INTER-UNIVERSITY ACCELERATOR CENTRE
(An Autonomous Centre of UGC)
Aruna Asaf Ali Marg, New Delhi-110 067

NOTICE INVITING E-TENDER

TENDER NO: IUAC/NIT/55/AJM/2019-20 Dated: 12/02/2020

Instructions for Online Bid Submission:

Inter-University Accelerator Centre (IUAC), invites online bids through e-Procurement Portal under two bid system, viz., Technical and Financial bids, from eligible and experienced parties for the work of "**Design, Supply, Fabrication, Installation, Testing and Commissioning of SS Process Water System and Replacement of Old SS & MS Pipes including Thermal Insulation etc.,** at IUAC".

Tender Documents may be downloaded from Central Public Procurement Portal **http://eprocure.gov.in/eprocure/app** and **www.iuac.res.in**

Aspiring Bidders who have not enrolled/registered in e-Procurement Portal should enroll/ register before participating through the website http://eprocure.gov.in/eprocure/app.

Bids shall be submitted online only at CPPP website: http://eprocure.gov.in/eprocure/app. Tenderers/Contractors are advised to follow the instructions provided in the e-procurement portal. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.

IUAC reserves the right to accept / reject any/all tenders in part/full without assigning any reasons thereof.

Bidder has to select the payment option as "**offline**" to pay the tender fee and EMD as applicable. The Earnest Money Deposit and tender cost shall be in the form of demand draft issued in favour of "Inter-University Accelerator Centre, New Delhi" and it should be deposited in IUAC before the bid opening. Bidders registered with MSME/NSIC are exempted from payments of EMD & tender fee. Copy of valid registration certificate should be uploaded.

Bidders are requested to note that they should necessarily submit their financial bids in the .XLS Format provided and no other format is acceptable. If the price bid has been given as a standard BOQ .XLS format with the tender document, then the same is to be downloaded and to be filled and submit it online without modifying the format. If the BOQ file is found to be modified by the bidder, the bid will be rejected.

Any Corrigendum/Amendments in respect of above tender shall be issued on website **https://eprocure.gov.in** only. Bidders should take into account any corrigendum published on the tender document before submitting their bids.

E-TENDER DOCUMENT

Name of Work	Design, Supply, Fabrication, Installation, Testing and Commissioning of SS Process Water System and Replacement of Old SS & MS Pipes including Thermal Insulation etc., at IUAC
Tender No.	IUAC/NIT/55/AJM/2019-20
Tender Value/Estimate	Rs. 77,84,000/- Excluding GST (Rupees Seventy Seven Lakh Eighty Four Thousand only)
Earnest Money Deposit	Rs. 1,56,000/- (Rupees One Lakh Fifty Six Thousand only in the form of DD)
Tender Fee	Rs. 500/- (Rupees five hundred only)
Bid Submission End Date	27/02/2020 at 3.00 PM
Technical Bid (Part-A) Opening Date	28/02/2020 at 3.30 PM
Price Bid (Part-B) Opening Date	To be intimated later
Contact Persons	M. B. Joseph, Administrative Officer (S&P) e-mail: joseph@iuac.res.in A.J. Malyadri e-mail: ajm.iuac@gmail.com Phone: 011-24126018 & 24126022

GENERAL CONDITIONS OF TENDER:

1. **Submission of Tender**: Tenders should be uploaded on CPP portal in two parts separately, **i.e. "Technical Bid" (Part-A) and "Price Bid / BOQ)" (Part-B).** No other mode of submission will be accepted. **Any clarifications/amendments/corrigenda etc., to NIT before last date of submission of bid will only be available on our website: www.iuac.res.in. Therefore bidders are advised to keep visiting our website.**

2. **Technical Bid (Part-A) :** In this bid, the bidder should upload his company profile, history and structure of firm, name of directors/partners/proprietor with technical staff, list of plant, machinery & tools in his possession, copies of work orders successfully executed during the last seven years. No deviations in respect of NIT conditions are acceptable.

The following essential documents are required for Technical Qualification:-

i) Earnest Money Deposit (NSIC / MSME registered companies are exempted from EMD)

ii) Tender acceptance letter (as per Annexure - III of tender document) on bidder's letter head duly signed & stamped by the bidder as acceptance of all terms & condition of tender.

iii) Copies of work orders successfully executed for **"Supply, Installation, Testing & Commissioning of Water Supply Systems including SS & MS Piping Works, Pumps, Tank, Valves, Thermal Insulation etc.,"** during the last 7 years for reputed Public Ltd. Companies, Public Sector, Govt. Institutions and autonomous bodies in the following manner:

HOWEVER, PLEASE NOTE THAT EXPERIENCE IN SITC OF SS PIPING WORKS IS ESSENTIAL AND MUST. Without the experience in having executed SS Piping Works, bidders will not be Technically Qualified.

a) One similar work of value not less than Rs.62.27 lakhs. Experience in SITC of SS Piping Works is must.

OR

b) Two similar works, each of value not less than Rs. 38.92 lakhs. At least in one of the works, experience in SITC of SS Piping Works is must.

OR

c) Three similar works, each of value not less than Rs. 31.14 lakhs. At least in two of the works, experience in SITC of SS Piping Works is must.

d)

iv) Satisfactory work completion certificate from at least one client with contract details. The work order and completion certificate should be for the same work.

v) Copy of GST Registration Certificate

vi) List of Makes / Model Nos. of offered items and Technical Data Sheets

viii) Undertaking for Site Visit has to be submitted as per Annexure – IV

vii) No deviations in respect of NIT conditions are acceptable. However technical discrepancy, if any, shall be clearly mentioned in Technical Bid (Part-A).

IUAC reserves the right to visit the working sites mentioned by bidders as proof of experience to ascertain the quality of service rendered. The bidder will have to arrange for such visit.

3. **Price Bid (Part-B):** In this bid the bidder is required to quote his items rates/prices for the works mentioned in the scope of work & technical specifications. The rates/price should be inclusive of all material cost, labour, services, charges for the plant/machinery/tools & tackles required for work, freight, Insurance, Govt. duties, **Excluding GST**, levies up to IUAC site basis.
   IUAC is exempted from GST. Necessary Exemption certificate shall be provided by IUAC wherever applicable.
   Quoted rates deemed to cover all the items & works which may be required for completeness for functioning of total system, even though they may not have been explicitly mentioned in the scope and schedule of works.
   No charges towards price escalation, site difficulties shall be payable extra or separately. It is mandatory on bidder to quote all items rate as asked for in the BOQ/ PRICE schedule. Failure to adhere to this condition will lead to rejection of tender.

4. **Earnest Money**: An earnest money of Rs.1,56,000/- has to be deposited at IUAC before the tender opening. The EMD shall be only in the form of Bank Draft in favour of "Inter-University Accelerator Centre" payable at New Delhi. No Cheques/Cash shall be accepted as EMD. The EMD of technically disqualified tenderers will be returned within 15 days from the date of evaluation of the technical bids. The refund of EMD to all other tenderers except the lowest tenderer shall be made within 15 days from the date of opening of price bid. The refund of EMD of the successful tenderer shall be made after completion of works and acceptance of system by IUAC upon his written request.

5. **Exemption from EMD:** Companies registered with National Small Scale Industries Corporation (NSIC) and Micro, Small & Medium Enterprises (MSME) will be given relaxation as per Govt. rules. Copy of relevant exemption certificates shall be uploaded.

6. **Validity of Tender:** Tender shall be valid for our acceptance without any change in rates and NIT conditions for a period of 90 days from the date of opening of Technical bid.

7. **Escalation:** No escalation over and above items rates quoted by the bidder shall be paid during the execution of contract.

8. **Performance Security:**

   i). SUBMISSION: The successful tenderer has to submit a performance bank guarantee /FDR of an amount equal to 5% of total contract value within a period of 15 days from the date of issue of LOI. Performance Bank guarantee / FDR shall be drawn in favor of Inter University Accelerator Centre as applicable. If tenderer fails to deposit the said performance security within the period as indicated, the Earnest Money deposited by the tenderer shall be forfeited automatically without any notice to the tenderer and without prejudice to any other right or remedy. Performance Bank guarantee shall be Valid for entire contract period and two extra months. In case of contract extension with or without LD the validity of BG shall also be extended for the extended period with additional two months.

   ii). FORFEITURE: Performance Bank guarantee established under Clause 8 (i) shall contain a statement that it shall be automatically and unconditionally forfeited without recourse and payable against the presentation by INTER UNIVERSITY ACCELERATOR CENTRE to the relevant company/ correspondent bank, as the case may be, together with a simple statement that tenderer has failed to comply with any term or condition set forth in the Contract.

   iii). RELEASE: Performance Bank guarantee will be released without interest within fifteen (15) days on successful taking over of the project by IUAC on receipt of written request from tenderer seeking release subjected to submission of BG towards defect liability period as per the clause no-16.

9. **Extra Items:**- During the execution of work, the contractor may require to execute certain additional/extra items in order to complete the job/works beyond the BOQ for which no rates are available. The payment for such extra/deviated items shall be paid as per rate approved on the basis of analysis. The cost component for rate analysis shall be (i) cost of material (ii) cost of direct labour (iii) Contractor over heads & profit 10%. Before execution of extra work, the rate analysis may be forwarded to A.O (S&P) duly certified by the IUAC representative for approval of the Director, IUAC. However, the extra items amount should not exceed 10% of the total contract value including all taxes.

10. **Completion Time:** The time shall be the essence of this contract and entire work as titled above is to be completed in all respects within a period of Four Months (120 days) from the date of issue of LOI/PO. The successful bidder has to submit the time & activity chart for the completion of work. Replacement of old SS & MS pipes including thermal insulation has to be done in the existing running systems and shall be carried out only during shutdown period.

Availability of shut down will be subject to supply of all the material at site and time frame agreed upon by IUAC and to the satisfaction of IUAC engineer. Work may have to be carried out at night and holidays also depending on the shut down availability and no extra compensation will be given for the delays, time extensions due to non - availability of shut down. Any delay in completing the work for reasons attributable to the contractor is liable for liquidated damages as per clause 18 of NIT. Under the force-majure conditions or delay due to reasons beyond control of the contractor, IUAC may grant suitable time extension for which the contractor has to request along with the justification/ reasons well in advance to the Director, IUAC for approval without any prejudice to price escalation. No time extension request shall be considered after the expiry of completion period/contract. The decision of the Director will be final and binding on the bidder/contractor.

11. **Scope of Work**: Detailed scope of work, technical specifications etc., are enclosed with this NIT as per Annexure I, II and V.

12. **Deviations:** No deviation from the stipulated terms and conditions will be allowed. Tenders should be unconditional.

13. **Site Conditions**: Contractor shall acquaint himself fully with the site conditions and the working environment of IUAC before quoting his rates. No compensation on account of any site difficulties will be entertained, at a later date, after award of the works.

14. **Correspondence**: All the correspondence in respect of tender/contractual obligation shall be made to AO (S&P), Inter–University Accelerator Centre, Aruna Asaf Ali Marg, New Delhi-110067.

15. **Terms of Payment**: The payment shall be made on submission of the bills by the contractor after due certification by the IUAC person responsible for supervision of the work in the following manner:-

i) 60% Payment will be released against supply of material at site in good condition on pro- rata basis.

ii) 30% Payment will be released after satisfactory completion of fabrication, installation, testing, commissioning & acceptance of the system by IUAC in all respects

iii) Balance 10% Payment shall be held towards performance guarantee for one year from the date of satisfactory commissioning & handing over the system to IUAC. Release of this payment is subjected to submission of bank guarantee /FDR of amount equivalent to 10% of final bill value valid for 365 - days towards the defect liability period.

16. **Guarantee/Defect Liability Period**: The contractor should guarantee for the works / items executed / supplied by him against the manufacturing / engineering defect and bad material / workmanship for a

period of one year from the date of acceptance by IUAC. During this period if any replacement of items and/or repairs / rectification is needed, the same should be replaced / repaired free of cost to IUAC.

