td><td>2.65</td></tr>
<tr><td>Top chords and trusses member</td><td>48/43</td><td>2</td><td>2.30/2.10</td></tr>
<tr><td>Internal Bracings of the truss – Pipe structural members to be fitted in plated nuts, bolts and washers without welding</td><td>33</td><td>2</td><td>1.60</td></tr>
<tr><td>Coridors/Balconies</td><td>60</td><td>2</td><td>2.65</td></tr>
<tr><td>Curtain Runner</td><td>42</td><td>2</td><td>2.10</td></tr>
<tr><td>Flap control pipe</td><td>21</td><td>2</td><td>1</td></tr>
<tr><td>Curtain Shaft</td><td>27</td><td>2</td><td>1.30</td></tr>
<tr><td>Cross Bracing</td><td>33</td><td>2</td><td>1.60</td></tr>
<tr><td colspan="4">Not:- Welded pipes should not be used for structure erection except bottom pipe of 8 m length.</td></tr>
</table>
</td></tr>
</table>

	Columns	76 OD, 2mm thick
	Purlin	48 mm OD/2.0 mm thick at ridge and 42/43 mm OD/2 mm thick for centre
	Trusses	Bottom horizontal 60 mm OD/2 mm thick G.I. Pipe, top chords and truss members 48 mm OD/ and 43 mm OD 2.0 mm thick Bracing 32 mm OD/1.8 mm thick G.I. Pipe structural members to be fitted in plated nuts, bolts and washers without welding.
	Clamps and Nut Bolts	Well Compatible GI Clamps < 120 GSM, 2 mm thickness.
4.	Grid Size	- 8 m x 4 m (Ideal size), - Size can be less depending upon space availability but not more 8m x4m grid size.
5.	Balcony and Corridor	2 meter wide, vertical/curved pipe-60 mm OD/2 mm thick G.I Pipe with 32 mm OD/1.8mm thick horizontal GI pipe as supporting pipe. Area covered by corridors should not be included while calculating the area under poly house.
6.	Foundation	Pit size should be min.450mm dia. Depth 750 to 900mm or suitably altered depending upon Ground strata / level so as to ensure safety and stability of the structure even under extreme wind conditions. Columns are fitted over ground "Inserts" and bolted to Insert pipe of 60 mm OD/2mm thick G I Pipe. Length of Insert 1200 to 1300 mm. & filling the pit with 1:2:4 concrete hand mixed with appropriate Grade cement. Before doing the line out for the foundation, ensure that slope of greenhouse ground along the gable should be 0% to 1% and along gutter min. 1% and max. 3%. If slope of ground exceeds this limit then ask grower to do the land development and maintain the slopes of the ground within the limits. Slope along the gable and gutter should be uniform. If developed ground has filling depth more than 200 mm then ask grower to do the flooding of water over the ground so that it should settle down. If the flooding is not done then there are chances of foundation piercing into the ground after application of structural load even foundation may dislocate.
7.	Gutter	should be made of Galvanized sheet of 2 mm thickness in trapezoidal shape having 500 mm wide perimeter (Preferably of single length without joint) Coil having 120 GSM Galvanization. It should be leak proof. Min. 1% slope required for the gutter. Assure uniform slope to gutter to avoid stagnant water in gutter to achieve maximum life of gutter.

		Gutter Orientation – North- south and may change according to wind direction.
	(a) Gutter Height	4 m to 4.5 m
	(b) Gutter Slope	1 to 1.5% to be provided in civil structural work
	Ridge Height/Centre Height	Minimum 5 to 6.5 meter.
8.	Fasteners	Cold Galvanized well compatible M6 to M10 bolts & nuts, 50 to 150 mm long with plain washers as per requirement and with the best quality plating to have good anti-corrosiveness.
9	Poly film	Technical Specifications of polythene should be as per Indian standard (IS 15827: 2009) To select the proper film for poly-house is very important and which have direct relation with quality of the crop as well quantity of the produce. Polythene should be properly UV stabilized at least three years. Thickness of polythene should be minimum 200 micron (0.2mm). **Options in green house film** Compulsory Properties: *UV stabilization *Diffusion/Clear (Light Transmission) Optional Properties: *UV Blocking /Antivirus *Sulphur Resistant *Thermic *Anti Drip *Anti Mist *Anti Dust Manufacturing Process: Three Layer/Five layer Our crop wise recommendation of minimum properties of polythene is: 1. Dutch Roses: 200 micron thick, UV Stabilized, UV Blocking (Not for bi color roses), anti dust, anti sulpher, with cooling effect. Light diffusion should be maximum (upto 75%) but it should not be less than 50%.

