

**SHRI GURU GOBIND SINGHJI**  
**INSTITUTE OF ENGINEERING & TECHNOLOGY,**  
**VISHNUPURI, NANDED - 431 606**



**e -TENDER DOCUMENTS**

For

***Supply & installation of Fluid & Heat Transfer***

For

**Chemical Engineering**

**e-Tender Notice No.**

File No. SGGSI&T/Stores-2906/Fluid & Heat Transfer/Chemical/2018-19      Date **31/10/2018**

e-Tenders available on

Web sites <https://mahatenders.gov.in>

Institute Web site <http://www.sggs.ac.in>

**Price of e-Tender Document Rs. 2,000/-**

**SHRI GURU GOBIND SINGHJI  
INSTITUTE OF ENGINEERING & TECHNOLOGY,  
VISHNUPURI, NANDED. 431 606**

File No. SGGSE&T/Stores-2906/Fluid & Heat Transfer/Chemical/2018-19

Date: 31/10/2018

**NOTICE FOR INVITATION OF e-TENDER**

1. The institute invites online tenders/quotations for Supply & Installation of **Fluid & Heat Transfer** for **Chemical Engineering** at our institute from Manufacturers / Authorised Dealers who have registered under Shop Act, CGST/SGST Registration Certificate as manufacturer / Authorised Dealers, manufacturer / Authorised Dealers of the same material/equipment; details as per the e-tender notice published in news paper. (Press note enclosed here with).
2. The Terms and conditions, which are Govern the contract made on behalf of the institute, are also enclosed.
3. The Tenderers are requested to read the instructions in the e-Tender; Terms and conditions carefully before quoting the rates in quotations / Tender Schedule and comply with the same.
4. The Tenderer should satisfy & comply all the Terms & conditions and instructions, which are mentioned in the e-Tender Notice and in this e-Tender document and there after amendments made if any.
5. The institute reserves the right to delete any item or items or to increase or to decrease the quantity of any item or items from the e-Tender Schedule.
6. All the rights to increase or decrease the quantity of the required item is reserved, the right to cancel any item or items is reserved with the institute.
7. **The right to accept or reject any / or all the tenders/quotations from any or all parties without assigning any reason is reserved.**

**Sd/-  
DIRECTOR  
Shri Guru Gobind Singhji  
Institute of Engg. & Tech.  
Vishnupuri, Nanded.**

*e-Tender documents for supply & installation of Fluid & Heat Transfer for Chemical Engineering.*



**Press note**  
SHRI GURU GOBIND SINGHJI  
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File No. SGGSE&T/Stores-2906/Fluid & Heat Transfer/Chemical/2018-19

Date: 31/10/2018

### **e-TENDER NOTICE**

Online Tenders / quotations are invited for **Supply & installation of Fluid & Heat Transfer for Chemical Engineering** of this institute from manufacturers / authorised dealers, those who have registered under shop act, CGST/SGST registration certificate for required goods. The e-Tender documents containing all detailed **specification of the Equipments & Tender's Terms and conditions** will be available on the web sites <https://mahatenders.gov.in> & <http://www.sggs.ac.in>. Vendors can download and submit their tenders online only from <https://mahatenders.gov.in> **e-tender fees Rs. 2,000/-**.

EMD is Rs. **45,000=00**

The tender EMD and Tender Fees should be paid online using given payment options on mahatenders.gov.in

All tenders should be submitted on or before **online key schedule** & technical bids will be opened on **as per key schedule**.

The right to accept or reject any or all the quotations / tenders from any or all parties without assigning any reason is reserved.

**Sd/-  
Director**

*e-Tender documents for supply & installation of Fluid & Heat Transfer for Chemical Engineering.*

File No. SGGSE&T/Stores-2906/Fluid & Heat Transfer/Chemical/2018-19

Date: 31/10/2018

Tender Schedule : (Key Dates)

Seq. No.		
1	<b>Tender Publishing</b>	31-10-2018
2	<b>Bid Submission Start</b>	31-10-2018
3	<b>Bid Submission End</b>	15-11-2018
4	<b>Technical Bid Opening</b>	24-11-2018
5	<b>Financial Bid Opening</b>	After preparation of Technical summery c

## **e-TENDERING PROCEDURE**

### **Tender Information:**

Tender Forms can be available on the e-Tendering Portal Maharashtra Government i.e. <https://mahatenders.gov.in>.

All vendor/bidder are cautioned that tenders containing any deviation from the contractual terms and conditions, specifications or other requirements and conditional tenders will be treated as nonresponsive. The tenderer should clearly mention in forwarding letter that his offer (in envelope No. 1& 2) does not contain any conditions, deviations from terms and conditions stipulated in the tender.

Vendor/bidder should have valid Class II / III Digital Signature Certificate (DSC) obtained from any Certifying Authorities. In case of requirement of DSC, interested Bidders should go to <http://maharashtra.etenders.in/mah/DigitalCerti.asp> and follow the procedure mentioned in the document 'Procedure for application of Digital Certificate'.