17. **Tender Rejection:** IUAC reserves the right to reject any or all the tenders in full or in part without assigning any reasons whatsoever, and the decision of the centre in this regard will be binding on all the bidders. Tenders not complying with any of the provisions stated in this tender document are liable to be rejected. **Director, IUAC reserves the right to accept or reject any tender without assigning any reason and does not bind himself to accept the lowest tender.**

18. **Liquidated damages**: In case the work is delayed beyond the specified completion period for reasons attributable to the contractor, deductions on account of Liquidated damages @1% of the contract value per week will be deducted subject to a maximum of 10% of the total cost excluding GST. However, in case the works are delayed beyond the scheduled completion / contract period, IUAC reserves the right to get the work done by any other contractor at the risk and cost of the contractor and amount to this affect along with 10% over heads will be deductible from his bills/dues.

19. **Performance of the System:** On receipt of the purchase order, the contractor will submit the design and other details to carry-out the job. Only after getting approval from IUAC, the contractor should go ahead with procurement and fabrication etc. The contractor on completion of the work will amply demonstrate the system & design parameters. He should supply the manufacturer's certificate/ instruction manual along with materials / equipments. If the equipment is supplied & installed by vendors other than manufacturers, they should submit the purchase details of items from original manufacturer like purchase order, bill particulars, equipment test and guarantee certificates etc.

20. **Specifications:** Where not specified will be as per the best industry practices, ISI marked or CPWD Technical Specifications whichever is superior. In case of any variation in specifications at different places in NIT, the best /richer specification will be considered. However, decision of IUAC engineer will be final.

21. Contractor should depute a qualified supervisor dedicated for this site, who will co-ordinate work execution activities and interact with the IUAC representative responsible for supervision of work. Without a Supervisor, work will not be allowed. All the persons deployed at IUAC site should carry valid gate-passes. Any negligence/offence on their part will attract immediate removal from site.

22. The contractor will provide for all necessary materials, tools, equipment, measuring instruments and working consumables etc., needed for execution of the works. Safe custody of all such material will be contractor's sole responsibility. No extra charges will be paid for the same.

23. Watch and Ward of all material till the system is taken over by IUAC shall be the sole responsibility of the contractor and pilferage etc. shall be entirely to his account.

24. The work shall be carried out as per the norms set by the manufacturer of respective equipment, specifications and specific instructions as may be issued by the IUAC representative responsible for work from time to time.

25. During execution of work, the contractor should follow all standard norms of safety measures / precautions to avoid accidents / damages to man, machines and buildings. On non-adherence of this clause, suitable fines as decided by the Director, IUAC shall be imposed.

26. **Challan :** No material belonging to the contractor whether consumable or non-consumable should be brought inside the IUAC campus without proper entry at the main gate nor any material should be taken out without proper gate pass issued by the centre. **List of all inwards / outwards challan to be maintained by the contractor with a copy mark to IUAC Engineer.**

27. IUAC will provide free water and electricity during installation work at IUAC at one point. The contractor has to make his own arrangements for installation of power and water from that point as per his requirements.

28. Tender once submitted will remain with the centre and will never be returned to the bidders.

29. **Termination of Contract:** The Director, IUAC reserves the right to terminate the contract on account of poor workmanship, failure to mobilise the site within 30 days, non-compliance of set norms/ specifications for the works, delay in progress of work, violation of any contract provisions by the contractor. In such case the contractor is liable to pay liquidated damages @ 10% of tendered value besides performance security / EMD.

30. **Any dispute arising out of this contract will be subjected to jurisdiction of New Delhi/Delhi.**

Accepted

(Signature of bidder)

ANNEXURE - I

Scope of Work:

1. It includes Design, Supply, Fabrication, Installation, Testing and Commissioning of Water Systems including Pumps, Heat Exchanger, Expansion / Storage tank, SS Piping, SS Valves, Chilled Water MS Piping, Thermal insulation, Pipe supports etc., in Beam Hall#III FF.

2. The main SS Supply & Return pipes will be connected onto the existing pipes. Chilled Water MS Piping will be connected onto the existing S/R headers.

3. The replacement of SS, MS Piping including valves & thermal insulation is in the existing running systems. Old pipes and valves have to be dismantled and new pipes have be installed in its place. This work shall be carried out only during shutdown period. The dismantled old pipes have to be shifted to IUAC junkyard after cutting into pieces by gas cutting.

4. All related electrical works as per schedule of quantities should be part of the work

5. Minor civil works associated with this should be included in the work

6. Please note that the entire system shall be installed on the first floor of Beam Hall#III. The noise and vibration levels of Pumps should be within the allowable limits as specified in the technical details of Pumps. The inertia block and floating foundation should be adequate enough, not limited to what has been specified, to ensure minimum noise and vibration levels.

7. During Dye Penetrant Test (DPT) of TIG weld joints, it is to be ensured that DPT penetrants/chemicals do not spill over on the floor/equipments/instruments. The area surrounding the DPT should be properly covered.

8. The system installation team should comprise of a Technical Supervisor, experienced and approved TIG welder(s), pipe fitter, grinder, helpers etc.,

9. All tap-off holes on main headers should be done by drilling only. TIG welding torch cutting will not be allowed at any cost.

10. Preparation of piping layout drawing including support details. The same should be got approved by us before fabrication and 2 copies of as built drawings & one soft copy both in solid works and in pdf to be submitted. Works shall be allowed only after approval of drawings.

11. Manufacturer's Material & Test certificates for all the equipment/material including SS Pumps, Motors, SS Heat Exchanger, SS Pipes, Chilled Water Pipes, SS Fittings, Valves etc., should be submitted to us before starting execution of works by the contractor. Without submission of test certificates and approval from our end, work will not be allowed.

12. Material / Equipments like SS Pumps, Heat Exchanger etc., should be offered for inspection and testing at factory before dispatch to site wherever applicable.

13. All the works will be done as per the technical specifications mentioned in Annexure-II.

14. All rates should be quoted by the bidders item wise after carefully going through the Technical specifications.

15. No deviations from scope of work & technical specifications will be acceptable.

16. The works are only indicative and all the activities needed for completion of the works have to be accounted for by the bidder at the time of quoting.

17. Bidder should take into account all the implicit items not specified here-in, but are essential for completion of the work. The costs of such items should be in-built in the costing of the item rates. If the items are not taken into account, they should be clearly brought out in the Technical Bid (Part-A) of the bid document.

18. While carrying out the works all precautions have to be taken to ensure no defacing / damage occurs to adjacent area / equipments etc., In case of any damage occures, the same has to be rectified/repaired free of cost by contractor.

19. Supports shall be made of Equal angles of 50x50x6 mm thickness / C-channels of ISMC 100 (100x50) / ISMC 75 (75x40mm), box made out of 2 nos. of ISMC 100 (100x50) welded together, MS plates of size 150x150x12 mm thickness or various sizes with a thickness of 10/12 mm, Anchor fasteners of 12 mm as required as per the requirement or as per the design. One coat of red oxide paining and two coats of synthetic enamel painting should be done on all the supports. This should be included in the costing of SITC of SS piping.

20. Basis of Payment: The quantities shown on the price schedule are only tentative and the actual measurements will only be known after the exact design & drawing is finalised by the successful bidder with due approval of the owner.

21. Kindly note that payment shall be made as per the actual quantities installed and not on the basis of items supplied. The final payment will only be made on the basis of the actual work / quantities executed and for this a joint measurement by IUAC engineer and the contractor will have to be taken. The responsibility and the facilitation for taking the measurements will rest with the contractor. It is entirely contractor's responsibility to take dimensions, sizes from site, design the system and take IUAC's engineer's approval before actually proceeding with supply and installation of the same at site.

Technical Specifications: **ANNEXURE - II**

I. SS PROCESS WATERPUMPS:

i) The pump shall be capable of developing the required total head at rated capacity. The pump shall operate satisfactorily on the HQ Characteristic curve over a range of 50% to 130% capacity.

ii) The total head capacity curve shall be continuously rising towards the shut off. The pump should deliver at least 125% of its rated capacity at 75% of the specified total head.

iii) The required NPSH at duty point shall be at least 1.0Mt loss than the available NPSH.

iv) The pump shall run smoothly without undue noise and vibration. The velocity of vibration shall be within 1.8mm/sec. The noise level shall be limited 85db at a distance of 1.8Mt.

a) The maximum power required by the pump from zero discharge to zero head.

b) 115% of the power required at the duty point considering the pump efficiency with 1% relative tolerance on quoted figure of efficiency (with zero negative tolerance)

v) The power rating of pump motor shall be the larger of the following:

vi) Suction & discharge connection shall be flanged

vii) Pump impeller shall be dynamically and statically balanced

viii) All accessories required for proper and safe operation shall be furnished with the pump

ix) The contractor shall furnish routine and type test certificate of the pump in original as per IS 5120

x) All pump foundation shall be of floating type

xi) Pump shall be back pull out type with enclosed impeller single volute, coupled shaft, direct driven, with gland seal, flexible/spacer coupling, nozzle orientation of end suction and top discharge, flange drilling as per ANSI B 16.1 (125lbs). Impeller, casing, shaft and shaft sleeve shall be of SS-304 and MS base plate.

xii) Installation of Pump sets:

The total weight of pump and inertia block shall be twice to thrice the weights of the pump/motor/base plate. The inertia solid blocks of minimum size of extending 150 mm all around the base frame, suitable height (minimum 200 mm) with all around frame of MS equal angle 50 x 50 x 6 mm, steel reinforcement grid of 100 mm max. made of steel bar 8 mm dia, cement : sand : concrete mixture of 1:1.5:3 to be made. The inertia block shall be floating on rubber vibration pads with GI sheets in between of 150 x 150 x 12 mm thickness - 6 nos. each placed at total 9 places.

a) The MS base frame in main channel should be of size 5”x2”x6mm thick, top plate under pump and motor 10mm each, bottom plates 5mm, taper washers, side rigid stiffeners, HT fasteners with spring washers for holding, SS shims for alignment, drip pan arrangement in base

b) The base frame will be leveled to an accuracy of 0.05mm/meter

c) The leveling of pump motor to an accuracy of 0.05 mm per meter & loading of pump feet on new machined packer plate with a foot impression of minimum 80% of the foot area

d) Preliminary alignment with the drive motor

e) Final positioning of pump after preliminary alignment, leveling, feet loading & tightening of the hold down bolts

f) Connection of suction & discharge lines duly aligned & parallel

g) Bearing of coupling (if needed & fencing the same)

h) Final alignment of pump to motor shaft to an accuracy of 0.05 mm on axial & radial both

Performance Tests: The pump shall be tested as per IS: 5120 at rated speed in manufacturer's place to measure capacity, total head, efficiency, and power. Test certificate for same to be supplied.

Field Testing: After installation, the pump shall be subjected to testing at field for designed noise and vibration levels.

Name plate: It should be mounted having details i. Design capacity ii. Total head iii. Speed iv. Sr. No. v. Model No.

