



Regd./ Speed Post

RATE CONTRACT

HARYANA RENEWABLE ENERGY DEVELOPMENT AGENCY (HAREDA)

(DEPARTMENT OF RENEWABLE ENERGY, HARYANA)

Akshay Urja Bhawan, Institutional Plot No. 1, Sector-17, Panchkula

PHONE: 0172-2585733, 2585433 EPBX: 0172-2587233, 2587833

Fax No.0172-2564433

Email: drehareda@gmail.com Website: www.hareda.gov.in

Rate Contract No. DRE/HAREDA/2018-19/ 168-170 Dated: 09.01.2019

To

1. M/s Solchrome Pvt. Ltd.
61, Sector-V,
Parwanoo-173220 (Himachal Pradesh)
Tel No. 01792-232125, 232126, Fax No. 01792-232572
E-mail: solchrome@solchrome.com
2. M/s Bipin Engineers Pvt. Ltd.,
Gat No. 136 Varve Budruk,
Pune-Satara Road Taluka Bhor,
Pune-412205
Tel. No. 8805028908, 9011060908
E-mail: contact@bipin.com, contact@bipsun.com,
3. M/s Inter Solar Systems (P) Ltd.,
Plot No. 901-A, Business Development Centre,
Phase-II, Chandigarh-160002.
Tel. No. : 0172- 4589999, 2655349, 2650901, 5086113, Fax No. 0172-5086113
E-mail: info@intersolarsystems.com, bk@intersolarsystems.com

SUBJECT: RATE CONTRACT FOR SUPPLY, INSTALLATION AND COMMISSIONING OF SOLAR WATER HEATING SYSTEM (SWHS) IN THE STATE OF HARYANA.

Reference: (i) This office tender enquiry opened on 03.08.2018.
(ii) Your quotation submitted against the said tender enquiry followed by your subsequent last letter.

You are hereby informed that your above referred tender read with subsequent letter mentioned above for the stores specified in the schedule- A annexed has been accepted. This Rate Contract will be governed by the terms and conditions given in schedule-B. The rate contract and the schedules annexed here to shall be sole responsibility of this Rate Contract/ transaction.

2- This rate contract shall be valid for supply, installation and commissioning of 90 Nos. solar water heating system (s) of capacity of 500 LPD and 45 Nos. solar water heating system (s) of capacity 1000 LPD (Liter Per Day) and the additional works for one year from the date of its issue or up to placement of work order/s of cumulative capacity of 90000 LPD. The supplied, installed & commissioned systems will have warranty of 15 years for solar flat plate collector & 5 years warranty for the complete system from the date of commissioning and handing over the system.

3- The other terms and conditions and specifications not mentioned in the schedule- B, shall be as per DNIT.

4- Please acknowledge receipt of this Rate Contract within a week's time from the date of issue by returning the second copy duly signed and stamped by authorized representative of your firm.

5- This Rate Contract contains 13 pages, including this page.



Annexures:

1. Schedule "A" - Description of Stores, Prices, Duties/ Taxes.
2. Schedule "B" - General Terms & Conditions of the Contract.
3. Schedule "C" - TECHNICAL SPECIFICATIONS OF SWHS

Sd/-
Technical Expert,
for Director, Haryana Renewable Energy
Development Agency (HAREDA),
Panchkula (Haryana).

Encl: As above



Schedule-A

DESCRIPTION OF STORES, PRICES, DUTIES/ TAXES

(i) Approved rates of Solar Water Heating System

Sr. No	Capacity of the system	Total cost of Solar water Heating System for anywhere in Haryana including electric back up, transportation, packaging, installation, commissioning, GST etc. with 5 years warranty of complete system and 15 years warranty of solar flat plate collector	Name of the firm(s) approved	Place of Billing	Monthly supply capacity offered in the bid (in LPD)	Remarks
1.	500 LPD	Rs. 93,450/- (Rupees Ninety Three Thousand Four Hundred & Fifty only)	1. M/s. Bipin Engineers Pvt. Ltd., Pune 2. M/s. Inter Solar Systems Pvt. Ltd., Chandigarh	Pune Sundran (Punjab)	125000 LPD 200000 LPD	The quantity is to be distributed on 50:50 basis.
2.	1000 LPD	Rs. 1,65,000/- (Rupees One Lakh Sixty Five Thousand only)	M/s. Solchrome Pvt. Ltd., Parwanoo	Parwanoo (Himachal Pardesh)	45000 LPD	