Vendor/bidder should install the Mandatory Components available on the Home Page of <https://mahatenders.gov.in> under the section 'Mandatory Components' and make the necessary Browser Settings provided under section 'Internet Explorer Settings'

Guidelines to Bidders on the operations of Electronic Tendering System on <https://mahatenders.gov.in>

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File No. SGGSE&T/Stores-2906/Fluid & Heat Transfer/Chemical/2018-19

Date: 31/10/2018

**INSTRUCTIONS TO TENDERERS**

1. The Tenderer should submit quotations / Tenders in online sealed envelope. Please note No EMD exemption will be considered and all interested bidder have to pay **EMD Rs. 45,000=00** by online payment gateway
2. The Tender Schedule with **specifications is given for the Supply & installation of Access Layer Switches for Campus Networking of the institute. The quoted goods/material & accessories/allied components should be strictly as per the specifications**, and should be given with detailed specifications in writing on your letter head **along with catalogue.**
3. It should be the Technical Bids will be opened and scrutinized online as per key dates. Technically qualified vendors price bid will be opened as per online schedule.
4. The Tenders / quotations should be strictly **as per the G.R. of Maharashtra Govt.** for two Bid systems. Bidder should quote rate as per the specification provided by Tender calling authority.
5. Procedure for submission of quotations: -Tenderer should note that they will have to submit as per online envelopes.
6. **A) ENVELOPE No.1 / TECHNICAL BID:** Should contain attested copies of the following documents.
  - \* a. Shop Act Registration.
  - \* b. CGST/SGST Registration Certificate
  - \* c. Manufacturer / authorised dealership certificate.
  - \* d. Income tax return for last three financial years [The bidder should have the turnover at least equal to estimated cost during each of the last three years]**B) ENVELOPE No. 2 [Commercial Bid / envelope for Rates]: -**  
Its available with tender document in excel format i.e. BOQ.  
Tenderer should fill and upload online the given BOQ
7. **The Tenderer should note that in case Envelope No. 1 does not fulfil any requirement like tender fees, EMD, attested copies of registration of Shop under Shop Act and CGST/SGST Registration No., OEM/Authorisation from Manufacturer or any documents required as per technical bid the Envelope No. 2 will not be opened and the offered quotation will be liable for rejection.**
8. The tenderer should **quote the rates on quotation/our enclosed Tender schedule duly signed online with valid digital certificate.** Vendors should not quote the rates anywhere directly or indirectly in Envelope No. 1.
9. Tenderer must follow all instructions, terms and conditions. If tenderer fails to follow any of the conditions, and instructions, his / her Tender / Quotation are to be liable for rejection.
10. Tenderer, whose Offer is found to be the best as per clause No. 1 & as per our specifications, will be informed about the same, He will have to deposit 5% of total amount as Security Deposit (S.D.). After the receipt of S.D. orders will be released.
11. If the Tenderer is manufacturer or authorised dealer and the item is the PROPRIETARY item then they should furnish the "PROPRIETARY ITEM CERTIFICATE" along with the quotation /Tender.

Sd/-  
DIRECTOR  
SGGSIE&T NANDED

**SHRI GURU GOBIND SHINGHJI INSTITUTE OF ENGINEERING & TECHNOLOGY,  
VISHNUPURI, NANDED. 431 606**

File No. SGGSI&T/Stores-2906/Fluid & Heat Transfer/Chemical/2018-19

Date: 31/10/2018

**TERMS AND CONDITIONS**

1. The rates should be quoted online as F.O.R. Destination at our **Vishnupuri, Nanded.**
2. CGST/SGST if any tax, Levis, Freight, Packing, Forwarding and Insurance Charges etc. must be incorporated in quoted amount.
3. No additional amount will be considered or paid excluding the rates quoted by bidder.
4. The validity period for the rates offered should be clearly mentioned and it should be minimum 180 days from the date of opening of tender. Items quoted should confirm to our specification. In addition, please furnish the detailed specifications against each item, the relevant catalogue/pamphlet should be necessary to accompany with the quotations; in case of any deviations in the specifications then please submit the statement duly signed as mentioned in "Instructions to Tenderer"
5. The delivery period should be clearly stated.
  - a) Liquidated Damages: Firm should quote the delivery period clearly from the date of receipt of order or confirmed order.
  - b) If supplier fails to supply the ordered material within the scheduled delivery period, for late delivery of goods we will be entitled to recover the liquidated damages as a sum equal to ½ percent of the price of item delivered late per week.
6. **Extension of Delivery period:**
  - i) If the completion of supply of goods/components/equipments/etc is Delayed due to reasons such as act of God, act of Public enemy, Wars, Act of Government, Fires, Floods, Epidemics, Quarantine, Restrictions, Strikes and Freight embargoes the delivery period may be extended.
  - ii) Supplier will have to give notice within 10 days to this institute in writing of his claim for an extension of the delivery period. After receipt of such notice and verification; if necessary the delivery period will be extended but without prejudice to other terms and conditions of the purchase order and Tender notice/Tender document's conditions.
  - iii) If supplier has delivered material after expiry of extended delivery period then institute will be entitled to recover the liquidated damages.
7. The instructions manual for each equipment/components/machinery/material should be supplied separately with the item/s supplied.
8. Supplier's Technician/Engineer must carry out the demonstration and installation at our site, free of cost.
9. **The institute reserves the right to accept any/all quotations, reject any/all quotations and to order any of the item/s in any quantity without assigning any reason.**
  - a) **The institute reserves the right with itself to delete any item/s from the Tender Enquiry.**
10. **The items will be checked at the institute and acceptance is subject to the approval of the institute.**
11. **If the supply of goods/equipments/material or any part there of is rejected by the institute, the supplier will have to bear all expenses incurred in the matter including all charges for return and replacement of the items. The rejected material/ equipments/parts of equipments should be received by supplier on their own cost.**
12. **PAYMENT CONDITION:-**  
**[Send Your Bank Details i. e. name of Bank, IFSC code, mobile number etc]**
  - \* **For equipment and instrument / component etc those items are required to be installed and demonstrated at this institute:**
    - I. 90% payment on demonstration of satisfactory working and installation of instruments/equipment/goods/components and balance 10% after 30 days.
  - \* **For the items those need not be installed and demonstrated at this institute:**
    - II. 100% payment will be released after receipt of material in good condition and approved by this institute.
13. **Inspection of Goods:** - The ordered equipments/goods/instruments will be inspected if required by our representative at your workshop/show room before despatch of goods.
  - a) The supplier should inform the date of inspection in advance at least by 8 days.
  - b) The supplier will have to provide free lodging and boarding facilities to our representative who would carry out inspection.
14. The equipments should be guaranteed for minimum period of one year from the date of installation of the goods.
15. The repairs within the guarantee period must be carried out at the cost of supplier.

