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RATE CONTRACT

HARYANA RENEWABLE ENERGY DEVELOPMENT AGENCY (HAREDA)

(DEPARTMENT OF RENEWABLE ENERGY, HARYANA)

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

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Rate Contract No. DRE-HAREDA/2016-17/2149 Dated: 04/08/2016

To

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

Mobile: 9814104139, 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 04.01.2016.
(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 annexured here to shall be sole responsibility of this Rate Contract/ transaction.

2- This rate contract shall be valid for supply, installation and commissioning of solar water heating system (s) of capacity of 1000 Liter per Day (LPD) and the additional works for one year from the date of its issue i.e. up to 03/08/2017 or up to placement of work order/s of cumulative capacity of 45000 LPD, whichever the earlier. 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 12 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/ 04.08.2016

Technical Adviser

for Director, Haryana Renewable Energy
Development Agency (HAREDA),
Panchkula (Haryana).

Encl: As above



DESCRIPTION OF STORES, PRICES, DUTIES/ TAXES

(i) Approved rates of Solar Water Heating System

Sr. No .	Capacity of the system	Total cost including electric back up, transportation, packaging, installation, commissioning, VAT / taxes/ duties 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)
1.	1000 LPD	Rs. 171765/- (Rupees one lakh seventy one thousand seven hundred and sixty five only)	M/s.Inter Solar Systems Pvt. Ltd, Chandigarh	Sundran, Derabassi (Punjab)	50000 LPD

(ii) Approved Rates of additional works

a) Cold Water piping per running meter

- (i) 20 NB Rs. 105/-
(ii) 25 NB Rs. 147/-

(b) Hot Water piping per running meter

- (i) 20 NB Rs. 315/-
(ii) 25 NB Rs. 352/-



Schedule- B

GENERAL TERMS AND CONDITIONS OF CONTRACT

1- SCOPE OF WORK/DESCRIPTION OF STORES

Supply, installation, and commissioning of 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 (Part I-V) of 2003 as amended from time to time 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 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 supplier shall deposit Security Deposit (SD) equivalent to **10% of the work order value within 30 days** from the date of issue of the work order. The EMD of supplier shall be released on submission of SD in the shape of DD or Bank guarantee valid for a period of 5½ years (five year & six months). After the successful completion of the work, 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. In case of delays, the validity of the SD/PSD will be extended by the firm failing which it will be encashed.

3- PAYMENT TERMS

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

- a. **80% of the ordered value** after the supply of the complete system at site supported with material receipt duly signed & issued by user & Project Officer/ Assistant Project Officer of the concerned district.
- b. **20% of the ordered value** after 30 days of installation & commissioning of the system on submission of the Joint Commissioning Report (JCR) supported with satisfactory performance report, bill of material, photographs of complete system (before & after installation) duly signed by the supplier, district PO/APO and end user. The JCR must be countersigned by the concerned ADC-cum-CPO.



4- TIME SCHEDULE, PENALTY/LIQUIDATED DAMAGES

- (a) The systems are 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:
- i. Though the work order shall be released after entire satisfaction of the district office about clearance of the site, the firm shall also visit the site under intimation to HAREDA & district Project Officer and inform HAREDA & district Project Officer through email within 30 days about clearance of the site. In case no communication is received from the firm about the site, it will be assumed that the site is clear and no correspondence/request for additional time without penalty in this regard shall be entertained later.
 - ii. The time for and date of delivery or dispatch stipulated in the supply order (delivery or dispatch includes pre-dispatch inspection, supply, installation & commissioning) shall be deemed to be the essence of the contract, and should the contractor fail to deliver or dispatch any consignment within the period prescribed for such delivery or dispatch stipulated in the supply order, the delayed consignment will be subject to **2% penalty per consignment per month** subject to max. of 10% of the work order value recoverable on the value of the stores supplied. Once the maximum is reached, the "HAREDA" may consider termination of the contract. 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 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 on valid grounds before the expiry of the allowed time. Requests for extension received after the expiry of the allowed time shall not be entertained and shall be subject to penalty.
 - (ii) 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 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.
- (b) 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).
- (c) In the event of the contractor failing duly and properly to fulfil 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) After receipt of call for inspection, the material shall be inspected by the Director, HAREDA or a committee authorized by him/her 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.