(ii) Approved Rates of additional works

a) Cold Water piping per running meter

(i)	15 NB	Rs. 97.44
(ii)	20 NB	Rs. 121.80
(iii)	25 NB	Rs. 170.52

(b) Hot Water piping per running meter

(i)	15 NB	Rs. 290.00
(ii)	20 NB	Rs. 365.40
(iii)	25 NB	Rs. 408.32



Schedule- B

GENERAL TERMS AND CONDITIONS OF CONTRACT

1- SCOPE OF WORK/DESCRIPTION OF STORES

Supply, installation, and commissioning of 500 LPD and 1000 LPD solar water heating systems (Flat Plate Collector only) with five years warranty of the complete system/s including 15 years warranty of the Solar Flat Plate Collector/s with required specifications as per MNRE, Govt. of India guidelines along with other additional works required at site etc. with following features:

- (i) Flat plate collector (2 Sq. m of collector area for 100 LPD) as per IS 12933 with latest amendment as per enclosed specifications.
- (ii) Insulated pipes (GI) connecting Solar Absorber Panels.
- (iii) Stainless Steel Hot Water Storage Tanks with insulation (PUF/Rock Wool) Electrical Back Up.
- (iv) Cold Water Storage Tank with support stand.
- (v) Necessary civil work and other support structure for collectors, tanks and piping within the system as per requirement.
- (vi) Temperature indicator (one)
- (vii) The specifications of various sub-components of the system should be as per the latest BIS/MNRE.
- (viii) Heat Exchanger

2- SECURITY DEPOSIT / PERFORMANCE SECURITY DEPOSIT

The successful suppliers of other states shall deposit Security Deposit (SD) equivalent to **5% of the work order value within 15 days** from the date of issue of the work order. The Haryana based Medium, Small and Micro Enterprises shall be deposit Security Deposit as per **GO No. 2/2/2016-4IBII (2) dated 20.10.2016**. The EMD of such successful bidders shall be released on submission of SD in the shape of DD or Bank guarantee valid for a period of five year & six months. After the successful completion of the work order, the SD shall be treated as Performance Security Deposit (PSD) & shall be released on successful completion of the warrantee period of five years from the date of commissioning of the project. If required, the validity of the SD/PSD will be extended by the firm failing which it will be en-cashed.

3- PAYMENT TERMS & CONDITION

The payments shall be made as per the following terms and conditions:

- a. **60% of the ordered value** after the supply and installation of the complete material at site supported with pre-dispatch inspection report, list of material with complete details, material receipt and installation certificate issued by user /P.O of the concerned district and bill of material.
- b. **Balance payment** within 30 days on submission of Joint Commissioning Report (JCR) to the indenting organization/HAREDA. The JCR must be countersigned by the respective ADC-cum-CPO of the district.



4- TIME SCHEDULE, PENALTY/LIQUIDATED DAMAGES

a. The ordered system/s are allowed to be got **inspected, supplied, installed and commissioned** within **four months** time from the date of issue of work order during which following milestones should be achieved by the firm for execution of the project:

Sr.No.	Description	Time Required
1.	Award of contract/ issue of work order	Say X date
2.	Acknowledge the receipt of the work order	X+ 7days
3.	Submission of Security Deposit / Performance Bank Guarantee	X + 15 days
4.	Site visit and clearance of site (if any) with District Officer	X +30 days
5.	Pre-dispatch Inspection by Purchaser	X + 90 days
6.	Progressive deliveries of complete material, erection, tastings and Commissioning etc.	X + 120 days

b. Before placing the work order it will have to ensure that site is clear and feasible in all respect for installation of system/ plant. However, it will be the sole responsibility of the supplier to be satisfied with the site through visit under intimation to PO/APO of the district within 30 days of placing of work order. Request, if any, received from the supplier for any extension on ground of issue of site clearance after above said period will out rightly be rejected.