***e-Tender documents for supply & installation of Fluid & Heat Transfer for Chemical Engineering.***

16. If there are any damages in transit, that should be repaired / or equipments should be replaced by the supplier on their own cost.
17. The gate pass of excise duty must be supplied in duplicate.
18. Demurrage: - If any demurrage will be charged due to any delay any other reasons from supplier; then the same should be borne by supplier or it will be deducted from their final payment.
19. Mode of Despatches: - Equipments/Stores/Components/Machineries should be despatched by Railway or Road Transport as per availability of facilities. The road transporters office / Godown must be available at Nanded City. A copy of the invoice / bill and packing list should invariably be kept inside each of the packages.
20. The package should be marked as follows
  - I) Consignee: - Director, S.G.G.S. Institute of Engg. and Tech., VISHNUPURI, NANDED – 431 606 (MAHARASHTRA)
  - II) Purchase Order No. \_\_\_\_\_ Date \_\_\_\_\_ Department. \_\_\_\_\_ R.R. /L.R. No. \_\_\_\_\_ Number of cases/packages \_\_\_\_\_ S.G.G.S. Institute of Engineering and Technology, VISHNUPURI, NANDED (M.S.) Destination: Nanded.
21. Cancellation of purchase orders: - Institute reserves the right to cancel the purchase orders on following grounds.
  - a) If supplier fails to supply the goods/equipments/machinery/components within the delivery period without confirmation of extension of the period from the institute or without obtaining the permission for extension of delivery period.
  - b) If the supplier fails to supply the goods within extended delivery period.
  - c) If supplier fails to follow the terms & conditions and instructions as mentioned in the tender documents or conditions mentioned in purchase orders.
  - d) If supplier is found defaulter.
22. The institute reserves the right to place an order for any party who is ready to supply on lowest rate for the items whose order is cancelled as per clause 21, and institute has reserves the right to place an order on 2<sup>nd</sup> lowest rate if any supplier is not found ready to supply on 1<sup>st</sup> lowest rate for items for which order is cancelled (which was placed on 1<sup>st</sup> lowest but party fails to supply).
- 23. Security Deposit:** - Successful tenderer will be informed that their quotation/Tender rates are acceptable to us, such Tenderer should deposit the **5% value** of the equipments/order value; in form of Demand Draft/Bank Guarantee in favour of Director, S.G.G.S.I.E.& T., Nanded, payable at State Bank of India, main branch, Vazirabad, Nanded or any Nationalised Bank at Nanded. The Security Deposit will be refundable after completion of one year from the date of complete payment of ordered items.
- 24. Exemption from security Deposit:** - The following tenderer s are exempted from the payment of Security Deposit
  - I. If the Tenderer has produced a certificate from the Director of Supplies & Disposal, Bombay to affect that they are exempted from payment of Security Deposit.
    1. The Security Deposit is liable to be forfeited in the event of non-fulfilment of terms and conditions by the tenderer.
      - a) If any stores, equipment/all equipments or any parts of equipment Is/are damaged in transit, and not replaced by supplier within stipulated period as notified by institute. We will recover the damages and applicable expenditure will be deducted from balance payment of supplier or from Security Deposit; or Security Deposit will be forfeited.
  25. All the replacement of stores/equipments shall also be guaranteed for a period of 12 month from the date of installation and demonstration.
  26. If any short supply is found at the time of verification/inspection of material/checking of material on its receipt, the supplier will have to supply the material within 15 days. Non-compliance of the order will compel institute to recover the cost from balance payment.
  27. Repeat order:- If necessary/any equipment/stores is required in additional number, the repeat order will be placed on previous purchase order. The supplier will have to supply the equipment/s, stores as per the previous rates.
  28. Training: - If we require training facility to our representative/staffs the supplier should have to provide training facility free of cost.
  29. The origin of stores offered whether Indian or foreign and in the case of the former State in which it is manufactured should be clearly stated against each article/equipment.
- 30. IMPORTED EQUIPMENTS:** -



***e-Tender documents for supply & installation of Fluid & Heat Transfer for Chemical Engineering.***

- a) If any tenderer is going to quote the imported equipments, he should quote the rates in Indian currency (Rupees), and he should note that, if the item finalised to purchase they should supply at our door delivery and payment will be made in Rupees only.
- b) If such equipments are in foreign currency and agent/or manufacturer/dealer has quoted the equipments. The Tenderer should have to quote the rates, all charges, Freight, Insurance clearly. F.O.R. VISHNUPURI site; If finalised to purchase the imported equipments, he should do the all Import formalities; and must be followed all other conditions of Tender Notice/documents and purchase orders; and the tenderer has to supply at our site.
31. **Rate Contract:** - If the item/s is/are covered under DGS&D Rate contract, the tenderer should quote DGS&D Rate contract number, furnish the copy of the Rate contract and other relevant particulars.
32. **Disputes:** - If any disputes or differences, questions what so ever arises the same subject to Nanded Jurisdiction.

**Sd/-  
DIRECTOR  
S.G.G.S.I.E. & T., Nanded**

Encl. Tender schedule

*e-Tender documents for supply & installation of Fluid & Heat Transfer for Chemical Engineering.*

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INSTITUTE OF ENGINEERING & TECHNOLOGY,  
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**e-TENDER SCHEDULE**

File No. SGGSE&T/Stores-2906/Fluid & Heat Transfer/Chemical/2018-19

Date: 31/10/2018

**Dept.: Chemical Engineering.**

Name of the Head of Stores: Equipments/Non – Recurring [Dead Stock]/ Recurring

*Note: Please read carefully all instructions, required specifications, Terms & conditions before quoting the rates.*

Sr. No.	Name of the Equipment & Technical Specification of the equipment	Req. Qty.	Rate	Remark/ Make
1	Department of Chemical Engineering MODROB-17 Approved equipment List with detail specification of Fluid Mechanics & Heat Transfer Lab	01 No	<b>Your rate quote in our BOQ file</b>	

The quantity required for the following each equipment is **one**.

