

राष्ट्रीय प्रौद्योगिकी संस्थान, मिजोरम  
NATIONAL INSTITUTE OF TECHNOLOGY, MIZORAM

(An Institute of National Importance under Ministry of HRD, Govt. of India)

CHALTLANG, AIZAWL: MIZORAM – 796012,

Phone No. 0389- 2341236/ 2341699

Fax: 0389-2341774

Web: www.nitmz.ac.in

Email: nit\_mizoram@nitmz.ac.in

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Ref. No.: NIT-MZ/TENDER/01-A/2014

Date: 29<sup>th</sup> January 2014

**NOTICE INVITING TENDER FOR SUPPLY & INSTALATION OF  
LABORATORY EQUIPMENTS FOR MECHANICAL ENGINEERING  
DEPARTMENT**

***Applied Thermodynamics***

Last date for receiving Tender documents: **25<sup>th</sup> February 2014 before 3:00 PM**

Date/Time for Opening of Tech. Bids: **25<sup>th</sup> February 2014 at 3.30 PM**

**राष्ट्रीय प्रौद्योगिकी संस्थान, मिजोरम**  
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**Ref. No.: NIT-MZ/TENDER/02-A/2013**

**Date: 20<sup>th</sup> May 2013**

**NOTICE INVITING TENDER (NIT)**

National Institute of Technology-Mizoram is one of the ten new NITs established by Ministry of Human Recourse Development, Government of India, New Delhi in the year 2010 at Aizawl, Mizoram to impart education, training and research in Science, Technology and Management leading to award of B. Tech., M. Tech., MBA and Ph.D degrees. This institute is fully financed and governed by Ministry of Human Recourse Development, Government of India.

Sealed Tenders are invited from eligible Manufacturers/Developers or their Authorized Dealers for supply & Installation of Machines as per details at **ANNEXURE-IV, in Two Bids** to reach the undersigned on or before **25<sup>th</sup> February 2014 before 3:00 PM**. Date/Time for Opening of Tech. Bids: **25<sup>th</sup> February 2014 at 3.30 PM**. After evaluation of Technical Bids, Financial Bids of the successful bidders will be opened on later date which will be notified in the Institute website. Venue of bid opening: **NIT Mizoram, Aizawl**.

Sl. No.	Reference No.	Items	Qty	EMD (Rs.) in the form of DD only. (Refundable)	Tender Document Fee (Rs.) in the form of DD only. (Non-Refundable)
01.		<b>Supply &amp; Installation of Equipments for Applied Thermodynamics Lab on turnkey basis to be installed at NIT, Mizoram, Aizawl</b>	<b>One Package</b>	<b>@2%</b>	<b>1,000.00</b>

**Note:** Demand Draft must be in favor of “**Director, NIT Mizoram**” Payable at **Aizawl**.

### **General Instructions for the Bidders:**

01. Quotations will have to be submitted in TWO Bids i.e. **Technical Bid and Financial Bid, in hard copy as well as in soft copy (soft copy must be in MS word 2007 provided in separate CDs for Technical Bid and Financial Bid). Both hard copy and soft copy of Technical Bid should be in one sealed envelope specifically mentioning “Technical Bid” on the cover of the envelope similarly for Financial Bid also, both hard copy and soft copy of must be in one sealed envelope specifically mentioning “Financial Bid” on the cover of the envelope.** Further these two sealed Bids must be kept inside one big sealed envelope before submitting it.

The address of the firm submitting the quotation and the Officer to whom the quotation is addressed must appear distinctly on sealed covers. Further, on sealed cover, the following are to be written:

QUOTATION FOR SUPPLY & INSTALLATION OF **“EQUIPMENT FOR APPLIED THERMODYNAMICS LABORATORY OF MECHANICAL ENGINEERING DEPARTMENT AT NIT MIZORAM”.**

02. **Submission of Compliance Certificate:** Duly filled and signed Compliance Certificates (as per formats at **Annexure I (A & B)** are must with the Technical bid.

03. **Bid not transferable:** The bid documents are not transferable and the seal and signature of the authorized official of the firm must appear on all the papers and envelopes submitted.

### **QUALIFICATION REQUIREMENTS**

01. The Bidder should be a Original Equipment Manufacturer (OEM) Or a firm of reputation having sufficient expertise and experience in the subject tender with sound warranty / service support capability and authorization from Manufacturer/Distributor.