c. The time for and date of delivery (includes supply, installation & commissioning) stipulated in the work order shall be deemed to be the essence of the contract and should the contractor fail to deliver / complete the work (includes supply, installation & commissioning) within the period prescribed for such delivery penalty @ **2% of the work value per month** subject to max. of 10% of the work order value recoverable. Once the maximum is reached, the “HAREDA” may consider termination of the contract. For the purpose of calculation of penalty, month will be considered of 30 days and the week of 7 days. In case of non-payment by the contractor, recovery will be made from his bills or amount of Earnest money or security deposited with Director, HAREDA, provide also that :

- (i) No recovery of penalty will be made if the Director, HAREDA/Indenting Officer accepts the delayed supplies by extending the delivery period by recording in writing that the exceptional circumstances were beyond the control of the supplier and there was no loss to the Government on written request by the supplier, with proper documentation establishing the reasons for delay were beyond the control of the supplier, before the expiry of the allowed time. Requests for extension received after the expiry of the allowed timeline shall not be entertained and shall be subject to penalty.
- (ii) The supplies, if any, made beyond the time limit for completion of the project defined in the work order will require prior approval of the Director, HAREDA / Indenting Officer even the same are with penalty means supplier has no right to deliver the material with applicable penalty clause without the written concurrence of the Director, HAREDA. If any supplies fall under the warranty clause then the supplier has to obtain written permission from the Director, HAREDA/ Indenting officer through a request letter at least seven days before the expiry of delivery period with reason for delay.
- (iii) On the failure of the supplier/s to make supply within the extended period or otherwise and the receipt of such information in the office of the Director, HAREDA, risk purchase at the cost of the supplier will be made by the Director, HAREDA after the maximum penalty is reached by obtaining consent from the L2, L3 bidders or approved supplier/s or approved RC holder of DGS&D, GOI or any State empanelled supplier or by inviting short terms quotations from the



Registered and other known suppliers within next two months. The difference of excess cost thus, incurred will be recovered from the supplier from his pending bills, earnest money or security whichever is available. This procedure will be adopted after serving a registered notice to the supplier to supply stores within 15 days.

- d. The Contractor shall not;
- (i) Without the consent in writing of HAREDA transfer, assign or sublet the work under this contract or any substantial part thereof to any other party. HAREDA shall have at all reasonable time access to the works being carried out by the contractor under this contract. All the work shall be carried out by the contractor to the satisfaction of HAREDA.
- (ii) Disclose details of the conditions governing this contract to unauthorized persons (Indenting against this contract is permissible only for the bonafide use of Governments departments and quasi public and not for private parties or for the private use of the Government officers).
- e. In the event of the contractor failing duly and properly to fulfill or committing breach of any of the terms and conditions of the tender or repeatedly supplying goods liable to rejection hereunder or failing, declining, neglecting/ or delaying to comply with any demand or requisition or otherwise not executing the same in accordance with the terms of this tender, or if the bidder or his agents or servants being guilty of fraud in respect of the contract or any other contract entered into by the contractor or any of his partners or representatives thereof with Government directing, giving, promising or offering any bribes, gratuity, gift, loan, perquisite, reward or advantage pecuniary or otherwise to any person in the employment of Government in any way relating to such officers or person of persons, office or employment or if the contractor or any of his partners become insolvent or apply for relief as insolvent debtor or commence any insolvency proceedings or make any composition with his/ their creditors or attempts to do so then without prejudice to Government rights and remedies otherwise, HAREDA/ Government shall be entitled to terminate this contract forthwith and to **blacklist the contractor** for a period as deemed fit by the competent authority and purchase or procure or arrange from Government's stocks or otherwise at the contractor's risk and at the absolute discretion of the Director, HAREDA as regards the manner, place or time of such purchases, such supplies as have not been supplied or have been rejected under this agreement or are required subsequently by Government there under and in cases where issues in replacement are made from Government's stocks or supplies, the cost of value of stocks or supplies together with all incidental charges or expenses, shall be recoverable from the contractor on demand and the contractor shall not be entitled to benefit from any profit which may accrue to Government.