**Design Key Features (Same for all equipment):**

- Quality Standards used for Designing and manufacturing.
- Equipment should be safe mechanically and electrically.
- Advanced PID Control. Equipment can be upgrade to incorporate the following numerous designs:
- Easily useable with guiding instruction manual.
- Choice of up gradation of equipment to data logging / computer control facility.

Sr. No	Name of Equipment	Specifications
1	Heat transfer through composite walls	<p><b>Experimentations/Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To determine total thermal resistance and thermal conductivity of composite walls.</li> <li>• To plot temperature gradient along composite walls.</li> <li>• To conduct experiments at different temperature to study its effect on thermal conductivity</li> <li>• To plot thermal conductivity Vs temperature.</li> </ul> <p><b>Technical Details Of Equipment:</b></p> <p>1. Measurable Parameters:</p> <ul style="list-style-type: none"> <li>• Interface temperature of cast iron and heater (°C).</li> <li>• Interface temperature of cast iron and bakelite (°C).</li> <li>• Interface temperature of bakelite and press wood (°C)</li> <li>• Top surface temperature of press wood (°C)</li> </ul> <p><b>Utilities Required:</b></p> <ul style="list-style-type: none"> <li>• Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 Amp. Combined socket with earth connection.</li> <li>• Table for set-up support</li> <li>• Bench Area: 1.25 m X 0.5 m</li> </ul> <p><b>Technical Data</b></p> <ul style="list-style-type: none"> <li>• Slab assembly</li> </ul> <p>Slab Material : Slab Size</p> <p>Cast Iron : 250 mm dia. &amp; 20 mm thick.</p> <p>Bakelite : 250 mm dia. &amp; 15 mm thick.</p> <p>Press Wood : 250 mm dia. &amp; 12 mm thick.</p> <ul style="list-style-type: none"> <li>• Heater : Nichrome wire, 300 Watt</li> <li>• Temperature Sensors : RTD Pt-100 type- 8Nos.</li> </ul> <p><b>Control Panel</b></p> <ul style="list-style-type: none"> <li>• PID Controller : 0-199.9 °C, For controlling temperature</li> <li>• Digital Temperature Indicator : 0-199.9 °C with multi-channel switch</li> </ul>

File no. No. SGGSE&T/Stores-2886/Access Layer Switches/Campus Networking/2018-19

*e-Tender documents for supply & installation of Fluid & Heat Transfer for Chemical Engineering.*

		<ul style="list-style-type: none"> <li>• Power measurement : By Watt-hour pulse indicator</li> <li>• Standard make On/off switch, Mains Indicator etc.</li> <li>• Cabinet to accommodate the slab assembly with front window of acrylic/Glass.</li> <li>• An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. provide along with the Apparatus.</li> <li>• The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</li> </ul>
2	Thermal conductivity of metal rod	<p><b>Experimentations/Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To determine the thermal conductivity of given bars at various temperatures.</li> <li>• To study the temperature distribution along the length of different metal rods.</li> <li>• To study the time dependency until steady state reached.</li> <li>• To conduct the experiments at different temperature and study its effect on thermal conductivity.</li> <li>• To plot the temperature distribution along the length of Bar.</li> </ul> <p>Utilities Required:</p> <p>Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 Amp. Combined socket with earth connection.</p> <ul style="list-style-type: none"> <li>• Water supply: @ 2 LPM at 1 bar</li> <li>• Table for set-up support</li> <li>• Bench Area: 1.0 m X 0.5 m</li> </ul> <p><b>Technical Data:</b></p> <ul style="list-style-type: none"> <li>• Metal bars : 3 Nos., Material Aluminium, Copper and brass, Length-400 mm, Dia.-25 mm</li> <li>• Cooling water jacket : Length- 75 mm, Dia.-50 mm.</li> <li>• Heater : Nichrome Wire, 400 Watt</li> <li>• Water measurement : By measuring cylinder and stop watch</li> <li>• Temperature Measurement : By RTD Pt-100 type sensor, 8 Nos.</li> </ul> <p>Control Panel</p> <ul style="list-style-type: none"> <li>• PID Controller : 0-199.9 °C For controlling temperature</li> <li>• Standard make On/off switch, Mains Indicator etc.</li> <li>• An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. must be provided along with the Apparatus.</li> <li>• The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</li> </ul>
3	Heat transfer in natural convection	<p><b>Experimentations/Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To study the temperature distribution along the length of vertical test pipe.</li> <li>• To determine average surface heat transfer coefficient under natural convection.</li> <li>• To conduct experiments at different temperature.</li> </ul> <p><b>Utilities Required:</b></p> <ul style="list-style-type: none"> <li>• Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 Amp. Combined socket with earth connection.</li> <li>• Table for set-up support.</li> <li>• Bench area: 1.25 m X 0.5 m</li> </ul> <p><b>Technical Data</b></p> <ul style="list-style-type: none"> <li>• Test Section : Material-Brass, Diameter: 38 mm, Length:500 mm</li> <li>• Heater : Nichrome Wire, 400 watt</li> <li>• Temperature Sensors : RTD Pt-100 type - 8 Nos.</li> </ul> <p><b>Control Panel</b></p> <ul style="list-style-type: none"> <li>• PID Controller : 0-199.9 °C for controlling temperature</li> <li>• Digital Temperature Indicator : 0-199.9°C with multi-channel switch</li> <li>• Power measurement : By Watt-hour pulse indicator</li> <li>• Standard make On/off switch, Mains Indicator etc.</li> <li>• Powder coated duct of MS to accommodate the assembly with front window of Acrylic.</li> </ul>