The Firm should offer inspection **with 10 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 9th April (10 days notice) & period from 1st April to 9th April shall be under penalty clause.

- (ii) If the proposal for pre-dispatch inspection is received within defined & valid time period in the office of Director, HAREDA from the supplier and inspection is not carried out by the HAREDA by any reasons within 10 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 10 days till the date of actual inspection and no penalty will be imposed for this extended period.
- (iii) 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 a supplier to get inspected the material well in advance before the stipulated delivery time in case of bigger systems which require considerable time in their installation & commissioning so as to avoid delay 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 can also get the functionality of the system tested from any MNRE approved test centre/laboratory and the expenses shall be borne by the supplier.



Rejected material (if any) will have to be replaced by the supplier at its costs within a week time.

- (iv) 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 is not available for inspection, HAREDA 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.
- (v) The inspection report should be submitted to HAREDA 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 **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 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 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 HAREDA/District Office/User.
- (vi) The firm will print the words '**PROMOTED BY HAREDA & YEAR-2016/17**' on the body of the Systems in permanent manner so as to minimize any possible malpractices.

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.
- (ii) 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, 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.
- (iii) 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 15 year for solar thermal collectors and 5 years for complete system from the date of commissioning and handing over of the system. The contractor shall rectify defects developed in the system within Warranty period promptly. **The procedure to rectify the complaint/service to be provided during warrantee period is as follows :**

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 7 days of forwarding such complaints. The procedure to rectify the complaints shall be as under:

- (a) The notice through E-mail/hard copy to rectify the complaints shall be issued by the HQ/district officer/User to the supplier with copy to the HAREDA. This shall be followed by two reminders on 7 days intervals each. The district office shall maintain proper record of the complaints.
- (b) Even after this, the complaints remain unattended the penalty @ Rs.100 per day per system will be imposed from the expiry of 21 days & same will be deducted from the payment due to the supplier / out of the Performance Security Deposit/ bank Guarantee. The firm if failed to repair/ replace the defective system within next 10 days after expiry of the earlier specified 21 days of forwarding of the complaint then concerned ADC-cum-CPO shall forward the case to the Director, HAREDA along with estimated expenditure for the replacement/ repair. Director, HAREDA may consider repairing / replacing such defective system on the cost of the supplier. **The firm who shall be penalized by revoking PSD/Bank guarantee shall deemed to be considered as unfit to participate in all the tenders floated by HAREDA in future and shall be treated as unsatisfactory performer.**
- (c) 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 within 15 days.
- (d) 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.
- (ii) The supplier shall affirm as per standards for quality that anything 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.
- (iii) 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 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.



- (iv) HAREDA/the consignee will have the liberty to get the sample for the item(s) supplied tested from any of the Govt. approved lab at any time during the inspection or warranty period to ascertain the performance of the item(s) as per DNIT specifications. The cost of testing will be borne by the supplier.
- (v) The Contractor in consultation with concerned Project Officer/ Assistant 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.
- (vi) The Contractor/supplier shall continue to provide spare parts 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.