5- INSPECTION & COMMISSIONING

- (i) The HAREDA through its duly authorized representative(s) shall have at all reasonable times access to the contractor/ bidders premises or works and shall have the power at all reasonable time to inspect and examine the materials and workmanship of the works during its manufacture, supply, installation etc.
- (ii) Before supply of the materials, the contractor/ bidder are required to get lot of material offered for inspection get inspected at one site. In case the contractor/ bidder fails to get the offered material inspected, the total expenses of the further inspection will be borne by the supplier/contractor/ bidder.
- (iii) **HAREDA will bear the inspector's cost at only one site. No request, to inspect the component(s) of the material at different location would be entertained.**
- (iv) The inspection by HAREDA and issue of dispatch instruction thereof shall in no way limit the liabilities and responsibilities of the contractor/ bidder in respect of the agreed quality assurance forming a part of the contract.
- (v) After receipt of call for inspection, the material shall be inspected by the Director, HAREDA or a committee authorized by her/him or indenting organisation at firm's premises or in exceptional cases at site and material shall be dispatched/erected after acceptance of the same by the Inspection Committee.
- (vi) The Supplier shall offer inspection **with 15 Days notice within 90 days of placement of work order with firm date and thereafter, should complete the project within the allowed time.** To illustrate it further, if the last date of supply is 31st March & supplier sends the inspection



call on 30th March for inspection on 31st March, the inspection date shall be considered as 15th April (15 days notice) & period from 1st April to 14th April shall be under penalty clause.

- (vii) If the proposal for pre-dispatch inspection is received within defined & valid time period in the office of Director, HAREDA or indenting organisation from the supplier and inspection is not carried out by the HAREDA due to any reasons within 15 days of receipt of such letter, the time period for supply, installation & commissioning will be extended equivalent to delayed period, from the next day of expiry of these 15 days till the date of actual inspection and no penalty will be imposed for this extended period.
- (viii) In case the material offered for inspection fails to meet the specifications stipulated in DNIT /Order /Contract and the material is rejected by the Inspecting Committee or complete material offered for inspection is not available for inspection, HAREDA or Indenting Organization will levy a penalty at 0.1% of the order value. In case the material offered for inspection fails during the 2nd inspection also, the Indenting Department will have the right to increase the penalty to 0.25% of the order value. In case, the material offered fails during the 3rd and final inspection also, the firm will be liable for penal action including forfeiture of EMD/PSD, risk purchase, debarring/blacklisting in future, and no further opportunity for inspection will be provided to the supplier firm.
- (ix) The proposal for inspection received complete in all respect shall be processed by the dealing officer within seven (7) days of receipt of the same by him/her, failing which he/she will be liable to explain the reason for delay.
- (x) The firm will print the words “**PROMOTED BY DNRE/HAREDA (2018-19)**” on the body of the Systems in a permanent manner so as to minimize any possible malpractices.
- (xi) The inspection report should be submitted to HAREDA or Indenting Organisation within seven days from the date of inspection either by hand or by e-mail/fax. Similarly, the commissioning report should be submitted to the concerned district office and an advance copy to HAREDA or Indenting Organisation **within seven days** from the date of commissioning either by hand and by e-mail/fax failing which the commissioning date shall be considered seven days prior to the date of submission of the report in HAREDA or Indenting Organisation and the period of late submission of JCR shall be counted towards delay. The district office after verification will issue the JCR or shall report any discrepancy to the supplier with a copy to HAREDA or Indenting Organisation within seven days. In case of discrepancy in the system commissioned, the commissioning date shall be counted from the date when the discrepancy has been removed to the entire satisfaction of District Office & User/HAREDA/Indenting Organisation.
- (xii) The installation work shall be carried out under the close supervision of the Project Officer/Asstt. Project Officer of the district & the user. The final inspection after installation and commissioning shall be carried out by district office and user. The supplier should plan his activities in such a way that the entire process for supply, installation and commissioning after inspection of the systems is completed within the allowed time. Therefore, it is necessary & in the interest of the supplier to get inspected the material well in advance before the stipulated delivery time so as to avoid penalty. The supplier shall provide without any extra charge, all materials, tools, testing equipments, labour and assistance of very kind which the inspecting officer may consider necessary for any test or examination. HAREDA or indenting organisation can also get the functionality of the system tested from any MNRE approved test centre/laboratory. Rejected material (if any) will have to be replaced by the supplier at its costs within 15 days of issue of such notice.
- (xiii) Before the goods and equipment are taken over by the user, the supplier shall supply operation and maintenance manuals. These shall be in such details as will enable the user to operate, maintain, adjust and repair all parts of the works as stated in the specifications. The manuals shall be in the ruling language (English or Hindi). Unless and otherwise agreed, the goods and equipment shall not be considered to be completed for the purposes of taking over until such manuals have been supplied to the purchaser/user.
- (xiv) If the goods/services or any section fails to pass the Tests. The supplier may require such tests to be repeated on the same terms and conditions. All costs to which the purchaser may be put to by the repetition of the tests under this sub-clause shall be deducted from the contract price.
- (xv) **The purchaser has the right to pick any sample in working condition in the presence of bidder**, for random testing of any of the component of the system or complete system, while