*e-Tender documents for supply & installation of Fluid & Heat Transfer for Chemical Engineering.*

		<ul style="list-style-type: none"> <li>• An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. be provided along with the Apparatus.</li> <li>• The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</li> </ul>
4	Heat transfer in force convection	<p><b>Experimentations/Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To study the forced convection phenomena.</li> <li>• To calculate heat transfer rate.</li> <li>• To calculate Nusselt number and Reynolds number.</li> <li>• To determine experimental and theoretical heat transfer coefficient for a pipe by forced convection.</li> <li>• Comparison of heat transfer coefficient for different air flow rates and temperature.</li> <li>• To plot surface temperature distribution along length of the pipe.</li> </ul> <p><b>Utilities Required:</b></p> <p>Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 Amp. Combined socket with earth connection.</p> <ul style="list-style-type: none"> <li>• Floor area: 1.2 m x 0.5 m</li> </ul> <p><b>Technical Data</b></p> <ul style="list-style-type: none"> <li>• Test section : Horizontal, externally heated, Diameter-28 mm, Length-400 mm</li> <li>• Blower : FHP of Standard makes.</li> <li>• Heater : Nichrome Wire, 400 Watt</li> <li>• Air Flow Measurement : Orificemeter&amp; Manometer.</li> <li>• Temperature Sensors : RTD Pt-100 type- 6 Nos.</li> </ul> <p>Control Panel</p> <ul style="list-style-type: none"> <li>• PID Controller : 0-199.9 °C for controlling temperature</li> <li>• Digital Temperature Indicator : 0-200 °C with multi-channel switch</li> <li>• Standard make On/off switch, Mains Indicator etc.</li> </ul> <ul style="list-style-type: none"> <li>• An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. must be provided along with the Apparatus.</li> <li>• The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</li> </ul>
5	Stefan Boltzmann's Apparatus	<p><b>Experimentations/Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To study the phenomena of heat transfer by radiation and effect of hemisphere temperature on it.</li> <li>• To study and plot the variation of temperature of disc with time.</li> <li>• Determination of Stefan Boltzmann constant.</li> </ul> <p><b>Utilities Required:</b></p> <ul style="list-style-type: none"> <li>• Electricity Supply: 1 Phase, 220 V AC, 50 Hz, 5-15 Amp combined socket with earth connection</li> <li>• Water Supply: Initial fill</li> <li>• Floor drain.</li> <li>• Table for set-up support</li> <li>• Bench area: 1.25 m X 0.5 m</li> </ul> <p><b>Technical Data</b></p> <ul style="list-style-type: none"> <li>• Hemisphere : Material copper, Dia.- 200 mm</li> <li>• Jacket : Material Stainless Steel 304 Grade, Dia. 250 mm</li> <li>• Test Disc Size : Material Copper, 20 mm Dia. x 1.5 mm thickness</li> <li>• Water Tank : Material Stainless steel 304 Grade, Capacity- 12 Ltrs.</li> <li>• Heater : Nichrome wire immersion heater, 1 kW</li> <li>• Temperature Sensors : RTD Pt-100 type-2 Nos.</li> </ul> <p><b>Control Panel</b></p> <ul style="list-style-type: none"> <li>• PID Controller : 0-199.9 °C for controlling temperature</li> <li>• Digital Temperature Indicator : 0-199.9 °C with multi-channel switch</li> <li>• Standard make On/off switch, Mains Indicator etc.</li> </ul> <ul style="list-style-type: none"> <li>• An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. must be provided along with the Apparatus.</li> </ul>

*e-Tender documents for supply & installation of Fluid & Heat Transfer for Chemical Engineering.*

		<ul style="list-style-type: none"> <li>• The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</li> </ul>
6	Fluidized bed heat transfer	<p><b>Experimentations/Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To demonstrate fluidization phenomena.</li> <li>• To calculate heat transfer coefficient of the fluidized bed.</li> <li>• To study the effect of temperature and air flow rate on heat transfer rate and heat transfer coefficient.</li> </ul> <p><b>Utilities Required:</b></p> <ul style="list-style-type: none"> <li>• Electricity Supply: 1 Phase, 220 V AC, 50 Hz, 5-15 Amp. combined socket with earth connection</li> <li>• Compressed Air Supply: 1 CFM @ 2 Bar, with end connection for 6 x 8 mm PU tubing.</li> <li>• Floor area: 1. m x 0.75 m</li> </ul> <p><b>Technical Data</b></p> <ul style="list-style-type: none"> <li>• Column : Material Borosilicate Glass,</li> <li>• Fluidizing Medium : Air</li> <li>• Heater :Nichrome Wire. 0-100 W</li> <li>• Air Flow Measurement : By Orificemeter&amp; manometer</li> <li>• Temperature Sensors : RTD Pt-100 type-3 Nos.</li> </ul> <p><b>Control Panel</b></p> <ul style="list-style-type: none"> <li>• PID Controller : 0-199.9 °C for controlling temperature</li> <li>• Digital Temperature Indicator : 0-199.9 °C with multi-channel switch</li> <li>• Standard make On/off switch, Mains Indicator etc.</li> <li>• An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. must be provided along with the Apparatus.</li> <li>• The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</li> </ul>
7	Pin Fin apparatus	<p><b>Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To study temperature distribution along the length of fin in both Free &amp; forced convection.</li> <li>• To calculate heat transfer rate in pin-fin for natural and forced convection.</li> <li>• To calculate Gr, Pr and Nu number in free convection.</li> <li>• To calculate Re, Pr and Nu number in forced convection.</li> <li>• To determine experimental and theoretical heat transfer coefficient for free and forced convection.</li> <li>• To determine fin effectiveness and efficiency in free and forced convection.</li> <li>• To conduct the experiments at different Temperature.</li> <li>• Comparison of theoretical temperature distribution with that of experimentally obtained distribution.</li> </ul> <p><b>Utilities Required:</b></p> <ul style="list-style-type: none"> <li>• Electricity Supply: 1 Phase, 220 V AC, 50 Hz, 5-15 Amp. combined socket with earth connection</li> <li>• Floor area: 1.5 m x 0.5 m</li> </ul> <p><b>Technical Data</b></p> <ul style="list-style-type: none"> <li>• Fin : Pin type, Material Aluminum, Size-Dia. 20 mm, Length 170 mm</li> <li>• Air Duct : Material MS.</li> <li>• Air Flow Measurement : By Orifice meter and water manometer</li> <li>• Fan : Standard make</li> <li>• Heater : Band type, Nichrome Wire, 150 Watt</li> <li>• Temperature Sensors : RTD Pt-100 type- 8 Nos.</li> </ul> <p><b>Control panel</b></p> <ul style="list-style-type: none"> <li>• PID Controller : 0-199.9 °C, For controlling temperature</li> <li>• Digital Temperature Indicator : 0-199.9 °C with multi-channel switch</li> <li>• Standard make On/off switch, Mains Indicator etc.</li> <li>• An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. must be provided along with the Apparatus.</li> </ul>