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 fulfil 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 General, 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, RE/ Chairman, HAREDA or a person nominated by him. 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

- (i) The prices are FOR anywhere in the State of Haryana inclusive of all taxes and duties, custom duty, excise duty, service tax, sales tax, C.S.T., local taxes, Trade Tax/VAT, Income Tax, Surcharge on income tax etc. if any. Contractor shall be entirely responsible for all taxes, duties, license fees, etc. All taxes payable as per Government income tax & service tax norms will be payable by the contractor. If any new tax/duty is levied during the contract period the same will be borne by the firm exclusively. TDS will be deducted from the payment of the contractor as per the prevalent laws and rules of Government of India and Government of Haryana state in this regard.
- (ii) Material shall be strictly as per DNIT specifications. If there is any left out specification, the same shall be considered as per the MNRE specification/applicable latest BIS/International Standards.
- (iii) All disputes relating to this work shall be subject to the jurisdiction of Panchkula and Principal Secretary, Renewable Energy Department, Haryana / Chairman, HAREDA shall be the sole arbitrator.
- (iv) The make of parts of systems should be strictly as per the make mentioned in the technical bid and test reports submitted along with the offer.
- (v) In case of any ambiguity in interpretation of any of the clauses/ provision of the said rate contract/DNIT, the decision of the Director General, HAREDA shall be final and binding.
- (vi) It shall be the sole responsibility of the contractor to get verified the quality & quantity of the supplied material at the site of delivery.
- (vii) The Contractor shall indemnify the HAREDA against all third party claims of Infringement of patent, royalty's trademark or industrial design rights arising from use to the goods or any part thereof.
- (viii) Contractor, wherever applicable, shall after proper painting, pack and crate all the equipment in such manner as to protect them from deterioration and damage during rail and road transportation to the site and storage at the site till time of installation. Contractor shall be held responsible for all damage due to improper packing.
- (ix) The contractor shall inform in advance to the HAREDA of the date of each shipment from his works and the expected date of arrival at the site to the concerned Project Officer.
- (x) All demurrage, wharf age and other expenses incurred due to delayed clearance of the material or any other reason shall be to the account of the contractor.
- (xi) The goods supplied under the contract shall be fully insured against loss or damage incidental to manufacture or acquisition, transportation, shall be included in the approved prices.
- (xii) HAREDA may at any time terminate the contract by giving written notice to the contractor without compensation to the contractor, if it becomes bankrupt or otherwise insolvent, provided that such termination will not prejudice or affect any right of action or remedy, which has accrued or will accrue thereafter to the HAREDA.



- (xiii) HAREDA, may by written notice sent to the supplier, terminate the contract, in whole or in part at any time for its convenience. The notice of termination shall specify that termination is for the purchaser's convenience in the interest of HAREDA.
- (xiv) Any material /instrument required for completing /successful running of the project which is not mentioned in the DNIT will be provided by the bidder in the approved rates only and no additional payment shall be made.
- (xv) Income Tax/Cess will be deducted at source from contractor' bills/dues in accordance with latest Govt. orders from time to time. The contractor will have no objection to this effect.
- (xvi) The contractor shall supply all technical literature and drawing considered necessary for the installation, operation and maintenance of the equipment and its fittings. These shall essentially include:-
- i) Drawing showing over all dimensions and all other details including sectional view of the equipments.
 - ii) List of parts with reference to nos.
 - iii) Manual of instructions for the operation, maintenance and repairs/equipment and special fittings, if any.
 - iv) Checking methods and schedule for cleaning the system.
 - v) Any other relevant technical data which would be of assistance for efficient operation and maintenance of the system including energy savings etc.
 - vi) Detail of manufacturing equipment, plant and machinery with their make, specification, cost and year of purchase.
- (xvii) The contractor shall put up a **MS iron display board** at site indicating salient features like cost, technology, important technical parameters etc along with the names of HAREDA as the sponsoring agency after approval of the same from HAREDA.
- (xviii) The make and serial number of collector must be recorded by the manufacturer in a permanent manner on the body of the component along with the serial number and year of manufacture of that item. This will enable verification with sale/supply records.
- (xix) The manufacturer should issue excise gate pass for the products sold so that sale of product can be independently verified, where applicable.
- (xx) HAREDA reserves the rights to verify the claimed capacity of the contractor, at any stage, from their own or through a third party. Supplier will have to extend all cooperation. If the claim of the supplier is found negative, then HAREDA may consider reject/cancel the contract.