erecting of material, post commissioning for testing as per the DNIT specifications. The expenditure on the tests (for maximum 2 systems) will be borne by the supplier. If more system(s) are taken for testing, the cost of testing shall be borne by the Indenting Department.

- (xvi) If the purchaser and the supplier disagree on the interpretation of the test results each shall give a statement of his views to the other within 14 days after such disagreement arises. The statement shall be accompanied by all relevant evidence. The purchaser will review both the statements and render a final decision within a further period of fourteen days which shall be binding on the supplier.

6- PRICE FALL CLAUSE

- (i) The prices charged for the stores supplied under the contract by the contractor shall in no event exceed the lowest price at which the Contractor sells the Stores or offer to sell stores of identical description to any Department of the Central Government or any Department of a State Government or any statutory undertaking of the Central or a State Government, as the case may be, during the period till all orders placed during the currency of contract is completed.

If at any time during the said period, the Contractor reduces the Sale price, sells or offers to sell such stores irrespective of quantity to any person(s)/organization(s) including the Purchaser or any Statutory Undertaking of the Central or a State Government, as the case may be, at a price lower than the price chargeable under this Contract, he shall forthwith notify such reduction or Sale or offer of Sale to the Director, New & Renewable Energy Department, Haryana/HAREDA and the price payable under the Contract for the stores supplied after the date of coming into force of such reduction or sale or offer of sale stand correspondingly reduced. The above stipulation will, however, not apply to :

- (a) Export/deemed Export by the Contractor
- (b) Sale/ normal replacement.

- (ii) The Contractor shall furnish the following certificate to the Paying Authority along with each bill for payment for supplies made against the Contract.

“I/We certify that there has been no reduction in sale price of the Stores of Description identical to the Stores supplied to the Government under the contract herein and such Stores have not been offered/sold by me/us to any person(s)/organization(s) including the purchaser or any Department of Central Government or any Department of a State Government or any statutory Undertaking of the Central or State Government as the case may be up to the date of the bill of supplies against all orders placed during the currency of the Contract at a price lower than the price charged to the Government under the Contract except for quantity of Stores as mentioned at para (ii) above.

7- WARRANTY

- (i) The Warranty period shall be five (5) years for complete system from the date of commissioning and handing over of the system (or as per latest MNRE, GOI guidelines). The contractor shall rectify/replace defective parts of the system within Warranty period promptly i.e. **within 72 hours**.
- (ii) During the warrantee period, the firm shall ensure proper functioning of the systems and complaint, if any, forwarded to the supplier against the system, will have to be attended within 72 hours of forwarding such complaints.
- (iii) If the firm fails to repair/replace the defective system within 72 hours, penalty @ 0.1% of the system cost per day (subject to maximum of 10% of the cost) after expiry of 72 hrs period shall be imposed. Complaint will be forwarded through e-mail.
- (iv) If the whole PSD/ bank guarantee is utilized and the complaints are still pending then an online/registered notice will be sent to the firm to attend the complaint immediately.
- (v) If the firm still does not attend the complaint within the above mentioned period then the firm may be blacklisted and a legal proceeding may be initiated against the firm for Breach



the agreement.