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		<ul style="list-style-type: none"> <li>• The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</li> </ul>
8	Reynolds apparatus	<p><b>Experimentations/Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To visualize laminar, transition and turbulent flow.</li> <li>• To determine the Reynold's number and hence the type of flow either laminar or turbulent.</li> <li>• To study transition zone i.e. critical Reynolds number</li> </ul> <p><b>Utilities Required:</b></p> <ul style="list-style-type: none"> <li>• Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 Amp.</li> <li>• Water Supply (Initial Fill).</li> <li>• Floor Drain required.</li> <li>• Floor Area Required: 1.5 m x 0.75 m</li> </ul> <p>Chemical Required: Dye (KMnO<sub>4</sub>) - 10 gm</p> <p><b>Technical Data:</b></p> <p>Test Section : Material Borosilicate Glass, Dia. 14 mm, Length: 600 mm  Dye vessel : Material Stainless Steel 304 grade, Capacity 1 Ltrs.  Capillary Tube : Material copper/ Stainless Steel 304 grade.  Constant Head Water Tank : Capacity 40 Ltrs.  Water Circulation : 0.5 HP Pump, Crompton/Standard make.  Measuring Cylinder : Capacity 1000 ml.  Stop Watch : Electronic  Sump Tank : Capacity 60 Ltrs.  Control Panel Comprises of Standard makes On/Off Switch, Mains Indicator, etc.  Tanks will be made of Stainless Steel 304 grade.  An ENGLISH instruction manual consisting of experimental procedures, Calculation, block diagram safety precaution etc. Precautions etc. will be provided along with the Apparatus.  The whole set-up is well designed and arranged on a rigid structure painted with industrial PU Paint.</p>
9	Bernoulli's apparatus	<p><b>Experimentations/Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To Verify the Bernoulli's Theorem experimentally.</li> <li>• To observe energy conversion</li> <li>• To calculate and plot the pressure head along convergent and divergent section.</li> <li>• To calculate and plot velocity head along convergent and divergent section.</li> <li>• To determine the flow rate factor at various flow rates.</li> <li>• To calculate meter coefficient at various flow rate.</li> <li>• To plot the Total energy Vs. distance.</li> <li>• To recognize friction effects for different flow rates</li> </ul> <p><b>Utilities Required:</b></p> <ul style="list-style-type: none"> <li>• Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 Amp</li> <li>• Water Supply: Initial fill</li> <li>• Floor Drain.</li> <li>• Floor Area: 1.5 m x 0.75 m</li> </ul> <p><b>Technical Data</b></p> <ul style="list-style-type: none"> <li>• Test Section : Venturi Nozzle, Machined from clear Acrylic having Convergent and divergent section.</li> <li>• Piezometer Tubes : P.U. Tubes, 7 Nos.</li> <li>• Water Circulation :0.5 HP Pump, Crompton/Standard make</li> <li>• Measuring Tank : Capacity 15 Ltrs.</li> <li>• Sump Tank :Capacity 50 Ltrs.</li> <li>• Constant Head Inlet Tank :Capacity 15 Ltrs. with fixed overflow arrangement</li> <li>• Stop Watch :Electronic.</li> <li>• Control Panel Comprises of Standard makes On/Off Switch, Mains Indicator etc.</li> <li>• Tanks must be made of Stainless Steel 304 grade.</li> </ul>