02. **The Bidder has to Quote for all the items in the Applied Thermodynamics Lab, Bidders who do not Quote for all the items are subject to be disqualified.**

### **TERMS & CONDITIONS:**

01. **Rates:** Rates quoted in the **Price Bid** should be **on DOOR DELIVERY NIT Mizoram basis**, as per details below:

<b>Sl. No.</b>	<b>Particulars</b>	<b>Rate</b>
I	Basic Price (per unit) including Packing, Forwarding, Freight, Insurance, Installation & demonstration charges inclusive	
II	Taxes(pl. give break up)	
III	Grand Total for the item on door delivery at NIT Mizoram	

Bidders shall indicate their rates in clear/visible figures as well as in words and shall not alter/overwrite/make cutting in the quotation. In case of a mismatch, the rates written in words will prevail.

02. **Validity of Quotation:** Quoted rates must be valid for **90 days** from the date of quotation.
03. **Warranty:** The quoted equipment and components must be warranted for a minimum of one Year or period specified against the item from date of Installation.
04. **Literature a must:** All the quotations must be supported by the printed technical leaflet/literature and the specifications mentioned in the quotation must be reflected/ supported by such printed technical leaflet/literature. The model and specifications quoted should **invariably be highlighted** in the leaflet/literature for easy reference.
05. **After Sales Service:** Vendors should clearly state the available nearest after sales service facilities in the region, without which their offers will be rejected.
06. **Dealership Certificate:** Dealers or Agents quoting on behalf of Manufacturer must enclose valid dealership certificate.
07. **Earnest Money Deposit:**

Refundable earnest money deposit (EMD) of @2% of the Quoted Value through demand draft drawn in favor of “The Director, National Institute of Technology Mizoram”, payable at Aizawl, will have to accompany the technical Bid. The EMD of unsuccessful bidders shall be returned after award of contract. EMD of the successful bidder will be released on submission of the Performance Guarantee. Offers received without Earnest Money or valid Certificate shall be summarily rejected.

08. **Performance Bank Guarantee (PBG):** In case of items with order value of Rupees five lakhs (INR 5,00,000/-) and above, the successful bidder shall furnish an unconditional PBG (as per format at **Annexure II**) for 5% of the Purchase Order value from a scheduled Bank of India, after receiving the purchase order. Where the PBG is obtained by a foreign bank, it shall be got confirmed by a Schedule Indian bank and shall be governed by Indian Laws and be subject to the jurisdiction of courts at Aizawl. The PBG shall guarantee that,

- (a) The Vendor guarantees satisfactory operation of the Equipment & components against poor workmanship, bad quality of materials used, faulty designs and poor performance.
- (b) The Vendor shall, at his own cost, rectify the defects/replace the items supplied, for defects identified during the period of guarantee.
- (c) This guarantee shall be operative from the date of installation till 60 days after the warranty period.

09. **Delivery:**

- a) **Time Limit:** Maximum within 12 Weeks from the date of issue of this purchase order.
  - b) **Safe Delivery:** All aspects of safe delivery shall be the exclusive responsibility of the vendor. At the destination site, the package will be opened only in the presence of NIT user/representative and vendor's representative. The intact condition of the package and the seal/indicators for not being tampered with shall form the basis for certifying the receipt in good condition.
  - c) **Insurance:** The supplier is to establish 'All Risk Transit Insurance' coverage till door delivery at NIT Mizoram.
  - d) **Part Delivery:** Acceptance of part delivery shall be a prerogative of the institute.
  - e) **Penalty for delay in delivery:** The date of delivery should be strictly adhered to otherwise the Director, NIT Mizoram reserves the right not to accept delivery in part or full.
10. **Genuine Pricing:** Vendor is to ensure that quoted price for the particular item is not more than the price quoted to any other customer in India, particularly to IITs/NITs and other Government Organization. Copy of the latest price list for the quoted item, applicable in India, must be enclosed with the offer.
11. **Conditional tenders not acceptable:** All the terms and conditions mentioned herein must be strictly adhered to by all the vendors. Conditional tenders shall not be accepted on any ground and shall be rejected straightway. Conditions mentioned in the tender bids submitted by vendors will not be binding on NIT Mizoram.
12. **Road Permit:** NIT, Mizoram will provide Road Permit to the Vendors of outside Mizoram.
13. **VAT deduction at source:** In case of supply within Mizoram, VAT deduction at source, as per Order/ notification of the Govt. of Mizoram will be applicable.
14. **Late and delayed tender:** Late and delayed tender will not be considered. In case any unscheduled holiday occurs on the prescribed closing/opening date the next working day shall be the prescribed date of closing/opening.

15. **Payment:** 100% payment within 30(Thirty) days after receipt of the material in full, satisfactory installation, training and acceptance.

16. **Payment for Imported Goods:** By an irrevocable letter of Credit at CIF/CIP Kolkata value negotiable through any overseas branch of State Bank of India/any Schedule Bank of India.

**Note:** Please note LoC will not be opened unless and until Letter of Acknowledgement in original is received at NIT, Aizawl, Mizoram, directly from the principal (Even in case of firms having subsidiary office in India).