- (vi) The supplier shall affirm as per standards for quality that any thing to be furnished shall be new, free from all defects and faults in material, workmanship and manufacture, shall be of the highest grade and consistent with established and generally accepted standards for material of the type ordered, shall be in full conformity with the specifications, drawing or samples, if any and shall if operable, operate properly.
- (vii) Performance of Equipment: In addition to the warranty as already provided, the supplier shall guarantee satisfactory performance of the equipment and shall be responsible for the period or up to the date specified in sub-clause (iii) hereof after the equipment has been accepted by the HAREDA or indenting organization to the extent for any defects that may develop such defects shall be removed at his own cost when called upon to do so by the HAREDA or indenting organization.
- (viii) HAREDA/the consignee will have the liberty to get the sample for the item(s) supplied tested from any of the Govt. approved laboratory at any time during the installation or warranty period to ascertain the performance of the item(s) as per DNIT specifications. If during the lab test, sample fails then supplier has to repair/ replace the defective systems within 15 days of issue of such notice. If on the request of the supplier more than one samples are drawn for lab test and any one of them fail the lab test, bidder has to replace all the defective system at his own cost.
- (ix) The Contractor in consultation with concerned Project Officer will conduct training programme for users, focusing on main features, operation and maintenance of the systems. After successful supply/commissioning of the system and training, the system will be handed over to the person designated by the end user.
- (x) The Contractor/supplier shall continue to provide spare parts for 2 years after the expiry of warranty period at the users cost. If the contractor fails to continue to supply spare parts and services to users then HAREDA shall take appropriate action against the firm which can be to ban the supplier for participating in future tenders of the HAREDA.
- (xi) **Service Centers**: Each successful bidder (either from Haryana or outside Haryana) will have to establish at least one service centre at the divisional level in their area of operation in the State, where a skilled technician and readily available spare parts will be made available during the entire period of Warranty/ Guarantee. The supplier will convey name & address of the outlet along with name of contact person, his/ her address, mobile number & e-mail address within 90 days of placing of the work order to the Director, HAREDA or indenting organization. The name & address of the service outlet and contact number will be displayed on the web portal of HAREDA www.hareda.gov.in.
- (xii) **Suryamitra**: There is a Programme under MNRE to provide training to ITI Certificate and Diploma holders on operation and maintenance of SPV devices and systems and it is called "Suryamitra Skill Development Programme". The successful contractor(s) may preferably engage them in their service centers to provide necessary repairs and maintenance service including installation of the systems during the time of execution.

8- **FORCE MAJEURE**

- (i) Notwithstanding the provisions of clauses contained in this deed; the contractor shall not be liable for forfeiture of its performance security, liquidated damages, termination for default, if he is unable to fulfill his obligation under this deed due to event of force majeure circumstances.
- (ii) For purpose of this clause, "Force majeure" means an event beyond the control of the contractor and not involving the contractor's fault or negligence and not foreseeable. Such events may include, but are not restricted to, acts of Govt. either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and



fright embargoes.



- (iii) Obstruction in procurement of components /raw material by the firm from the manufacturers with whom they have tied up for execution of the projects under this tender shall not be covered under force majeure condition. The bidders are advised to make suitable arrangements for supply of parts and components for implementation of the tendered projects within allowed timeframe.
- (iv) However, if a force majeure situation arises, the contractor shall immediately notify the “HAREDA” in writing. The decision of the Director, HAREDA in above conditions shall be final.

9- ARBITRATION

If any question, dispute or difference what so ever shall arises between HAREDA and the contractor, in the connection with this agreement except as to matters, the decisions for which have been specifically provided, either party may forthwith give to the other notice in writing of existence of such question, dispute or difference and the same shall be referred to the sole arbitration of the Principal Secretary, Govt. Haryana, New & Renewable Energy Department or a person nominated by him/her. This reference shall be governed by the Indian Arbitration Act, and the rules made there under. The award in such arbitration shall be final and binding on both the parties. Work under the agreement shall be continuing during the arbitration proceedings unless the HAREDA or the arbitrator directs otherwise.