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		<ul style="list-style-type: none"> <li>• An ENGLISH instruction manual consisting of experimental procedures, along with the Apparatus.</li> <li>• The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</li> </ul>
10	Pipe Friction apparatus	<p><b>Experimentations/Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To relate head loss due to friction and velocity for flow of water.</li> <li>• To determine the losses due to friction in both pipes.</li> <li>• To determine the friction factor for Darcy-Weis back equation.</li> <li>• To study the effect of pipe diameter on friction factor.</li> <li>• To plot head loss Vs Flow rates for a particular pipe diameter.</li> </ul> <p><b>Utilities Required:</b></p> <ul style="list-style-type: none"> <li>• Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 Amp. Combined socket with earth connection.</li> <li>• Water Supply: Initial fill</li> <li>• Floor Drain.</li> <li>• Floor Area 1.5 m x 0.75 m</li> </ul> <p><b>Technical Data</b></p> <ul style="list-style-type: none"> <li>• Pipe Test Section : Material Stainless Steel 304 grade,</li> <li>(i) Dia. ½”, Length: 1 m</li> <li>(ii) Dia. ¾”, Length: 1.25 m</li> <li>• Water Circulation : 0.5 HP Pump, Crompton/Standard make.</li> <li>• Measuring Tank : Capacity 25 Ltrs.</li> <li>• Sump Tank : Capacity 50 Ltrs.</li> <li>• Stop Watch : Electronic.</li> <li>• Pressure measurement : Pressurized Differential Pressure Manometer</li> <li>• <b>Control Panel</b> Comprises of Standard makes On/Off Switch, Mains Indicator, etc.</li> <li>• Tanks must be made of Stainless Steel 304 grade.</li> <li>• An ENGLISH instruction manual consisting of experimental procedures, Calculation, block diagram, safety Precautions etc. must be provided along with the Apparatus.</li> <li>• The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</li> </ul>
11	Venture meter, Orifice meter and rotameter test ring	<p><b>Experimentations/Learning Objectives:</b></p> <p>To determine the co-efficient of discharged through Venturi meter and orifice meter. To measure discharge through Venturi meter, Orifice meter and Rotameter.</p> <p><b>Utilities Required:</b></p> <p>Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 Amp. Combined socket with earth connection. Water Supply (Initial Fill). Floor Drain required. Floor Area Required: 1.5 m x 0.75 m</p> <p><b>Technical Data:</b></p> <p>Venturimeter : Machined from clear Acrylic, compatible to 1” Dia. Pipe. Orifice meter : Machined from clear Acrylic, compatible to 1” Dia. Pipe, Orifice plate made of Stainless Steel SS 304 Grade. Rotameter : Rotameter of compatible range, Eureka/equivalent make Water Circulation : 0.5 HP Pump, Crompton/Standard make. Measuring Tank : Capacity 25 Ltrs. Sump Tank : Capacity 50 Ltrs. Stop Watch : Electronic Pressure measurement : By Pressurized differential pressure manometer.</p> <p><b>Control Panel</b> Comprises of Standard makes On/Off Switch, Mains Indicator, etc. Tanks must be made of Stainless Steel SS-304 grade.</p>

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		<p>Provide an ENGLISH instruction manual consisting of experimental procedures, Calculation, block diagram, safety Precautions etc along with the Apparatus.</p> <p>The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</p>
12	Pitot tube	<p><b>Experimentations/Learning Objectives:</b></p> <p>To find the point velocity at the center of a tube for different flow rates of meter and calibrate the Pitot tube.</p> <p>To find the co-efficient of Pitot</p> <p>To plot velocity profile across the cross section of pipe</p> <p><b>Utilities Required:</b></p> <p>Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 Amp</p> <p>Water Supply (Initial Fill).</p> <p>Floor Drain required</p> <p>Floor Area Required: 1.5 m x 0.75 m</p> <p><b>Technical Data</b></p> <p>Pitot Tube : Material Copper/Stainless Steel 304 Grade of compatible size fitted scale.</p> <p>Test Section : Machined from Clear Acrylic, compatible to 1” Dia. Pipe.</p> <p>Water Circulation : 0.5 HP Pump, Crompton/Standard make</p> <p>Measuring Tank : Capacity 25 Ltrs.</p> <p>Sump Tank : Capacity 50 Ltrs.</p> <p>Stop Watch : Electronic.</p> <p>Pressure measurement : By pressurized differential pressure manometer.</p> <p><b>Control Panel</b> Comprises of Standard makes On/Off Switch, Mains Indicator, etc.</p> <p>Tanks must be made of Stainless Steel 304 grade.</p> <p>An ENGLISH instruction manual consisting of experimental procedures, Calculation, block diagram, safety Precautions etc. must be provided along with the Apparatus</p> <p>The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</p>
13	Centrifugal pump test ring	<p><b>Experimentations/Learning Objectives:</b></p> <p>To measure suction and discharge pressure.</p> <p>To determine following at different speeds.</p> <ol style="list-style-type: none"> <li>1. Total head</li> <li>2. Discharge</li> <li>3. Shaft output</li> <li>4. Power input</li> <li>5. Pump output</li> <li>6. overall efficiency</li> <li>7. Pump efficiency.</li> </ol> <p>To plot:</p> <ol style="list-style-type: none"> <li>1. Head vs. Discharge</li> <li>2. Pump efficiency vs. Discharge</li> <li>3. Pump output vs. Discharge</li> </ol> <p>To analyze characteristics curve of centrifugal pump</p> <p><b>Utilities Required:</b></p> <p>Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5 should be less than 5 volts.</p> <p>Water Supply : Initial fill.</p> <p>Floor Drain.</p> <p>Floor Area: 2.0 m x 1.0 m</p> <p><b>Technical Data:.</b></p>