TECHNICAL DATA SHEET-1 TO BE SUBMITTED BY BIDDER WITH TECHNICAL BID		
	Item (Bidder's Scope in quoted price)	**To be filled by Bidder**
1	**SS Centrifugal Pumps (Process Water)**	
1.1	Make	
1.2	Model	
1.3	Quantity Nos.	Three (3)
1.4	Type - Back pullout	confirm
1.5	Suction - End	confirm
1.6	Discharge - Top	confirm
1.7	Design Flow rate – 120CMH approx / as required	
1.8	Total Head - 80 met. approx. or as required.	
1.9	Shut off Head M	
1.10	Pump efficiency at duty point(> 65%)	
1.11	Power input to pump at duty point	
1.12	Motor, Squirrel Cage, induction motors, continuous duty, Star-Delta starter, Insulation Class-F, IP-55, Motor rating (415Volts/3-Phase/50Hz) kW	
1.13	Speed - ~3000 RPM	
1.14	Type of motor enclosure SPDP / IE 3 efficiency	
1.15	Motor / Pump common Base Frame - C-channel, Size- 5" min, thick-6mm, with M.S Plates (grinding finish) with holes for motor / pump foots (Included) duly painted	Confirm
1.16	R.C.C. Floating Foundation included in scope duly painted	confirm
1.17	Flexible Coupling with spacer	confirm
1.18	Motor Starter – Star Delta Type, (included in electrical panel)	Confirm
DATA TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT		
1	Final Overall dimensional drawings for pump set. These shall show all the major parameters of set.	
2	Cross sectional drawing of the pump indicating material of construction of all the parts.	
3	Foundation drawing indication details of fixing, grouting, total weight, plinth size, anchor bolts etc.	
4	Performance curve	
5	Test certificates	
6	Operation and maintenance manual.	

II. Heat Exchanger:

General:
The type, size and design conditions for the heat exchanger shall be specified in the form of data sheet
Scope:
This specification covers the design, material, construction features, manufacture, shop inspection and testing, commissioning and field testing of shell and tube heat exchanger.
Codes & Standards:
The design, manufacture & performance of shell and tube heat exchangers shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. The

equipment shall also confirm to the latest applicable standards. Nothing in this specification shall be construed to relieve the vendor of the responsibility.

Design Temperature:

For tubes, tube sheets and floating heads, which are in contact with both hot and cold fluids, the design temperature shall be the higher of the two design temperatures indicated in the price schedule.

Design Pressure:

Floating heads and tube sheets shall be designed for full design pressure acting independently on either side.

Construction Features:

Shell:

The shell thickness shall be as per TEMA standard. The shell can be of rolled steel plate longitudinally welded preferably from one plate or of seamless pipe. Of the two, seamless pipe shell is preferred. For seamless pipe shell, the minimum wall thickness (87 ½% of nominal thickness) less corrosion allowance shall be considered as available for pressure part design.

Shell Cover:

The shell cover may be of forged or built up welded construction. The shell cover shall be an elliptical head or tori spherical head or spherical head as specified. The cover shall be bolted to the shell in the case of floating head type heat exchangers. The bolts of the floating head cover joint shall be accessible when the shell cover is removed. The shell cover may be welded on to the shell in the case of U tube bundles and kettle type re-boilers. Shell cover thickness shall be computed as recommended by TEMA standard.

Main Shell & Channel Flanges:

All flanges shall have the minimum thickness as per ASME codes. Forged and weld neck flanges conforming to TEMA or ANSI standards are preferred. Hub as well as ring flanges and plate fabricated flanges are also acceptable. Slip on ring flanges fabricated out of plate, if used, shall be fabricated from a single piece of plate. Main shell and channel flange joints shall be of tongue and groove type.

Tube Sheets:

Tube sheets shall be of rolled plate or forged. Tube sheet thickness shall be calculated as recommended by TEMA.

Pass Partition Plates:

The pass partition plates shall be tightly welded in place. Weep holes in pass partition plates are not acceptable for draining the tube side of the exchanger.

Tubes:

Welded tubes are not acceptable unless otherwise specified. The minimum wall thickness required at any point shall be determined in accordance with UPV formula. Tube wall gauge in accordance with TEMA recommendations will be preferred. The tube bundle after taking out the floating head cover and the backing device shall be removable through the inlet channel end. The tube bundle shall be capable of being rotated through 180 degrees around the longitudinal axis without bending. When straight tube channel type construction is used, all tubes shall be accessible for inside cleaning, rolling and replacement from both ends of the exchanger. The angular clearances between tubes and shell must be kept to a minimum to obtain efficient heat transfer. If this gap exceeds 19.1 mm (3/4”), suitable longitudinal sealing strips shall be provided. The tubes shall be roller expanded into the tube sheets. Tubes shall be expanded into tube sheet at least for 51 mm or tube sheet thickness minus 3 mm whichever is less unless specified otherwise. Tubes shall extend beyond the face of tube plate by 1.5 mm or 3 mm uniformly in the case of expanded tubes. In the case of vertical heat exchanger or in welded tube exchanger, the tube ends shall be flush with the face of the tube sheet. The tubes shall be roller expanded into tube sheet preferably with a torque controlling device to prevent over or under rolling.

Material and Specifications:

Shell	-	Seamless SA 312 TP 304
Baffles	-	SA 240-304
Impingement plate	-	SA 240-304
Channels/Bonnets	-	SA 312 TP 304
Channels/Bonnets flanges	-	SA 240-304
Nozzles – Shell side	-	SA 312 TP 304
Nozzles – Tubes side	-	SA 312 TP 304
Nozzles – Flanges-Shell side	-	SA 240-304
Nozzles – Flanges-Tube side	-	SA 240-304
Tubes	-	Seamless SA 213 TP 304
Tube Sheets	-	SA 240-304
Tie Rods	-	SA 479-304
Spacers	-	SA 312 TP 304
Name plate and plate bracket	-	SS 304
Bolting-fixed tube joint	-	SA 193-B7
Nozzles	-	SA 193-B7

TECHNICAL DATA SHEET-2

TO BE SUBMITTED BY BIDDER WITH TECHNICAL BID

	Item (Bidder's Scope in Quoted Price)	**To be filled by Bidder**
2.	**SS Heat Exchanger**	
2.1	Make	
2.2	Model	
2.3	Overall Sizes of Heat Exchanger	Bidder to Specify
2.4	Quantity Nos.	1
2.5	Type – Shell & Tube	confirm
2.6	Fluid Circulated on Shell Side – Chilled Water	confirm

2.7	Fluid Circulated on Tube Side – Process Water	confirm
2.8	Design Flow rate on Shell side– 175 CMH	confirm
2.9	Water Temp. IN / OUT, on Shell side – 6.7 / 12.2 Deg. C	confirm
2.10	No. of Passes on Shell Side	Bidder to specify
2.11	Design Flow rate on Tube side– 120 CMH	Confirm
2.12	Water Temp. IN / OUT, on Tube side – 28 / 20 Deg. C	Confirm
2.13	No. of Passes on Tube Side	Bidder to specify
2.14	Fouling hr.m2.C/kcal	Bidder to specify
2.15	Heat Exchange Capacity, 960000 Kcal/hr,	Confirm
2.16	Heat Transfer Surface Area, sq.met	Bidder to specify
2.17	LMTD	Bidder to specify
2.18	Operating Pressure – 10 kg/sq.cm	Confirm
2.19	Design Pressure	Bidder to specify
2.20	Shell MOC (Should be Seamless SS only)	Bidder to specify
2.21	Shell Inlet / Outlet Connection Sizes (OD), mm	Bidder to specify
2.22	Tube MOC (Should be Seamless SS only)	Bidder to specify
2.23	Tube Inlet / Outlet Connection Sizes (OD), mm	Bidder to specify
DATA TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT		
1	Final Overall dimensional drawings for Heat Exchanger. These shall show all the major parameters of set.	
2	Cross sectional drawing of the Heat Exchanger indicating material of construction of all the parts.	
3	Foundation drawing indication details of fixing, grouting, total weight, plinth size, anchor bolts etc.	
4	Performance curve	
5	Test certificates	
6	Operation and maintenance manual.	

SS Expansion Water Tank:

The SS expansion water tank shall be fabricated with minimum 3 mm thick stainless steel sheet SS-304. SS angle should be used as stiffener. It should be provided with inlet, outlet, return connection for process water, vent, drain, overflow, low level limit switch, level indicator and manhole with cover for cleaning the tank.

The tank should be placed on suitable foundation RCC pillar / MS supporting structure & thermally insulated from outside with 75 mm thick TF quality expanded polystyrene sheet. Finally it should be covered with 26 Gauge Al. sheet cladding.

TECHNICAL DATA SHEET -3

TO BE SUBMITTED BY BIDDER WITH TECHNICAL BID

S.N.	Description	Required	**Bidder to confirm**
3	**SS Expansion Tank**		
3.1	Number Required	1	
3.2	Size (LxW x H) mm	1160x1160x1500	
3.3	Clear water Volume capacity	2000 Lts.	
3.4	Design & Fabrication Code	ASME Sec-VIII	
3.5	Operating Pressure	Water Column	
3.6	Design Pressure	Water Column	
3.7	Design / Operating	4**0** ºC / 20 ºC	
3.8	Joint efficiency	0.7	
3.9	Operating/Erection/Filled	By Vendor	
3.10	Construction	Butt TIG Welding	
3.11	Inspection	By IUAC	
3.12	Insulation	TF quality Expanded Polystrene, Density-24 kg/sqcm, thickness-75 mm, CPRX coat, 1000 gauge (250 micron) polythen**e** sheet, hessian, 19 mm mesh 24SWG GI wire, 26 G Al cladding	
3.13	Installation	Shall be installed on CC foundation or steel supporting structure on the floor at a height of 1500 mm	
3.14	Level Indicator	Having SS Valves on both ends, flanged joint, Glass/Scale level indication	
	Material and Specifications		
3.15	Shell and Cover	SS-304, Thickness-**3** mm minimum.	
3.16	Nozzle / Neck / Piping	SS-304, Sch-40/80, 6” long	
3.17	Nozzle Flanges	SS-304, #150 lbs. RF	
3.18	Manhole Flange & Cover, fasteners	SS 304, Size- 600 NB, 6” long	

3.19	Stiffener	SS EA-40x 40x 5mm. At centre height along all sides. Bottom support frame made of SS 50x50x6 mm Equal Angle	
3.20	Painting	MS surfaces shall be painted with one coat of primer and two coats of synthetic enamel of approved shade after surface preparation.	
3.21	Insulation Support	Welded SS cleats of 14 SWG SS wire x 75 long	
3.22	Name Plate	SS	
3.23	**Flanged Nozzle Schedule**		
3.24	Make up Inlet	2" NB, Sch-80 – 1 No.	
3.25	Expansion Line / System	6" NB, Sch-40– 2 Nos.	
3.26	Drain	2" NB, Sch-80 – 1 No.	
3.27	Instrumentation	2" NB or as required, Sch-80 – 4 Nos. (for low level switch & level Indicator)	
3.28	Over Flow	2" NB, Sch-80 – 1 No.	
3.29	Manhole with Double wall, SS Sheet Cover, Handle, Hinges, leak tight gasket etc.	600 Dia. x 100mm neck High	

4. Technical Specifications for SS Piping:

a. All pipes shall confirm to ASTM A312, TP 304, Sch.40S, ERW with dimensional standard as per ANSI B 36.19. The pipe material shall be SS-304. Ends shall be beveled.
b. All elbows, Tees, reducers will conform to ASTM A 403, WP 304 with dimensional standard as per ANSI B 16.19. Elbows radius should be 1.5 D or it may vary as per the site conditions. It shall have beveled ends.
c. All flanges shall conform to ASTM A 240, TP 304 with dimensional standard as per ANSI B 16.5, #150 SORF.
d. All bolts shall be SS Material with dimensional standard as per ANSI B 18.21 and length to suit.
e. All nuts shall be SS Material with dimensional standard as per ANSI B 18.21
f. Pipe in maximum length shall be used to minimise the welded joints.
g. All gaskets shall be as per CAF IS:2712 W/3 with dimensional standard of ANSI B 16.21 150# and 3 mm Thick Ring Type.
h. All pipe supports should be as per ANSI code B 31.1/B 31.3 and good engineering practice. Pipe support to be provided at every 2/2.5/3 m (depending upon the pipe sizes) length of pipe and before and after the fittings. Indian Standard Channel and Equal Angles to be used. Pipe support drawing to be provided along with final drawing. Load bearing on pipe supports to be calculated and to be furnished.
i. Thermal packing has to be provided between support steel and SS Pipes to prevent the contact between dis-similar material. Wherever thermal insulation has to be done on SS pipes, wooden blocks with a half circle cut on top of required pipe sizes should be provided between supports and SS Pipes.
j. Hanger rods shall be minimum 12 mm in size and load ratings shall be in accordance with ANSI B31.1 for ASTM A 36 or equal.
k. Vendor shall carry out detailed design of all the supports, hangers and welded attachments.
l. All test certificates shall have to be provided for the pipes, valves, fittings etc., for conformity to standards. If required, IUAC may ask the bidder to get the material test done. All expenditure on account of material testing shall be to bidders account.
m. Nipples, U-Tubes, Valves and all fittings required for pressure gauges mounting should be in SS-304 material. U clamps for pipes should be in SS-304 material
n. SS Nipples should be made out of SS-304, Sch.80 Pipes and machine threaded SS Sockets, Reducing Bushes and Plugs shall be heavy duty, made out of SS-304 Rod (Cast Item not acceptable).
o. Thermowell to be mounted for Temperature Indicator fixing.
p. The pipe welding shall be as follows:

Welder: Pre-qualification of welder will be done based on face and root bend test & penetration. Test report for the same to be furnished. The welder will be qualified by us based on test specimen welding in our presence and submission of test report from an approved laboratory. Welders and welding procedures shall be certified as per Section IX of ASME Boiler and pressure vessels code - latest edition. All welders working on project piping shall have passed the performance qualification test prescribed by section IX of ASME Boiler and Pressure Vessel code. The welder qualification tests shall be performed at our site. All expenditure on account of welder testing shall be to bidders account.