10- JURISDICTION FOR SETTLING DISPUTES

Where a contractor has not agreed to Sole Arbitration Clause of the Conditions of the Contract, Governing contracts the dispute/claims arising out of the contract entered into with him will be subject to the jurisdiction of Civil Court Panchkula.

11- OTHER TERMS AND CONDITIONS

- 11.1 **Material shall be strictly as per DNIT specifications. If there is any left out specification, the same shall be considered as per the latest specifications applicable as per MNRE/ BIS/International Standards.**
- 11.2 The remaining terms & conditions shall be as per the DNIT.



DETAILED TECHNICAL SPECIFICATIONS OF VARIOUS COMPONENTS OF FLAT PLATE COLLECTOR SOLAR WATER HEATING SYSTEMS

General Requirements

- i) System will be well grouted/ clamped with collectors installed so as to enable it to sustain the highest wind speed of that area and in no case less than 120 KM/H.
- ii) All the collectors will be south facing inclined at suitable angle to give best performance in winter.
- iii) There will not be any shadow falling on the collectors from nearby structures or of other collectors in front or back row.
- iv) Hot water pipe lines will be fully insulated from the point of drawl of water from tank to delivery points.
- v) System will be installed nearest to the point of hot water usage to avoid longer pipeline & higher heat losses.
- vi) Heat Exchanger will be installed with the system.
- vii) The workmanship & aesthetics of the system will be good and it should be visible to anybody.
- viii) Air vent pipe, make up water and cold water tanks will be installed as required for smooth functioning of the system.
- ix) There won't be any leakage observed in the system from tanks/ collectors/ pipelines

Technical Requirements

1- Solar water heating system comprising of solar flat plate collector, collectors stand assembly, stainless steel insulated hot water storage tank with heat exchanger, Cold water Tank and various other components.

Solar flat plate collector component shall have:

- (a) Solar flat plate collector cover plate made of toughened glass
- (b) Sheet for absorber made of copper.
- (c) Absorber made of copper sheet with copper tube.

2- Solar Flat Plate Collector Specifications:

Solar flat plate collector shall be BIS marked and as per IS: 12933 with latest amendment and various components shall be as under:

- (a) Cover plate: Cover plate shall be of toughened glass and of thickness 3.22 mm (min.) conforming to IS: 12933 with latest amendment. The solar transmittance of the cover plate shall be minimum 92 percent at near normal incidence.

(NOTE: Cover plate used in the stores offered for inspection shall be same as reported in Type test report).

(b) Collector Box: Collector box shall be made of Aluminium sections only. Type, grade, size, workmanship and finish of the material used shall be as per IS: 12933 with latest amendment. The minimum thickness of Aluminium shall be as under:

(i) Channel section for sides 1.4 mm

(ii) Sheet for bottom 0.45 mm

(iii) Support for glass retaining 1.2 mm

Minimum thickness of Aluminium sheet shall be 0.91 mm for collector box.

(c) Absorber: Absorber shall consist of riser, header and sheet for absorber. The Diameter of header shall be 25.4 +/-0.5mm and thickness 0.71mm. The diameter of riser shall be 12.7 +/-0.5mm and thickness 0.56mm and made of copper only. The distance between the risers from centre to centre



shall be 112 mm. Type grade, size, workmanship and finish of the material used shall be as per IS:12933 with latest amendment.

Riser and header assembly designed for working pressure up to 24.5 K Pa (2.5kg/cm square) shall be tested for leakage at a minimum hydraulic pressure of 490 k Pa (5 Kg/cm square).

(d) Sheet for absorber: Sheet for absorber shall be made of copper only. Type, grade, size, workmanship and finish of the material used shall be as per IS: 12933 with latest amendment.