Note:

Placing of any work order under this rate contract will require prior approval/ sanction of the Director, HAREDA. Any work order, referring to this rate contract, placed without the prior approval/ sanction of the Director, HAREDA, except HAREDA, will not be accepted by the contractor.



Schedule-C

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

FLAT PLATE COLLECTOR	ISI marked as per BIS 12933 specifications issued on and after April, 2012 Glass : Borosil Make, Selective Coating: Nelson Make	
COLLECTOR SUPPORT FRAME	Of non corrosive material or have corrosion resistant protective coating and shall be made with angle iron of 35 mm x 35mm x 4mm; will have vertical support at top and bottom edge of the inclined plane of the collector at a distance of 1.5 M or less. The vertical support shall be firmly grouted with the roof.	
STORAGE TANK (HOT WATER) a)Material b) Thickness	SS 304 or 316 grade	
	Minimum thickness	Tank capacity
	18 gauge	1.2mm (1000 LPD)
c) Thermal Insulation of Storage tank	Minimum 50 mm thick CFC free PUF having density of 28-32kg/ cu.m for domestic systems and 100mm thick Rockwool of 48 kg per cu. m for other systems.	
d) Inner tank welding	TIG / Seam/ pressurized weld (Open arc weld not permitted)	
PIPING Material Insulation	GI which can withstand temp. of 100 deg. C. GI Fitting, G.I. Piping, Valves : ISI Marked Minimum 50 mm thick rock wool or 25 mm thick PUF on GI pipes. In case of composite pipes, protective material should be provided, to avoid cracks and damages due to weather.	
INSTRUMENTATION	Temperature gauge: 1 No. dial type (for Hot Water Storage Tank/Outlet)	
COLD WATER TANK	HDPE/LDPE material with Gun metal float valve (ISI marked) equal to the capacity of Hot water storage tank i.e. 1000 Liter.	
MAKE UP TANK	The capacity of makeup tank should be 10 liters for 1000 LPD made of SS304 minimum 0.8 mm thick	
STANDS & PEDESTALS FOR THE TANKS (hot water tank/ cold water tank)	The tanks will be mounted on stands made out of angle iron frame of 50x50x6 mm with each leg duly grouted with PCC 1:2:4 of 1'x1'x1' size. The cold water tanks will be placed over angle iron frame having 4 cross members in 4 legs with 3mm thick MS sheet for full bottom support fixed of 4 horizontal members based on the size of the cold water tanks.	



SYSTEM LAYOUT & DESIGN	<p>Maximum number of collectors in series should not be more than ten.</p> <p>Maximum number of collectors in parallel in one row without the use of any piping connections should not be more than six.</p> <p>Air venting at appropriate places without hindrance of a spring loaded valve to prevent air locking in the system should be provided. For this purpose, the system shall have, at a suitable point, atmospheric pressure conditions preferably in the high temperature zone.</p>
HEAT EXCHANGER (SHELL/ COIL Type) Material and size	Cu/SS tube of 3/4” dia for thermo-siphon systems only. It shall be so designed to ensure that pressure drop is less than 0.3 kg/cm. The surface area of the heat exchanger should be as per requirement.
ELECTRICAL BACK UP	<p>Electrical wiring of 2.5 mm sq. 2 core unarmoured cable, thermostat of ISI mark of 16 amps.</p> <p>1000 LPD- 9 KW</p>

General Requirement

- i) System installed in high windy area will be well grouted/ clamped with collectors installed in a way that it is able to sustain the highest wind pressure of that area.
- 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 of any kind 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) The workmanship & aesthetics of the system will be good and it should be visible to anybody.
- vii) Air vent pipe, make up water and cold water tanks will be installed as required for smooth functioning of the system.
- viii) There won't be any leakage observed in the system from tanks/ collectors/pipelines.