- Burrs will be removed by grinding around and the result will be a square butt edge without chamfer.
- Before welding the pipe edges will be cleared by SS wire brush, emery cloth and final wiping with clean rags.

- Ends of the pipes will be carefully aligned so that no offset is present. Evenly spaced tacking by shielding will be done and the tacking will be cleaned before welding process.
- All welds shall be done using only TIG process. All the joints should be got it physically checked by us before welding.
- Electrodes will be 1/6" or 3/32" diameter, 2% thoriated tungsten confirming to AWS-ASTM, EWTh2 and to be sharpened to pencil point.
- The electric current for welding will be direct current, straight polarity (electrode negative).
- All welds will be made to minimize carbide precipitation.
- All welds shall be shielded with welding grade argon at a controlled rate through a flow meter.
- In addition to shielding the weld area, the inside of the pipe is to be purged with argon to prevent oxidation of the inner surface. The purging will be done in all (root and final) the passes.
- All SS weld joints will be inspected Dye Penetrant Test Examination as per ASTM E-165. 100% root joints will be tested. 100% joints on final run will also tested by Dye Penetrant Test Examination.
- Filler wire shall confirm to AWS-A 5.9, ASTM 371 and ER 308 type. It should be Adore / L&T / BOC make.
- The pipe / fitting ends to be welded must be beveled and two passes must be made.
- All tacks and passes are to be cleaned on the outside by using stainless steel wire brush (not steel).
- Grinding of stainless steel welds is not permitted. Hammering of stainless steel welds is strictly prohibited.
- The tap-off on nipple end to be welded to main pipes will be rounded to radius of the pipe dia. and then butt welded.
- All tap-off holes will be drilled and no gas cutting will be allowed.
- All pipe pieces will be cut by hacksaw/powersaw and no gas cutting will be allowed.
- After the erection of piping, Hydrostatic test will be done on piping at 1.5 times the maximum working pressure or minimum 12 bar pressure. The test pressure shall be held with no noticeable loss in pressure while all joints are visually inspected for leaks. IUAC will be the final authority to determine the test pressure to be done on the joints

- Pipe Thermal Insulation Procedure:
  Insulation material shall be fire retardant TF quality expanded polystyrene moulded pipe section of density 24 kg/cum and a thickness of 75 mm in pipe section form, K=0.035 Kcal / hr.m.Deg.C and (glass wool not accepted).

Application:

- ✓ The surface to be insulated shall be thoroughly cleaned and allowed to dry.
- ✓ CPRX compound of STP confirming to IS 702 shall be uniformly applied @1.5 Kg/Sq m on the surface to be insulated.
- ✓ A similar layer shall also be applied on the inside surface of the insulation. Insulation sections shall be stuck to the surface with the joints staggered. The adjoining sections shall be tightly pressed together. All the joints shall be sealed with CPRX. Voids will be sealed with suitably cut pieces. Sections shall be held by PVC packing strip of ½ ‘ width at gap of 800 mm.
- ✓ A vapour barrier with cover of the insulation with 1000 gauge (250 micron) thickness white polythene followed by wrapping of Hessian with 50 mm overlaps and sealing all joints.
- ✓ The surface shall then be wrapped with 19 mm mesh 24 SWG GI wire, butting all the joints and laced down with 22 SWG GI lacing wire.
- ✓ On top of it 26 gauge thick Aluminum cladding should be done as outer finish. The Al cladding joints shall be sealed with white silicon sealant.

- ✓ **SS Ball Valves (Threaded end connections):**

Rating - PN 64, threaded end connections. Material of construction : Body-ASTM A, Body connector-351 CF8, Connector seal & ball seat - PTFE, Ball & stem-AISI 304, Stem seal & gland packing- PTFE, Gland - AISI 316, Gland nut-SS304, Lever & Lever nut - SS 304, lever sleeve – PVC.

- ✓ **SS Ball Valves (Flanged end connections):**

  Rating–ANSI Class#150, Flanged End Connections, Test pressure for Shell-31 bars (hydrostatic), Test pressure for Seat leak- 5-7 bar (air), Material Specification: Body-ASTM A, Body Connector-351 CF8, Connector Seal & Ball Seat-PTFE, Ball&Stem-AISI304, Stem Seal & Gland Packing-PTFE, Gland-AISI304, Gland Nut-SS-304, Lever & Lever Nut -SS-304, Lever sleeve-PVC

- ✓ **Non-Return Valves (Check Valves**): These should be ANSI 150# class rating and flanged end connections drilled to ASA B 16.1. The material of construction is as follows: Body-ASTM A 351 GR CF8, Body Seat & Disk Seat – SS 304, Bolts, studs & nuts as per ASTM A 193 GR B8/A194 GR8. Shell test 450 psig Hydro and seat test 325 psig Hydro.

- ✓ **Temperature Gauges (SS Dial Type):** It shall be dial type SS Temperature Indicator, 6" dia., 0-60 Deg C, Bimetal / Rigid stem type,

- ✓ **Pressure Gauges:** It shall be SS bourdon tube type, 150 mm Dial, 3/8" BSP bottom connection, 0-16 kg. per sq.cm (0-235 psi). They shall be installed on inlet and outlet of chilled water pipes. They include and shall be connected to the pipes by welding socket, SS Nipple, S.S. Ball valve (Shenco - Make), SS U-tube, SS Socket, pressure gauge and included in the cost.

- ✓ **Strainer:**

  Description : 'Y' Type Strainer

  End Connections: Flanged Drilled to ANSI B 16.5 #150

  Drain Size : ½" BSP

  Material of Construction: Body & Cover - SS 304, Screen / Basket – SS 304, Mesh Size – 3mm Dia. Hole

- ✓ **Three- Way Mixing Valve:** Process Water Temperature control system consisting of Siemens make three port 5" or 6" NB seat valve with flange of PN-16 rating with Siemens modulating motor, actuator, Siemens make pipe mounted immersion temperature sensor suitable for SS pipe of sizes 5"/6" with temp. range of -50 deg C to 80 deg C and IP 42 protection including bellow, Siemens make PID Controller. PID Controller should be mounted in a control panel. It should be suitable for the designed flow rate of 2910 lpm. Please note that the controller / actuator shall be proportionate (not on/off) opening type.

5. Technical Specifications for MS Piping:

5.1 MS Pipes:
The M.S. pipes shall be ERW Black (<=150mm shall be as per IS 1239, PTI, Heavy Class and >=200mm as per IS - 3589, 6 mm thick), bevelled ends.

5.2 Flanges:

The flanges forged ASTM - A105, SORF, ANSI B16.5, 150 lb, Table 15.

Flanges may be tack welded into position, but all final welding shall be done with joints dismounted. 3 mm thick gaskets shall be used with all flanged joints. The gaskets shall be fiber reinforced rubber as approved by the Engineer-In-Charge.

Counter flanges for equipment having flanged connections shall be used & provided by successful bidder.

Flanged pairs shall be used on all such equipment, which may require to be isolated or removed for service e.g. Pumps, refrigeration machines etc.

All threaded valves shall be provided with nipples and flanged pairs on both sides to permit flange connections, for removal of valves from main lines for repair/replacement.

5.3 Fittings: All fittings should confirm to ASTM A234, GR WPB, Sch.40, ANSI B 16.9. All integral branch off shall be stub connected. All fittings shall be tested to a pressure of 15 KSC.

5.4 Bolts: All bolts shall be as per IS: 1367 CL 4.6 with dimensional standard as per IS:1364 and length to suit.

5.5 Nuts: All nuts shall be as per IS: 1367 CL 4.0 with dimensional standard as per IS:1364 and Hexagonal.

5.6 Gaskets: All gaskets shall be as per CAF IS:2712 GRW/3 with dimensional standard of ANSI B 16.21 150# and 3 mm thick Ring Type.

5.7 Welding: Welding operations shall confirm to Chapter V of the code of Refinery piping ANSI B31.3 - latest edition.

All pipe ends shall be prepared V-end & tac welded before final welding.

The welder will be pre-qualified by us based on the 180 degree face and 180 deg root bend test of the samples to be test welded by him in our presence and in 45 degree position and the test result will be furnished by you from a Govt. approved test house. All expenditure to be incurred on the pre-qualification of the welder will be borne by you including the cost of samples and arrangements made thereof. **Welding work will be allowed only after completion of welder test and submission of test report.**

Welders and welding procedures shall be certified as per section IX of ASME Boiler and pressure vessel code - latest edition.
The electric current for welding will be DC straight polarity (electrode negative).

All pipes shall be butt welded as per ANSI B16.25.

The welding electrode to be used will be only **Adore/Advani/ IOL.**

5.8 Testing Piping: In general, tests shall be applied to piping before connection of equipment and appliances. In no case shall the piping, equipment or appliances be subjected to pressures exceeding their test ratings.

The tests shall be completed and approved before any insulation is applied. Testing of segments of pipe work will be permitted, provided all open ends are first closed, by blank offs or flanges.

After tests have been completed the system shall be drained and flushed 3 to 4 times and cleaned of all dust and foreign matter. All strainers, valves and fittings shall be cleaned of all dirt, fillings and debris.

All piping shall be tested to hydraulic test pressure of at least one and half times the maximum operating pressure but not less than 10 kg/cm2 for a period of not less than 12 hours. All leaks and defects in the joints revealed during the testing shall be rectified to the satisfaction of the Engineer-In-Charge, without any extra cost.

All the piping systems shall be tested in the presence of the Engineer-In-Charge or their authorized representative. Advance notice of test dates shall be given and all equipments, labor, materials required for inspection, and repairs during the test shall be provided by the contractor. A test shall be repeated till the entire systems are found to be satisfactory to the above authority. The tests shall be carried out for a part of work if required by Engineer-In-Charge in order to avoid hindrance in the work of the insulation contractor.

Miscellaneous piping, tests with air at 10.5 kg/cm2 without drop in pressure for a minimum of 24 hours.
The contractor shall make sure that proper noiseless circulation is achieved through all piping systems. If due to poor bond, proper circulation is not achieved, the contractor shall bear all expenses for carrying out the rectification work including finishing of floors, walls and ceiling damaged in the process of rectifications.

The contractor shall provide all labour and materials to make provision for removing water and throwing it at the proper place, during the testing or/and after the testing to avoid damages to employer or other contractors' properties. Any damages caused by the contractor to the employer or other contractors properties, shall be borne by the contractor.