(e) Collector box insulation: Insulation shall be provided at back and sides. Thermal Resistance (R) of insulation material shall be minimum 0.96 m square degree C/W for back insulation and minimum 0.48 m square degree C/W for side insulation. This shall be derived after determining thermal conductivity (K) value at 100 degree C mean temperature in accordance with IS:3346/1980. Collector box insulation shall conform to IS: 12933 with latest amendment.

(f) Gaskets and Grommets: Gaskets and Grommets shall conform to IS: 12933 with latest amendment.

3- Insulated hot water storage tank: The thickness of the water storage tank shall be 20 gauges (0.91 mm) up to 500 LPD and 18 gauge (1.2 mm) for 1000 LPD.

(a) Material: Insulated hot water storage tank shall be non-pressure type and made of stainless steel grade (X04Cr19Ni9 or X07Cr18Ni9 of IS: 1570(part 5)/1985) (Reaffirmed 2004), TIG/MIG welded. Open Arc weld not permitted.

(b) Insulation: Solar Water Heating System (SWHS) shall be insulated with 100mm thick Rock wool of 48Kg/m³ density with 22swg Aluminium cladding or polyurethane foam (PUF) of density 38Kg/m³ covered with 24swg aluminium sheet / 24 swg polypropylene galvanised iron (PPGI) coloured coated sheet.

(c) Hot Water Tank stand assembly: Up to 500 LPD: Shall be made of MS angle of size (min) 38x38x4 mm duly pre-treated and stove enamelled with black Colour paint and for 1000LPD: Shall be made of MS angle of size (min) 50X50X6 mm duly pre-treated and stove enamelled with black Colour paint.

4- Heat exchanger shall be cage type and made of copper/stainless steel tubes of grade X04Cr19Ni9 or X07Cr18Ni9 of IS: 1570(part 5)/1985(Reaffirmed 2004). Heat exchangers shall have a minimum of 0.24 sq. meters heat transfer area per 100 LPD capacity.

5- System inter connecting piping :ISI marked G.I. pipes, medium class of IS:1239 duly insulated with 50mm thick rock wool of 48 Kg/m³ density and 26swg Al cladding.

6- Collector stand assembly shall be made of MS angle of size 35x35x4 mm duly pre-treated and stove enamelled with black Colour paint. The vertical support shall be firmly grouted with the roof.

7- The capacity of makeup tank of SS304 min. 0.8 mm thick shall be 5 liters up to 500 LPD and 10 liters for 1000 LPD.

8- Electrical heaters (electrical back up): Electrical heater shall be ISI marked of following rating with 2 meter connecting wire 2.5mmsq. 2 core unarmoured cable with thermostat of ISI mark of 16 amps:

For 500LPD : 3 KW

For 1000LPD : 3 KW X 2.

9- Temperature Gauge: Dial type, duly calibrated and suitable for temperature range from 0 degree C to 120 degree C and shall be provided.

10- Cold Water tank: ISI Marked HDPE material with Gun metal float valve equal to the capacity of hot water storage tank.



11- Stand & pedestals for tank: The cold water tank will be placed over angle iron frame having 4 cross numbers in 4 legs with 2mm thick MS Sheet up to 500 LPD and 3 mm thick MS Sheet above 500LPD for full bottom support fixed of 4 horizontal members based on size of the cold water tank.

12- Grouting of solar collectors, stands will be with PCC 1:2:4 of 1'x1'x1'size.

Min. 2 sq. meter absorber area of ISI Mark FPC shall be for 100 liter tank capacity system.

Suppliers shall furnish 2 valves, one for inlet and one for outlet.

13- Other component essential for completeness of the system as per tenderers specification.

14- Installation, testing and commissioning of the complete system at consignee's end.

15- Suppliers shall supply two sets of instruction manual to the consignee without any extra cost. Instruction manual shall contain the following details:

- (a) Schematic diagram of the solar collector and a domestic hot water system.
- (b) Instructions for installation (including mounting details) and use and safety precautions.
- (c) Instructions for repair and maintenance including causes for common failures, such as, dust ingress on glass cover, peeling of paint, scaling, damaged sealant, gasket and grommets and their remedies.
- (d) List of service outlets.

16. All the items shall be as per MNRE norms.