		2. Gerbera, Coloured Capsicum, Anthurium and orchids: 200 micron thick, UV Stabilized, anti dust, with cooling effect. Light diffusion should be maximum (upto 75%) but it should not be less than 50%. 3. Carnation: 200 micron thick, UV Stabilized, anti dust, with cooling effect. Where altitude is high polythene should be with IR protection.
10	Thermal Net	30 to 50%, alluminate/thermal net as per requirement - Minimum 100 GSM - Power operated crank mechanism should be provided for expanding and retracting the shade net.
11	Poly fixing	C type profile made from Alloy Aluminum should have - high strength with light weight – (approx 220-250 gm/rmtrs), smooth edges, curve bottom proper for 1.25" to 3" pipes, Proper Channel for spring and suitable for double spring locking 0.9mm thick. Self Drilling Screw should be fixed on profile every 40 cm along the full length of the profile.
12	Spring Insert	A plastic coated GI wire spring of 2.2mm diameter, having good elasticity should be used for longer life that transferring less heat to the cladding materials as plastic films or shade net. If we are using GI spring it is better to use a two inch strip of new poly film to be placed over the main plastic in the profile and then lock it with GI profile. This will help in longer life of the plastic as the rusted spring will not directly come in contact with the main plastic. All spring must end inside the profile. Any spring outside profile must be either fixed inside or should be cut so that it does not damage the plastic in strong wind as it will initiate all the plastic being pulled out of profile
13	Entrance	Double door entry, Doors should be made of form FRP Sheets or polycarbonate sheets. Opening and closing is either hinged or sliding. Min. width of door should be 1M and min height 2M.The door area should have 50 mm PCC Flooring over 75 mm thick sub base.
14	Civil work	Wall on fan side will be 35 mm thick and 80 cm high and wall on pad side will be 23 cm thick & 100 cm high from ground level in cm 1:6 with required foundation. All the walls will be plastered in cm 1:4 on top and sides. 80cm to 1m wide and 10 cm thick footpaths made of cement concrete ratio of 1:2:4 should be provided as per the requirements.
15	Electrical fittings:	Conduit and wiring as required for connecting light, fan .motor and pumping to main electrical supplies.

		Preferably use copper wire to withstand the load of the electrical appliances of Indian standards.
16	Climate Control System	
A	Fan-Pad System	- Numbers of Fan depends upon size of Fan-fad house and it should be capable of exhausting air volume in one minutes. - Exhaust Fans- 50" however it depends upon size of fan-pad house with louvers, 1.5 HP – 3 phase ISI standard electric motor. - Cellulose cooling pads of 1.8 meter height with 100mm /150 mm thickness covering the area properly, PVC water distribution system, screen/disc filter, valve and pumps etc. - Control panel with manual operation, temp. and humidity sensors. - The necessary digital controller with sensory device & accessories of standard quality as per requirement should be provided to operate the fan & pad system for controlling temperature & humidity inside the Greenhouse.
B	Fogging System	- In consist of four way anti leak fogger 28 lph flow rate (working pressure should be mentioned at which we will 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 sensor etc. complete application rate 3 mm/hr.