5.9 Pipe Supports: It should be made of structural steel & include G.I. clamps, anchor fasteners, wooden blocks, insulation pad. Supports will be installed at no larger than 3 meters and as per the design calculations to be furnished by you and consisting of C-channels, Angles, I section etc. of 6 mm minimum thickness. Extra support should be provided at bends & fittings like valves to avoid undue stress at pipes. The support columns have to be appropriately grouted using 1:2:4 concrete mix. The fabrication of hangers, anchors and materials shall conform to the requirements of chapter "Fabrication of pipe hangers, supports, anchors, Sway bracing and piping B31.3-latest issue.

5.10 Butterfly Valve:

- Duty : Chilled Water / HOT Water / Condenser Water
- Pressure Rating : Confirm to BS:5155 PN-10/PN–16 & API–609 (As specified in BOQ)
- pH Value : Between 4 and 10
- Single body caste, Slim seal, wafer type,
- Body construction material should be graded cast iron
- Disc. Construction material should be Stainless steel.
- Disc. Seat should be an integral liner made of EDPM / Nitrite rubber, tight shut–off design
- Provide Hand Lever operated valves with locking arrangement for every 10° turn for valves up to NB200mm.
- Valves more than NB 350 mm shall allow for seat replacement at site.

5.11 Balancing Valves:

- Duty : Chilled Water / HOT Water / Condenser Water
- Pressure Rating : PN–10/PN–16 (As specified in B.O.Q.)
- pH Value :Between 4 and 10
- **Material Specification**
- Hand Wheel – CI-220
- Body / Bonnet –C.A.F. (CI 260 GG 25)
- Body / Bonnet Bolts –A 307, GR.B
- Gland Packing –Graphite asbestos
- Stem Seal –EPDM
- Stem –SS 410
- Disc. – SS 410
- Seat Seal –EPDM (Site replaceable)
- Tight Shut Off Type
- Flanges drilled to IS 6392 (PN 16) Standards
- The spindle shall be non–rising type, and its movement should be lockable/tamper proof type.
- Micro–meter scale in the wheel should allow fine settings up to $1/10^{th}$ of a hand wheel turn. The spindle should be lockable with a lock screw, allowing the limiting maximum opening of valve, to pre–determined position, while still allowing to use as shut–off valve.
- T.A.B. (Testing, Adjusting and Balancing)
- Measurement of pressure drops and flow rate should be possible using the body taps and quarter turn cocks.
- Digital measurements compatibility is a pre–requisite.
- Published 'K' factor of valve for different hand wheel turns should be available.

5.12 DUAL PLATE CHECK VALVE

- Duty : Chilled Water / HOT Water / Condenser Water
- Pressure Rating :Confirm to BS:5155 PN–10/PN–16 & API–609
- pH Value :Between 4 and 10
- **Material Specification**
- Dual plate with independent springs in a central hinge pin, to allow for reduced hammer and non-slam
- Valve design should confirm to APS–594 and API–6D
- One piece body, cast cut of graded C.I.
- Disc. Shall be stainless steel

5.13 Y-Strainers

The strainers shall either be Y type or fabricated steel body, tested upto pressure applicable for the valves. The strainers shall have a perforated S.S. sheet screen with 3 mm perforation, filteration area of minimum 75%, Y-strainers shall be provided with flanged ends. The strainers shall be designed to facilitate easy removal of filter screen for cleaning, without disconnection of pipe line.

5.14 Flow Switches:

Sockets or necessary arrangements to be made by HVAC Contractor for bellow type flow switches shall be provided in condensing water outlet and chilled water outlet at the water chilling machines. The flow switches shall

prevent the compressor from starting unless the water flow is established in condensing water lines, and chilled water flow is established in chilled water lines.

5.15 Temperature Gauges (Industrial Glass Thermometer type):

It shall be stem type with centigrade & Fahrenheit scales. Temperature gauge shall be of the separate able socket type and shall have extended brass stem, where required, for insulated pipes. Temperature gauge shall be installed at supply and return at chillers & condensers. Range of scales shall be 30-120 .F (0-50 Deg C).

5.16 Pressure Gauges:

It shall be brass bourdon tube type, 150 mm Dial, 3/8" BSP bottom connection, 0-7 kg. Per sq.cm (0-100 psi). They shall be installed on inlet and outlet at chillers, condensers and pumps. They shall be connected to the pipes by welding socket, GI nipple, S.S. Ball valve (Shenco - Make), S.S. U-tube, S.S. Socket & PI.

5.17 Pipe Insulation Procedure: (Outdoor)

Insulation material shall be fire retardant TF quality expanded polystyrene moulded pipe section of density 24 kg/cum and a thickness of 75 mm in pipe section form, K=0.035 Kcal / hr.m.Deg.C and (glass wool not accepted).

Application:

- ✓ The surface to be insulated shall be thoroughly cleaned and allowed to dry.
- ✓ CPRX compound of STP confirming to IS 702 shall be uniformly applied @1.5Kg / Sq m on the surface to be insulated.
- ✓ A similar layer shall also be applied on the inside surface of the insulation. Insulation sections shall be stuck to the surface with the joints staggered. The adjoining sections shall be tightly pressed together. All the joints shall be sealed with CPRX. Voids will be sealed with suitably cut pieces.
- ✓ A vapour barrier with cover of the insulation with 1000 gauge (250 micron) thickness white polythene followed by wrapping of Hessian with 50 mm overlaps and sealing all joints.
- ✓ The surface shall then be wrapped with 19 mm mesh 24 SWG GI wire, butting all the joints and laced down with 22 SWG GI lacing wire.
- ✓ On top of it 26 gauge thick Aluminum cladding should be done as outer finish. The Al cladding joints shall be sealed with white silicon sealant.

5.18 Pipe Insulation Procedure (Indoor):

Same as above

5.19 Insulation Procedure for Valves & Flanges:

Same as above

5.20 Painting:

All exposed metal surface of pipes, fittings and supports must be applied with one coat of red-oxide primer & two coats of synthetic enamel ICI / Nerolac paint of Approved shade. The surface to be painted shall be cleaned thoroughly before painting.

6. Electrical Systems:

6.1 Panel Construction

Features:-

- Cubicle type switchboard shall be fabricated out of sheet steel not less than 2.5/2.0 mm. thick MS sheet for load bearing and non load bearing members. Wherever necessary, such sheet steel members shall be stiffened by angle iron framework.
- General construction shall employ the principle of compartmentalization and segregation for each circuit. Unless otherwise approved, incomer and bus section panels or sections shall be separate and independent and shall not be mixed with sections required for feeders. Each section of the near accessible type board shall have hinged access doors at the rear. Multi tier mounting of feeders is permissible. The general arrangement for multi-tier construction shall be such that the horizontal tiers formed present appeasing and aesthetic look. The general arrangement shall be got approved before fabrication.
- The openings between bus chamber and feeder compartments shall be properly covered with bakelite/Hylam sheets of 3mm minimum thickness. The vertical bus bar chamber shall be provided with removable bolted cover in the front and back side. All the inter connection to the feeders shall be shrouded so as to avoid accidental contact by means of bakelite barriers of at least 2 mm thickness.
- Cable entries for various feeders shall be from the top/bottom and shall be accessible from both front and rear through cable alleys located between two circuit sections. Cable alleys shall have hinged doors with rubber gaskets. All cable entries shall be through gland plates. There shall be a separate gland plate for each cable entry so that there will not be dislocation of already wired circuit when new feeders are added. Cable entry plates shall therefore be sectionlised. The construction shall include necessary cable supports for clamping the cable in the cable alley or rear cable chamber.
- Each compartment shall have its own hinged door with concealed hinges. The door shall have square section rubber gaskets fixed on the inner side.

The panels shall be of Simplex type as indicated in the Specific Requirements. The panels shall be sheet steel enclosed, dust and vermin proof with minimum degree of protection not less than IP-54 in accordance with IS:2147. The panels shall be floor mounting free standing type mounted on a supporting structure so as to form a rigid enclosure suitable for the application. The panels shall be fabricated out of CRCA sheet steel of minimum 3 mm thickness for the front and back covers, doors and load bearing members and 2 mm for the rest. All doors and openings shall be provided with neoprene gaskets. Ventilating louvers, if provided shall have screens and filters. The screen shall be made of either Brass or GI wire mesh.

The panel shall be provided with integral base frame. The integral base frame of panels shall be suitable for directly bolting with the help of foundation bolts and shall also be suitable for tack welding to the plant room floor embedded insert plate/ flat/ channel. Amply dimensioned oblong holes shall be provided at the bottom of all panels for bolting on to the embedded insert channel. The height of the panels shall be matched with the other existing panels in the plant room and the bottom of the panels shall have a 100 mm kick plate all around. Cable entry shall be from the top unless specified otherwise. A suitable removable undrilled gland plate shall be provided for cable entry. Suitable compression type cable glands as required for cable termination in the control panel shall be supplied.

The panels shall be matched with other panels in the plant room in respect of dimension, colour, appearance and arrangement of components on the front of the panel wherever specified. Simplex type panels shall be with equipment mounted on the vertical front and access to wiring from rear. Door at the rear shall be provided with handles and lock facility.

6.2 Component mounting

All equipment on and in panels shall be mounted and completely wired to the terminal blocks ready for external connections. The equipment on front of panel shall be flush mounted. No equipment shall be mounted on the doors checking and removal of individual components shall be possible without disturbing the adjacent equipment. It should be possible to test all the protective relays 'in-situ'. All components shall be neatly arranged in a matching manner. The internally mounted components, auxiliary equipment such as transducers, interposing CTs etc. shall be mounted in such a way as to be readily accessible without impeding the access to internal wiring and other components. The relay panels shall be supplied complete with channel base grouting bolts, nuts, washers etc.

6.3 BUS BARS

Bus bars used in the panel shall be of Aluminum E91E grade (IS5052-1981) of adequate section suitable for 3 phase, 4 wire, 415 volt 50HZ AC supply and with short circuit current rating of 50 kA. The bus bar shall have uniform cross section through out the length. The bus bars shall be designed for carrying rated current continuously. The bus bars and links shall be designed for maximum temperature of 75 Deg C. the maximum current density of bus bars shall be 1.28 amps/ sq.mm. suitable de-rating factors shall be applied to arrive at the correct cross section of the bus bars. Bus bars shall be supported on suitable non hygroscopic, non-combustible material such as permali or Hylam at sufficiently close intervals to prevent bus bar sag. All bus bar joints shall be provided with high tensile steel bolts (Electro plated with suitable metal such as Nickel/cadmium), spring washers & nuts so as to ensure good contact. Alternatively, electroplated / tinned brass bolts shall be used. The joints shall be formed with fish plates on either side of bus bars to provide adequate contact area. Bus supports shall be provided on either side of joints (max unsupported distance from the joint shall not be more than 300 mm.) power shall be distributed to each circuit in each section by a set of vertical bus bars (phases + neutral). Individual module shall be connected from vertical connections through sleeved connections. Bus bars shall be insulated with heat shrinkable type PVC tapes with color coding (RYB-B). The bus bars and their supports shall be able to withstand thermal and dynamic stresses due to the system short circuits. The supplier shall furnish calculations along with his shop drawing establishing the adequacy of design of both for continuous duty and short circuits rating. Short circuit withstand capacity shall be one second.