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		<p>Pump :Kirloskar Make, Capacity 1 HP Speed 2800 RPM (max.), Head 12 m (max.)  Medium Flow : Clear Water.  Drive : 1 HP DC motor.  Speed Control :Thyristor controlled.  Sump Tank : Capacity 110 Ltrs. approx.  Measuring Tank : Capacity 70 Ltrs. approx. with Piezometer.  Stop Watch : Electronic.  Pressure Measurement : By Bourdon type Pressure gauge, 0-2 kg/cm<sup>2</sup> and Vacuum Gauge, 0-760 mm of Hg  <b>Control panel:</b>  Energy measurement : By watt-hour pulse indicator.  RPM measurement : Digital RPM Indicator with Proximity sensor.  MCB : For overload protection.  Standard make On/Off Switch, Mains Indicator, etc.  Tanks must be made of Stainless Steel 304 Grade.  An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. must be provided along with the Apparatus.  The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</p>
14	Reciprocating pump test ring	<p><b>Experimentations/Learning Objectives:</b>  To measure suction and discharge pressure.  To determine following at different speeds.  1. Total head  2. Discharge  3. Shaft output  4. Power input  5. Pump output  6. overall efficiency  7. Pump efficiency.  To plot:  1. Head vs. Discharge  2. Pump efficiency vs. Discharge  3. Pump output vs. Discharge  To analyze characteristics curve of reciprocating pump  <b>Utilities Required:</b>  Electricity Supply: Single Phase, 220 V AC, 50Hz 5-15 Amp. Combined socket with earth connection.  Water Supply : Initial fill.  Floor Drain.  Floor Area: 1.5 m x 0.75 ms  <b>Technical Data:</b>  Pump : Double acting, Single Cylinder, Capacity 1 HP, Speed 250 RPM (max.), Head 5 kg/cm<sup>2</sup> (max.)  Medium Flow : Clear Water.  Drive : 1 HP DC motor.  Speed Control :Thyristor controlled.  Sump Tank : Capacity 50 Ltrs. approx.  Measuring Tank : Capacity 25 Ltrs. approx. with Piezometer.  Stop Watch : Electronic.  Pressure Gauge : Bourdon type.</p>

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		<p><b>Control panel:</b>            Energy measurement : By watt-hour pulse indicator.            RPM measurement : Digital RPM Indicator with Proximity sensor            MCB : For overload protection.            Standard make On/Off Switch, Mains Indicator, etc.            Tanks must be made of Stainless Steel 304 Grade.            An ENGLISH instruction manual consisting of experimental procedures, block diagram etc. must be provided along with the Apparatus.            The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</p>
15	Losses in pipe fittings, sudden enlargement and contractions	<p><b>Experimentations/Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To determine loss of head in the fittings at various water flow rates.</li> <li>• To measure the loss coefficient for the pipe fittings.</li> </ul> <p><b>4. Utilities Required:</b></p> <ul style="list-style-type: none"> <li>• Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5 should be less than 5 volts.</li> <li>• Water Supply (Initial Fill).</li> <li>• Floor Drain.</li> <li>• Floor Area: 1.5 m x 0.75 m</li> </ul> <p><b>Technical Data</b></p> <ul style="list-style-type: none"> <li>• Test Section: Material Stainless steel 304 Grade, Sudden Enlargement: From 15 mm to 25 mm Sudden Contraction: From 25 mm to 15mm, Bend: 1/2", Elbow: 1/2", Ball valve 1/2", Gate valve: 1/2".</li> <li>• Water Circulation: 0.5 HP Pump, Crompton/Standard make.</li> <li>• Pressure Head Measurement: Pressurized Differential Pressure manometer</li> <li>• Measuring Tank: Capacity 25 Ltrs.</li> <li>• Sump Tank: Capacity 50 Ltrs.</li> <li>• Stop Watch: Electronic.</li> <li>• Control Panel Comprises of Standard makes On/Off Switch, Mains Indicator, etc.</li> <li>• Tanks must be made of Stainless Steel 304 grade.</li> <li>• An ENGLISH instruction manual consisting of experimental procedures, Calculation, Precautions etc. must be provided along with the Apparatus.</li> <li>• The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</li> </ul>
16	Study of pressure measurement	<p><b>Experimentations/Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• To demonstrate the working of different pressure measuring devices.</li> <li>• To measure the pressure and pressure difference by pressure gauge, single column manometer, U-Tube manometer &amp; Inclined tube manometer.</li> <li>• To compare different pressure measuring devices.</li> </ul> <p><b>4. Utilities Required:</b></p> <ul style="list-style-type: none"> <li>• Electricity Supply: Single Phase, 220 V AC, 50 Hz, 5-15 Amp. Combined socket with earth connection. Earth voltage should be less than 5 volts.</li> <li>• Water Supply (Initial fill)</li> <li>• Floor Drain required.</li> <li>• Floor Area Required: 1.5 m x 0.75 m</li> <li>• Mercury (Hg) for manometer (750 gm)</li> </ul> <p><b>5. Technical Data</b></p> <ul style="list-style-type: none"> <li>• Single Well Manometer : Single Tube Type.</li> <li>• Differential Manometer : U-Tube Type.</li> </ul>

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	<ul style="list-style-type: none"><li>• Sensitive Manometer. : Inclined Tube Type</li><li>• Pressure Gauge. : Bourdon Type</li><li>• Water Circulation : 0.5 HP Pump, Crompton/Standard make.</li><li>• Sump Tank : Capacity 50 Ltrs.</li><li>• Control Panel Comprises of Standard makes On/Off Switch, Mains Indicator etc.</li><li>• Tanks must be made of Stainless Steel 304 grade.</li><li>• An ENGLISH instruction manual consisting of experimental procedures, Calculation, block diagram, safety Precautions etc. must be provided along with the Apparatus.</li><li>• The whole set-up must be well designed and arranged on a rigid structure painted with industrial PU Paint.</li></ul>
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I / we agree to the all above terms and conditions of Tender documents and required specification of the items as per above tender schedule of the **e-Tender notice No.SGGSIE&T/Stores-2906/Fluid Mechanics & Heat Transfer/Chemical/2018-19 Date 31/10/2018**

Name of the firm:-

Seal of the firm:

Signature of Tenderer: \_\_\_\_\_

Quotation no.: \_\_\_\_\_

Date: \_\_\_\_\_

**Details of Certificate & documents attached [pl. mark as√ ]**

1. Shop Act Registration
2. CGST/SGST Registration No.
3. Copy of Income Tax returns for last three financial year. [The bidder should have the turnover of at least equal to estimated cost during each of the last three years]
4. Manufacturer's/ Authorized dealership certificate should certify that the items quoted are manufactured by them only.