Section-5 : SHADE / NET HOUSE

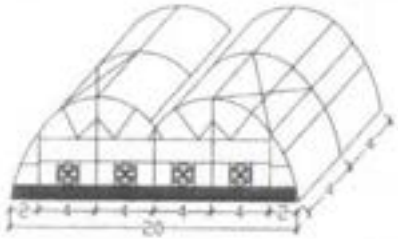
SPECIFICATION FOR SHADE HOUSE

Sr. No.	ITEM	SPECIFICATION
01	STRUCTURE	
	Size	According to requirement
	Shape	As per design
	Withstand to wind velocity	- Structure may be design to withstand wind velocity up to 104 Km/ hr.
		- 120 Km/ Hour per hrs in high wind velocity zone.
	Foundation	2mm thickness GI Pipes compatible with columns, length 1.2m.
	Main Column	Size 60 OD ,Thickness 2 mm, Wt. per length 2.85 kg , length- 4 m,
	Purlins	Purlin GI pipes- size 42/43 OD/ thickness 2 mm, Wt. per length 2.00/2.10kg length- 4 m. Purlin members-33/32 mm OD/2mm thickness, Wt. per length 1.60 kg.
	Corner	Size 48 OD ,Thickness 2 mm, Wt. per length 2.30 kg, length- 0.15 m,
	Four Way Pipe Couplers	Size 48 OD ,Thickness 2 mm, Wt. per length 2.30 kg, length- 0.15 m,
	Five Way Pipe Couplers	Size 48 OD , Wt. per length 2.30 kg, Thickness 2 mm, length-0.15 m,
	Nut Bolts	Size 3/8"
	Grid Size	4x4, 8x4, 4x6 (m)
	Gable length	4.0 m,
	Centre Height	• Flat Structure – 4 m
		• Hut/dome type structure – Centre height - 4m, Side height - 2.5m.

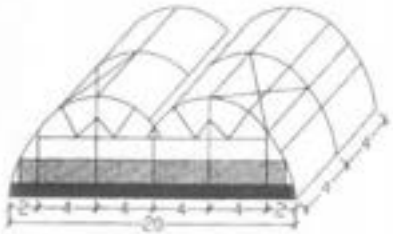
2.	Aluminum Profile	C type Aluminum profile to fix shade net to the structure by means of self tapping screws. Weight of aluminum profile is 200-220 gm/ meter. Self Drilling Screw should be fixed on profile every 40 cm along the full length of the profile
3.	Spring Insert	A coated spring is preferable compared to cold galvanized spring as a coated spring transfer less heat to the plastic and thus enhances the life of the plastic If we are using GI spring it is better to use a two inch strip of new poly film to be placed over the main plastic in the profile and then lock it with GI profile. This will help in longer life of the plastic as the rusted spring will not directly come in contact with the main plastic. Wire material should be high carbon spring steel with spring action
4.	Shade Net	UV stabilized, ranging from 30% to maximum 75% GSM shade depending upon the crop, made up of ISI/ applicable national standard, white / green/black/suitable colour.
5.	Door	Polycarbonate/polythene sheet door with 1 m widths and 2 m height and another door of 1 .m x 2 m Box section frame is embedded inside for the strength.
6.	Anti Room	Anti room of size 4 m x 3 m attached to net house
7.	Civil work/foundation	Cement concrete 1:2:4 block of size 40 cm x 40 cm x 90 cm for embedding vertical poll/pipe of shade net, subject to revision as per requirement of site.
8.	Overall slop	1 to 1.5%
	APRON	Use of APRON in shade net

Section-6 : Design

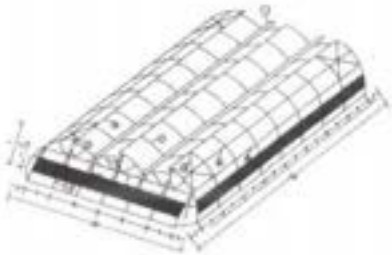
Fan Side Elevation



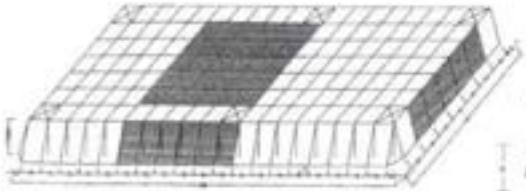
Pad Side Elevation



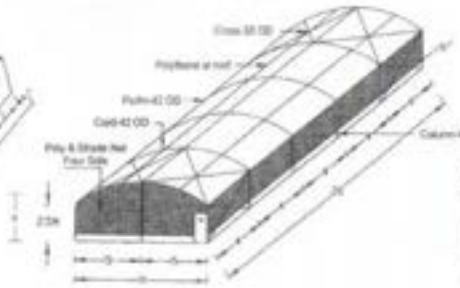
Naturally Ventilated



Shade House



Poly Tunnel Type



Shadow Hall