6.4 Wiring

The wires shall conform to IS: 694. All wiring shall be done with PVC insulated 1100V grade, single core multi-strand (minimum 3 strands) annealed copper conductors. The wires shall be flame proof and vermin proof. The minimum size for different circuits shall not be less than those as specified below:
1) Current Transformer Circuit: 1 X 2.5 sq. mm. Copper
2) Voltage Transformer Circuit: 1 X 1.5 sq. mm. Copper
3) Other Circuit including Control wires: 1 X 1.5 sq. mm. Copper for fuse rating of 10 Amps or less. Each wire shall be identified at both ends with wire numbers by means of PVC ferrules. Ferruling of wires shall be as per relevant IS. All control wiring shall be enclosed in plastic channels. The terminal blocks shall be located so as to ensure easy access. Split type terminal blocks shall be provided for all CT terminals. The terminals screws shall be of the Washer type and long enough for connecting following type conductor on each side. Each terminal block shall be capable of terminating the following no. of wires:
CT circuits 2 nos 4 mm sq. copper
PT/CVT circuits 2 nos 2.5 mm sq. copper
AC/DC supply circuits 2 nos 2.5 mm sq. copper
All other circuits 2 nos 2.5 mm sq. copper
Each terminal block shall be provided with a wire-marking strip and shall be shrouded by easily removable shrouds moulded of transparent dielectric material.

There shall be a minimum clearance of 250 mm between the front row of terminal block and the associated cable gland plate on panel side wall. The clearance between two rows of terminals block edges shall be a minimum of 150 mm. All inter-panel wiring within each shipping section shall be the vendor's responsibility. Wiring between panels shall be routed through PVC sleeves. For wiring between shipping section, vendor shall provide terminal blocks on adjacent shipping sections and supply suitable jumperingres.

6.5 Earthing

A continuous 25x5 mm Aluminium bus shall be provided along the full length of the panels. Suitable arrangement shall be provided at the two ends for connection to the plant grounding system. Each panel and the equipment mounted on each panel shall be securely connected to the grounding bus. For this purpose the ground wire shall be looped from equipment to equipment and both ends of the ground wire shall be connected to the ground bus. All doors and movable parts shall be connected to the ground bus with flexible copper connections.

6.6 Illumination & Space heaters

Fluorescent lamps working on 240V AC, operated by door switches shall be provided for internal panel illumination in each cable alley. Panel space heaters shall operate on 240 V±10% AC and shall be supplied complete with on-off switch, fuse and thermostat. A common thermostat shall be provided for the entire panel. The thermostat shall maintain the internal temperature above the ambient temperature to prevent moisture condensation. The watt loss per unit surface of the heaters shall be low enough to keep surface temperature well below visible heat.

6.7 Switches and fuse

Each panel shall be provided with necessary arrangements for receiving, distributing and isolating of AC supply for various control, signaling, lighting and space heater circuits. The incoming and sub-circuits shall be separately provided with MCBs. Selection of the main and sub circuit MCB rating shall be such as to ensure selective clearance of sub circuit faults. MCBs shall conform to IS:13947. Each MCB shall be provided with one potential free contact and the same shall be wired for annunciation purpose. However VT circuits for relaying shall be protected by MCB's.

6.8 Earthing of Various Equipments

All the equipments of the system shall be earthed at a minimum of two places by using GI earth strips & suitable connecting jumpers as required from the existing earth grid. The process water pumps shall be earthed by using 25 x 5 mm GI flat at two places drawn from the existing earth grid. The Main electrical panel shall also be connected at two places with the earthing system by using 25 x 5 mm mm GI earth flats

6.9 Power Cable:

The XLPE armoured power cable for use on 415 volts system shall be 3 or 3.5 Core with Aluminum conductors and be of 660/1100 volts grade. The cross section of the cable shall be to suit the load and rating of the equipment. The cables shall be of Aluminum conductor, XLPE insulated, strip armoured with overall PVC sheathing.

The cables shall be laid as per IS-1255/1967, Indian standard code of practice.

6.10 Control Cabling/wiring :

It shall be 1.1 kV grade, as per IS 1554, made from copper conductor of 2C / suitable cores x 1.5 Sq mm PVC insulated. strip armoured with an overall PVC sheathing.

6.11 Inspection & Testing :

Pre dispatch Inspection & Testing:

The bidder have to offer pre-dispatch test of all electrical items at their works. Enough time gap shall be provided by the bidder between the inspection call & the date of inspection. The bidder have to me all necesary arrangements of tests as mey be felt necessary by the IUAC engineers as per standards.

PRE-COMMISSIONING TESTS AND COMMISSIONING:

The panels shall be commissioned only after the successful completion of the following tests. The tests shall be conducted in the presence of IUAC representative/ Engineer.

All the main & auxiliary bus connections shall be checked and tightened.
All the wiring terminations & bus bar joints shall be checked and tightened.
Wiring shall be checked for correctness as per the drawings.
All wiring shall be tested for insulation resistance by 1000 V megger & panels shall be hi-pot testing at 2.5 kV.
Phase rotation tests shall be conducted
Suitable injection tests shall be applied to all the measuring instruments to establish the correctness & accuracy of calibration and working order.
All relays and protective devices shall be tested for correctness of settings & operation by introducing a current generator & an ammeter in the circuit.

List of Approved Makes:

S. No.	Equipment/Item/Material	Approved Manufacturer
	SS Pumps, Pipes, Valves, Instrumentation, Valves etc.,	
1	SS Centrifugal Pumps	Kirloskar Brothers /Beacon / CromptonGreaves / Grundfos / CRI
2	Motors	Siemens / ABB / Crompton Greaves / Bharat Bijlee
3	SS Heat Exchanger	Flowlink / Ammus Engineers (P) Ltd., / Alfa Laval
4	SS Pipes	Ratnamani / Remi / Choksi
5	SS Fittings	Rolex /DHV/Swastik/Randhir/Sudhir/Gujarat Engineering Co.,/ Sakhi/Tube Product Inc.
6	SS Ball Valves	Shenco / Flowjet / Sakhi Engineers Pvt. Ltd
7	SS Control Valves	Shenco / Flowjet / Sakhi Engineers Pvt. Ltd / Siemens
8	SS 'Y' Strainer	Bhatia Engineering / J N Marshall Pvt. Ltd., /Flowjet / Shenco
9	SS Check valve	Sakhi Engineers Pvt. Ltd / Shenco / Flowmatic
10	Flexible Couplings For Pipes (Bellow)	Senior India Pvt. Ltd., / Resistoflex/ Easyflex/ Vallab / SBM
11	SS Turbine Flow Meter	Rockwin / Kem Kuppers / Badger Meter Europa
12	Pressure Gauges	Fiebig / H.Guru / Micro / Wika
13	Temp. Gauges	Fiebig / H.Guru / Micro / Wika
14	Temperature Transmitter & Controller	Taylor Instrument / Bells Controls / V. Automat / Rosemount
15	Thermowell	Nagman enterprises / General Instruments / H. Guru Instruments
16	Mechanical Seal	LP/Micro
17	Coupling	Rathi / Lovejoy
18	Magnetic level Switch	Bliss Anand Pvt. Ltd., / Levcon Instruments / Crystal Instruments /
19	Level Gauge/Indicator	Bliss Anand Pvt. Ltd., / Levcon Instruments / Crystal Instruments/ Teleflo Instruments Co. Pvt. Ltd.,
20	Support Steel	Tata / Jindal.
21	Vibration pads	Resistoflex / Dunlop / Kanwal
22	Anchor Fastners	Cannon / Hilti / Fisher
23	Filler Wires	Adore / BOC / L&T
24	Paint / Primer / Thinner	Asian/Nerolac/Dulux

S.No.	**Chilled Water MS Piping, Valves, Instrumentation etc.,**	
1	Y-Strainers	Emerald/ Rapid Cool/ Flowell/Bhatia Engineering

2	Pipes (upto 200mm)	Jindal-Hissar/ Jindal-Star/Tata/Sail
3	Pipes (Beyond 200mm)	Jindal-Hissar/ Jindal-Star/Sail
4	Butterfly Valves (Water Duty)	Audco/ Advance
5	Check Valves (Water Duty)	Audco/ Advance
6	Ball Valves (Water Duty)	Cimm/ RB/ Arco/ KSB/ CG/Shenco
7	Balancing Valves (Water Duty)	Audco /ADVANCE
9	Pressure Gauges	Fiebig / H.Guru / Micro / Wika
10	Industrial Glass Thermometers	Fiebig / H.Guru / Micro / Wika
11	Water Flow Switch	Danfoss/ Rapid Control/Anergy/ Emerald/ Johnsons Control
12	Pipes Bellow	Resistoflex/ Easyflex/ Vallabh / SBM / Equiv.
13	Auto Air Vent	Rapid Control/ Hawa/ Leader
17	Instruments	IT / Taylor / Bells / Honeywell
18	Vibration Pads	Resistoflex/ Dunlop/ Kanwal
19	Aluminium Tape	Johnson/Birla 3m/Garware
20	Enamel Paint	ICI/ Asian/ Nerolac/Berger
21	Bituminus	Shalimar
22	Anchor Fasteners	Cannon/ Hilti/Fisher
Thermal Insulation		
S. No.	**Equipment/Material**	**Approved Manufacturer**
1	Expanded Polystyrene(TF quality)	Beardsell/Lloyd/Thermobreak/ Armaflex
2	Pre Laminated/Plain Fibre Glass Rigid Boards	Uptwiga/Owens/Corning/ Thermobreak/ Armaflex
3	**Extruded Polysterene**	Supreme/ Armaflex
4	Elastomeric/Cross Linked Polyethylene Foam	Trocellene/Thermoflex/Armaflex
5	Pre-moulded Puf Section For Pipe Supports	Malanpur /LLOYD
6	Fire Sealant	Hilti / Birla 3 M
Electrical Items		
S.No.	**Equipment/Material**	**Approved Manufacturer**

1	LT Panel and Sub Panel's	Precision System Control/ SPC Electrotech/ Nitya Electrocontrol Pvt Ltd./Risha Control/equiv.
2	Battery Charger	Ambit/Crompton Greaves/Mahamaya
3	ACB's	Schneider / Siemens /ABB/ L&T
4	MCCB's	Schneider / Legrand /Siemens
5	MCB's & DB's	Legrand/Schneider/Indo -Asian/Siemens
6	ELCB's, RCBO's & RCCB's	Legrand/Schneider /L&T/ Siemens
7	MPCB's :	Legrand/Schneider/Eaton /Siemens
8	HRC Fuses & Fues Switch Units	L & T/Siemens/ GEC Alsthom/ Siemens
9	Contactors & O/L relays with in built SPP	Telemecanique/Siemens/L & T
10	SPP	Minilec
11	Indication Lamps	Schneider/ESSBEE-L&T/Siemens/Cutler Hammer
12	Push Buttons	Schneider/ESSBEE-L&T/Siemens/cutler Hammer
13	Selector Switches	Kaycee/Siemens/GE
14	Electrical Terminals	Elmax/Connectwell
15	Multifuction Meter – Digital / Multifunction / VAF	Conzerv/Secure
16	(BMS / Non BMS compatible)	AMTL/Secure
17	Meters-Analogue	Rishab-L&T/AE/Conzerv/Siemens/KAPPA
18	Timers	Alsthom
19	Relays (Numeric Type)	Schneider / L&T/ Areva
20	Relays (Electromagnetic Type)	Areva/ Easun Reyrolle
21	Capacitors	Ducati/Neptune/Siemens/Epcos
22	Cast Resin Current Transformers	Kappa/Precise/Gilbert Maxwell/Pragati
23	Potential Transformers	Automatic Electric/Kappa/Gilbert & Maxwell/Pragati
24	Automatic power factor correction relay	EPCOS/Areva/Ducati/Siemens/L&T
25	Annunciator	Alain /Minilec
26	Power Cable	Finolex//Havells/Gloster/Finolex / Rallison
27	Fire Survival armoured cable of 600/1000V	Tyco/Polycab/Bonton/Fusion
28	Cable lugs & thimbles	Dowells/Comet
29	Cable glands	Comet/Lotus
30	GI Cable trays & GI Raceways	Slottco/Skabar/MAA Industries/equiv.

31	Rising Main / Bus duct	GE/Schneider Electric /C&S/Legrand
32	Maintenance Free Chemical Earthing	LPI/ Ashlok/Foruntec
33	Electronic Digital Meters	Conzerv/Secure
34	PVC insulated copper conductor stranded flexible wires (FRLS)	Polycab/Finolex/Lappe Cable/Havells/RR Kabel
35	Conduits ((MS and PVC)	BEC /AKG/RMCON/ JPC/Avonplast
36	Electric motors	Siemens / crompton / NGEF / kirloskar / Bharat Bijlee

NOTE:

a) IUAC reserves the right to add or delete the approval list of makes for certain items, if found not compatible with the system. In case the make of any item is not mentioned, the same should be of well-known reputed ISI. Above makers of materials are approved subject to their meeting the tender specification & site requirements.

b) The contractor shall supply ISI marked material as per of the makes/brands indicated above. In case, the firm is not manufacturing ISI marked material for any of the brands, first quality material shall be accepted.

c) The samples of the material shall in either case have to be got approved from the Engineer-in-charge.

d) Material where no make/brand has been mentioned, in this case ISI marked samples shall be submitted by the contractor for approval of Engineer.

e) Contractor will be responsible to ensure the quality of products listed in approved list of makes/brands. Contractor will have to replace the defective and sub-standard materials at his own cost.

7. Documents to be furnished by Vendor After Award of Contract

7.1. Activity Bar Chart.

7.2. Technical details, Make & model of all the items (BOQ) offered to supply.

7.3 Drawings for Layout Plan for Pumps, Heat Exchanger, Expansion Tank, Piping, electrical panel etc.,

7.4 Foundation detail drawing for Pumps, Heat Exchanger, Expansion Tank etc.,

7.5 Schematic piping diagram.

7.6 Piping & supports drawing.

7.7 Manufacturer's material certificate, test reports & manuals should be submitted in original for eqipments, pipes, fittings, insulation material, instrumentation, valves (balancing valve, butterfly valves, check valves etc.),

7.8 Performance / characteristic curves, material and test certificates, manuals for:

i. Pumps
ii. Balancing valves
iii. For any other supplies

7.9 General Arrangement Drawing, Power and Control Circuit Wiring diagram for electrical panel, APFC Panel, electrical motor starters. 2 copies of as built drawings and one soft copy both in solid works and in pdf to be submitted.

7.10 Design and Fabrication Drawings of Expansion tank and support structure.

7.11 Any other documents required

ANNEXURE - III

TENDER ACCEPTANCE LETTER (To be given on Company Letter Head)

Date: _____
To
The Administrative Officer (S&P)
Inter-University Accelerator Centre
Aruna Asaf Ali Marg
New Delhi-110 067
Sub: Acceptance of Terms & Conditions of Tender

Tender Reference No: _____ _____ _____ _____

Name of Tender / Work: _____ _____ _____ _____

Dear Sir,

1. We have downloaded / obtained the tender document(s) for the above mentioned 'Tender/Work' from the web site(s) namely: as per your advertisement, given in the above mentioned website(s).

1. We hereby certify that we have read the entire terms and conditions of the tender documents from Page No. _____ to _____ (including all documents like annexure(s), schedule(s), etc .,), which form part of the contract agreement and we shall abide hereby by the terms / conditions / clauses contained therein.

2. The corrigendum(s) issued from time to time by your department/ organizations too have also been taken into consideration, while submitting this acceptance letter.

3. We hereby unconditionally accept the tender conditions of above mentioned tender document(s) / corrigendum(s) in its totality / entirety.

4. We do hereby declare that our Firm has not been blacklisted/ debarred by any Govt. Department/ Public sector undertaking.

6. We certify that all information furnished by the our Firm is true & correct and in the event that the information is found to be incorrect/untrue or found violated, then your department/ organization shall without giving any notice or reason therefore or summarily reject the bid or terminate the contract, without prejudice to any other rights or remedy including the forfeiture of the full said earnest money deposit absolutely.

Yours Faithfully,
(Signature of the Bidder, with
Official Seal

This certificate shall be furnished duly signed & stamped with **Techno-commercial Bid.** **Annexure - IV**

Certificate/ Undertaking

This is to certify that we have visited the site for **SITC of Process Water System and Replacement of Old SS & MS Pipes including Thermal Insulation** in IUAC lab complex on …..... and assessed the actual situation & nature of site. We have also assessed the amount of work involved at site for tendered work before submitting our offer. We will be able to complete the above work within stipulated time as per site conditions. We also undertake that the replacement of old SS & MS Pipes along with Thermal insulation shall be installed by us with minimum possible shut down period in the same space with required maintenance all around

We further undertake that no extra cost will be claimed by us later-on for any difficulties/ modifications involved during the execution of tendered works. We understand that work is to be executed in an already operational/ functional institute.

(Signature & Seal of Bidder)

Name:.....

Annexure - V

Schedule of Quantities (Price Bid, Part – B)

(Prices should be quoted in .XLS BOQ Format attached)

S.No.	Item Description	Unit	Qty.	Unit Rate	Total Amount
	Supply, Fabrication, Installation, Testing & Commissioning of all the items mentioned below. Detailed Scope of Work & Technical Specifications are mentioned in Annexure-I&II.				

1	Process Water Stainless Steel (CF8M / SS-316) Pump set capable of delivering 1000 LPM against a Total Head of 80 mtr. comprising of: i) 1 No. Back Pull Out Pumpset (CF8M / SS-316) ii) 1 No. suitable HP SPDP, IE3 efficiency squirrel cage induction motor with class-F insulation, ~3000 rpm synchronous speed operating at 415+/-10% volts, 3phase, 50 Hz AC supply iii) Lot- 75 mm thick TF quality expanded polystyrene insulation of density 24 kg/cub.met and 26 G Al. sheet cladding etc. as required iv) Lot - Pump-motor pin bush coupling and Al. coupling guard, mechanical seal, AV pads etc., v) Lot - Base frame for pump-motor set, epoxy paint on base frame. The MS base frame in main channel should be of size 4"x2", top plate under pump and motor 10mm each, bottom plates 5mm, taper washers, side rigid stiffeners, HT fasteners with spring washers for holding, SS shims for alignment, drip pan arrangement in base etc., vi) Lot- RCC floating foundation as per the required size, with all around frame of MS equal angle 50 x 50 x 6 mm, steel reinforcement grid of 100 mm max. made of steel bar 8 mm dia, cement : sand : concrete mixture of 1:1.5:3 to be made. The inertia block shall be floating on rubber vibration pads with GI sheets in between of 150 x 150 x 12 mm thickness - 6 nos. each placed at total 9 places with anti- vibration isolation pads, foundation bolts, properly levelled as required	Sets	3		
2	Stainless Steel Strainer fabricated out of SS-304 body & wire mesh element duly flanged ends suitable for 4" NB dia. pipe, mesh size of 3mm dia. hole, flange connections drilled to ANSI B 16.5#150, complete with 75 mm thick TF quality expanded polystyrene insulation of density 24 kg/cub.met and 26 G Al. sheet cladding etc. as required of size 4" NB	Nos.	3		

3	Stainless Steel (SS-304) Heat exchanger of shell and tube type capable of heat transfer from chilled water having a flow rate of 2910 LPM, inlet temp. 6.7 Deg. C & outlet temp. 12.2 Deg. C on shell side and process water flow rate of 2000 LPM, inlet temp. 28 Deg. C & outlet temp. 20 Deg. C in tubes complete with all accessories & controls, MOC: Shell –Seamless SA 312 TP 314, Baffles: SA 240-304, Tubes: Seamless SA 213 TP 304, Tube Sheets – SA 240-304, Design code: ASME SEC-VIII, Design Pressure – 15 Kg/sq.cm, Operating Pressure – 10 kg/sq.cm, Test Pressure – 20 kg/sq.cm (shell side), Tube side (20kg/sq.cm), complete with SS 304 seamless tubes & tube end plates etc., including the following: a) 75 mm thick TF quality expanded polystyrene insulation of density 24 kg/cub.met & 26 G Al. sheet cladding etc. b) RCC foundation/Steel supporting structure made of I-Beam of ISMB 350 (350x140mm) approx. length of 2 met., MS Plate of size 450mmx450mmx10mm thickness – 2 Nos. grouted on the floor with 12mm anchor fasteners, misc. support steel, complete as required as per specifications – 01 Lot	Lot	1		

4	3 mm thick Stainless Steel (SS-304) Water Tank of 2000 ltrs. capacity with inlet, outlet, drain, overflow, manhole cover, magnetic low level limit switch & cut-off, level gauge/indicator, insulating the tank with 75mm thick TF quality expanded polystyrene of density 24 kg/cub.met as per specifications including making CC foundation/Steel supporting structure etc. complete as per specifications as required and as per the following: **a)** Magnetic level switch, SS-304, flanged end connections 3" ANSI 150#RF, Float–SS 316, side mounted, micro type switch, SPDT contact form, suitable Amp. 220/230 VAC, cable entry of suitable size, operating pressure – 10 kg/sq.cm etc., **b)** Glass Level gauge, MOC of all wetted parts should be SS-304/316, Valves on top & bottom etc., complete as required. **c)** CC foundation/Steel supporting structure made of I Beam of ISMB 200 (200x100mm)-4 Nos. each of length of 2 met., 'C' channel of size ISMC 150 (150x75mm)-Approx. length of 7 met., MS Plate of size 300x300x10 mm thickness – 4 Nos. grouted on the floor with 10/12 anchor fasteners, MS Plate of size 250x250x10 mm thickness – 4 Nos., Misc. support steel – 01 Lot	Lot	1		
5	Stainless Steel, SS-304, Schedule-40S, ERW Pipes including fittings i.e., elbow, tee, bend, reducers complete with supports comprising of equal angles of 50x50x6 mm thickness / C-channels of ISMC 100 (100x50) / ISMC 75 (75x40mm), box made out of 2 nos. of ISMC 100 (100x50) welded together, MS plates of size 150x150x12 mm thickness or various sizes with a thickness of 10/12 mm, Anchor fasteners of 12 mm as required as per the requirement or as per the design, hangers, vibration isolators, thermal isolators (wooden type of required pipe size) SS 'U' clamps etc., **(excluding flanges)** & welding of all joints by TIG process with 100% DPT on both root & final joints as required of the following sizes: 6" NB	RM	48		

5.1	Size: 4” NB (Specification same as item#5)	RM	48		
5.2	Size: 3” NB (Specification same as item#5)	RM	36		
5.3	Size: 2” NB (Specification same as item#5)	RM	36		
5.4	Size: 1-1/2” NB (Specification same as item#5)	RM	12		
6	SS Corrugated, SS Flexible connector (SS Bellows), PN 16 rating, SS End flanges (drilling as par ANSI B16.5), SS Braid with length adjustment studs Size : 4” NB x 150 mm long	Nos	4		
6.1	Size : 3” NB x 150 mm long (Specification same as item #6)	Nos	6		
6.3	Size : 2” NB x 150 mm long (Specification same as item #6)	Nos	1		
7	SS-304, Flange, #150 SORF including CAF gaskets (die cut), bolts, nuts & washers etc. as per requirement of the following sizes: 6” NB	Nos.	12		
7.1	Size: 4” NB (Specification same as item #7)	Nos.	50		
7.2	Size: 3” NB (Specification same as item #7)	Nos.	18		
7.3	Size: 2” NB (Specification same as item #7)	Nos.	10		
8	SS-304, Blind Flange, #150 SORF of the following sizes: 6” NB	Nos.	4		
9	Stainless Steel Non Return Valves (Check valves), SS-304 / CF-8, ANSI Class-150, flanged end connections as per specifications of the following: Size: 4” NB	Nos.	3		
9.1	Size: 3” NB (Specification same as item #9)	Nos.	2		
10	Stainless Steel Ball Valves, SS 304/CF8, 3 Pc Design, ANSI Class-150, full bore / port flanged end connections in supply & return line of process water as per specifications of the following sizes: 6” NB	Nos.	4		

10.1	Size: 4” NB (Specification same as item #10)	Nos.	7		
10.2	Size: 3” NB (Specification same as item #10)	Nos.	5		
10.3	Size: 2” NB (Specification same as item #10)	Nos.	1		
11	Electrically Operated Stainless Steel Ball /Butterfly ON / OFF Control Valve ANSI Class-150, full bore / port flanged end connections in supply & return line of process water as per specifications of the following sizes: 6” NB	Nos.	2		
12	SS 304 / SS 316 Turbine type Flow Meter including digital based panel mounted flow indicator / totalizer of suitable size flange end connections, SS fittings/reducers/flanges to be connected on to 6”/4”/3” NB SS Pump discharge/supply/ return lines. The flow meter should be calibrated for actual working pressure of the system. Flow indicator of suitable size (preferably 96x96mm or more as per design) to be mounted on floor mounted desk type control indicating panel etc., as per specifications of the following: Size: For a maximum water flow of 2500 lpm	Lot	1		
12.1	Size: For a maximum water flow of 1000 lpm (Specification same as item #12)	Lot	1		
12.2	Size: For a maximum water flow of 1000 lpm with meter mounted display (Specification same as item #12)	Lot	1		
13	SS dial type bourdon tube Pressure Gauge, 6" dia, along with SS Socket, SS U-tube, SS Ball Valves (Shenco - Make), SS Nipple and SS Socket welded on SS Pipes, Nitrile rubber thermal insulation on SS Ball valves/ fittings /U-tube etc., of the following range: 0-16 kg/cm^2	Nos.	14		
13.1	0-7 kg/cm^2 (Specification same as item #13)	Nos.	6		
14	SS Dial type Temperature indicator/gauge, Bimetal / Rigid Stem type, 6" dia., 0-60 Deg C along with SS Thermowell 3/4 " BSPT, SS Socket 3/4" BSPT welded on SS Pipes, Nitrile rubber thermal insulation on SS U-tube/ fittings etc.,	Nos.	6		

15	SS-304, Socket, 3/4” NB BSPF with a minimum wall thickness of 5mm, 3/4” NB SS Bellow, 3/4” NB BSPM plug etc., to be provided on SS Pipes (Provision for future)	Sets	6		
16	SS-304, Half Nipple 3/4"x 3" long NB threaded at one end (To be TIG welded on supply / return SS pipes), Sch. 80 Thickness, SS Ball Valve ¾”NB, (Shenco - Make), SS male plug etc., (Provision for future)	Sets	6		
17	Thermal insulation of the following size SS Pipes and Valves with flanges (Ball valve, NRV etc.,) with 75 mm thickness TF quality expanded polystyrene of density 24 kg/cub.met & 26 G Al. sheet cladding etc. as per specifications of the following sizes: 6” NB SS Pipe	RM	48		
17.1	4” NB SS Pipe (Specification same as item#17)	RM	24		
17.2	3” NB SS Pipe (Specification same as item#17)	RM	12		
17.3	2” NB SS Pipe (Specification same as item#17)	RM	12		
17.4	1-1/2” NB SS Pipe (Specification same as item#17)	RM	12		
17.5	6” NB Ball Valve & Control valve (Specification same as item#17)	Nos.	6		
17.6	4” NB Ball Valves (Specification same as item#17)	Nos.	7		
17.7	3” NB Ball Valve (Specification same as item#17)	Nos.	5		
17.8	Size: 2” NB (Specification same as item #17)	Nos.	1		
17.9	4” NB NRV (Specification same as item#17)	Nos.	3		
17.10	3” NB NRV (Specification same as item#17)	Nos.	2		
17.11	SS Corrugated, SS Flexible connector (SS Bellows), SS Pipes of sizes- 4”- 4 Nos., 3”- 6 Nos., 2” – 1 No. NB with a length of 150 mm (Specification same as item#17)	Nos.	11		
17.12	SS 304 / SS 316 Digital Flow Meter of suitable size for 2500 lpm – 1 No., 1000 lpm – 2 Nos. (Specification same as item#17)	Nos.	3		

18	MS Black Pipe, Heavy Class as per IS - 1239, ERW including fittings like elbow, tee, bend, reducers complete with supports, hangers, clamps, vibration isolators, thermal isolators (wooden type of required pipe size) etc., **(excluding flanges)** of the following sizes: 6" NB	RM	24		
18.1	Size: 4" NB (Specification same as item #18)	RM	36		
19	MS Flanges, rating – 150 lbs, RF-serrated type including gaskets, bolts, nuts & washers etc. as per requirement as following: Size - 6" NB	Nos.	24		
19.1	Size - 4" NB (Specifications same as item #19)	Nos.	40		
19.2	Size - 3" NB (Specifications same as item #19)	Nos.	12		
20	Butterfly Valve with SS disc and stem, PN-16 rating, flanged ends in supply & return line of chilled water as per specifications of the following: Size: 6" NB	Nos.	8		
20.1	Size: 4" NB (Specification same as item#20)	Nos.	14		
20.2	Size: 3" NB (Specification same as item#20)	Nos.	4		
21	Balancing Valve, C.I. Body, Flanged ends, PN 16 rating, SS disk & stem, micro meter scale, pressure test brass cocks in return line of chilled water etc. as per specifications of the following: Size: 6" NB	Nos.	1		
21.1	Size: 4" NB (Specification same as item#21)	Nos.	3		
22	Three-port Seat valve as required / as per the design, PN16 with flanged end connections, globe type, modulating motor (Electronic Actuator) catalogue nos. VXF 42.125/150-315+SAX 61.03/SKC 60, Immersion Temp. sensor of catalogue no. QAE 2120.010, micro processed based programmable PID controller catalogue no. RMU 710 with detachable display catalogue no. RMZ 790, SS-304 Socket 3/4" NB BSPF or suitable size with a minimum wall thickness of 5mm welded on SS Pipe, 3/4" NB SS Bellow, sensor to be fixed on SS process water supply line of 20 Deg. C etc. as per specifications of the following: Size: 5"/6" NB	Lot	1		

23	Modulating Motor (Electronic Actuator) catalogue no. SAX 61.03, Immersion Temp. Sensor of catalogue no. QAE 2120.010, micro processed based programmable PID controller catalogue no. RMU 710 with detachable display catalogue no. RMZ 790 as per specifications:	Lot	1		
24	Pressure Gauge 6" Dial, Range 0-10 kg/sqcm, bottom connection 3/8" BSPT, brass bourdon tube with Extra Long M.S. Threaded Socket (heavy) welded on MS pipe, SS Nipple, SS Ball Valve (Shenco - make), SS U-tube (Sch 40), SS Socket (heavy) etc., of the following: Range: 0-10 kg/cm^2	Sets	6		
25	Industrial Glass Thermometer, Range 0-50 Deg C, Size- 3/4"BSPT, MS Threaded Socket (Heavy) welded on pipe, long heavy duty brass bar bellow	Sets	6		
26	Thermal insulation of the following size MS Pipes and Valves with flanges (Butterfly valve, balancing valve, three way valve NRV etc.,) with 75 mm thickness TF quality expanded polystyrene of density 24 kg/cub.met & 26 G Al. sheet cladding etc. as per specifications of the following sizes: 6" NB SS Pipe	RM	24		
26.1	4" NB SS Pipe (Specification same as item#26)	RM	36		
26.2	Butterfly Valve 6" NB (Specification same as item#26)	Nos.	8		
26.3	Butterfly Valve 4" NB (Specification same as item#26)	Nos.	14		
26.4	Butterfly Valve 3" NB (Specification same as item#26)	Nos.	4		
26.5	Balancing valve 6" NB (Specification same as item#26)	Nos.	1		
26.6	Balancing valve 4" NB (Specification same as item#26)	Nos.	3		
26.7	Three way valve 5"/6" NB (Specification same as item#26)	Nos.	1		

27	The Electrical Power LV Panel board of cubical type, compart-mentalised design dust, damp and vermin proo free floor standing factory built sheet steel enclosed modular construction extendable panel, suitable for operation on 415 +/- 10% volts, 50 Hz AC 3 phase 4 wire system fabricated out of suitable sized section and covered with 2.5mm thick CRCA sheet, hinged doors of 2.0mm thick CRCA sheet, duly powder coated painted complete with aluminium bus bars, interconnection with solid Al. conductor wires / aluminium strips, neutral links, earth bus etc, necessary metering protections & indications and mounted with the following as per the technical specifications attached complete as required: INCOMING: 1No. of minimum 200A or more as required Amp. TPN MCCB with microprocessor based of 35 KA breaking capacity with O/L, S/C protection Coloured (Red, Yellow, Blue) phase indicating lamp – 1 set Digital flush type class-1.0 accuracy multifunction meter showing V, A, PF, KWH etc. with nos. current transformers of 125/5A ratio, 15 VA class-1.0 metering – 1 set BUS BAR: 200 Amp. TPN, 35 KA Al. Bus Bar OUT GOINGS: a) Fully Automatic start delta starter of required capacity (~35 KW) with MCCB, contactors, timer, O/L relay, single phase preventer, ON/OFF indications, push buttons, VAF meter complete for suitable size motor – 3 Nos. b) Outgoing with suitable size MCB for Three-way valve Actuator, interlocking with the main incoming power – 1 Lot c) 32 A SPMCB – 04 Nos. (Spare) d) 63A, TPMCB – 02 Nos. (Spare) e) Outgoing with suitable size MCB for Magnetic Level Switch, interlocking with the star delta panel of pumps – 1 Lot	Lot	1		

	f) Outgoing with suitable size MCB's for 2 Nos. Digital Flow Meters including electrical power and control wiring etc., – 1 Lot				
28	Power Cable XLPE insulated PVC sheathed, steel / wire armoured aluminium conductor cables of 1.1 KV grade of following sizes for electric supply from main panel to various loads including interconnections from starters to motors on suitable cable trays / supports, including suitable double compression glands, Terminal lugs, connections etc. as per specifications as required : 3 core x suitable size, 1.1 KV rating as suitable for Process Water Pumps (item#)1	RM	100		
28.1	3.5 corex120 sq mm for incoming power (to be laid in existing cable tray/cable trench) (Specification same as item#28)	RM	70		
28.2	4C x suitable size cable for Three-way valve Actuator (Specification same as item#28)	RM	10		
29	Making cable end termination for 3.5 corex120 sq mm aluminium armoured LT cable by using suitable thimbles, double compression brass cable glands etc., as required	Nos	2		
30	Digital LED display type, 3.5 digit Temperature indicators of size 96mmx96mm with sensor, sensor guard & thermocouple	Sets	4		

31	Wall mounted control indicating panel complete working unit containing various on/off LED indications and toggle switch controls. It should be damp and vermin proof free factory built sheet steel with 2.0 mm thick CRCA sheet, hinged doors of 1.6 mm thick CRCA sheet, duly powder coated painted complete for housing 4 nos. of Digital LED 3.5 digit display type Temperature indicators of size 96mmx96mm, 1 No. Siemens PID controller, 2 No. digital flow meters indicator/totalizer, control transformers, on/off or toggle switches, complete electrical and control wiring as per the technical specifications complete as required. PID Controller display should be flushed with the panel. It should also have a separate door with a lockable key. Transparent acrylic sheet should be provided on this door for seeing/accessing the PID.	Lot	1		
32	Cable tray of GI perforated construction of 2mm thickness with top cover complete with clamps and suspension arrangement of size 200mm wide x 50mm depth	RM	15		
32.1	Size – 100mm wide x 50mm depth (Specification same as item#22)	RM	25		
33	Control cabling of copper conductor, PVC insulated, PVC sheathed armoured cable of 1.1 KV grade, 2C / suitable cores x suitable size for three way valve controller, digital LED display type Temp. indicators, low level switch etc., as required.	RM	150		
34	25x5 mm GI earth strip to be fixed on wall including termination on LT panels earth bus as required	RM	150		
35	8 SWG dia. GI wire on surface or recess for loop earth connection complete as required.	RM	50		
36	Total Amount				

GST will be Paid Extra as applicable