### 17. ADDITIONAL TERM FOR IMPORTED GOODS

Following term besides the fore mentioned terms will be applicable in case of foreign purchases:

**Rates:** Prices quoted must be for destination including freight and insurance charges inclusive of free delivery up to the door of department/centre NIT, Mizoram premises, as per details below:

Sl. No.	Particulars	Rate
I	Basic Price (per unit) including Packing, Forwarding, Freight, Insurance, Installation & demonstration charges inclusive	
II	Custom Duty (Approximate)	
III	Grand Total for the item on door delivery at NIT Mizoram	

18. **Free Maintenance & Service for 20 Years:** An agreement is to be executed between the Institute & the **Manufacturer/Distributor/Dealer** for providing **Free Maintenance & Service for 20 Years** after expiry of the Warranty Period of the equipment by the Manufacturer/Distributor/Dealer (Preferably from the Manufacturer) within 30 Days from the day of Complain. The cost of the Spare parts required for the service and maintenance will be paid by the Institute along with the To & Fro charges (The cheapest mode of Travel).

18. **Enquiry during the course of evaluation not allowed:** No enquiry from the bidder(s) shall be entertained during the course of evaluation of the tender till final

decision is conveyed to the successful bidder(s). However, the Purchase Committee or its authorized representative may make enquiries/seek clarification from the bidders. In such a case, the bidder must extend full co-operation. The bidders may also be asked to arrange demonstration of the offered items, in a short period of notice.

19. The acceptance of the quotation will rest solely with the Director, NIT Mizoram, who in the interest of the Institute is not bound to accept the lowest quotation and reserves the right to himself to reject or partially accept any or all the quotations received without assigning any reasons.

**20. Force Majeure:**

If the performance of the obligation of either party is rendered commercially impossible by any of the events hereafter mentioned that party shall be under no obligation to perform the agreement under order after giving notice of 15 days from the date of such an event in writing to the other party, and the events referred to are as follows:

- i. Any law, statute or ordinance, order action or regulations of the Government of India,
- ii. Any kind of natural disaster, and
- iii. Strikes, acts of the Public enemy, war, insurrections, riots, lockouts, sabotage.

**21. Applicable Law:**

(a) The contract shall be governed by the laws and procedures established by Govt. of India and subject to exclusive jurisdiction of Competent Court and Forum in Aizawl only.

(b) Any dispute arising out of this purchase shall be referred to the Director NIT Mizoram, and if either of the parties hereto is dissatisfied with the decision, the dispute shall be referred to the decision of an Arbitrator to be appointed by the Director of the Institute. The decision of such Arbitrator shall be final and binding on both the parties.

22. **Training:** The vendor will provide free training at NIT Mizoram after Successful installation of the Machines/equipments.

**Sd/**

Encl.: **ANNEXURE-I, ANNEXURE-II, ANNEXURE-III & ANNEXURE-IV**

**A. COMPLIANCE CERTIFICATE FOR NIT TERMS**  
**(To be enclosed in the Technical bid)**

<b>Sl. No.</b>	<b>NIT Terms and Conditions</b>	<b>Yes/No</b>
01	<b>Rate</b> quoted as per instruction	
02	<b>AMC rate</b> after warranty provided	
03	<b>Validity</b> of quoted rate for 90 days agreed	
04	<b>EMD</b> submitted (appropriate certificate enclosed)	
05	<b>PBG</b> term agreed	
06	<b>Payment</b> term agreed	
07	<b>Delivery terms</b> agreed	
08	<b>Warranty period</b> agreed	
09	<b>Literature:</b> Printed Literature provided	
10	<b>Dealership</b> / distributorship certificate (in case of dealers/agents) provided	
11	<b>Sales Service:</b> address of after Sales Service centre in India (for imported goods)/ in the region provided	
12	<b>Manufacturer</b> certificate provided	
14	<b>Applicable law</b> terms agreed	

Signature with Seal:.....

Vendor: M/s.....



**B. COMPLIANCE CERTIFICATE FOR SPECIFICATIONS**  
**(One for each item must to be enclosed in the Technical bid)**

Item Sl. No.			
Specifications as per Annexure-IV		Quoted Item Specs.*	Complied (Yes/No)
Parameter	Specification		

Signature with Seal:.....

Vendor: M/s.....

**\* Vendor must quote the parameter specification of the quoted product in this column and not just copy the specification from the tender call document. Failure to do so will lead to rejection of the tender.**

**PERFORMANCE BANK GUARANTEE**

To:

**The Director  
National Institute of Technology Mizoram**

**WHEREAS**..... (Name of Supplier)

Hereinafter called "the Supplier" has undertaken, in pursuance of Contract No..... dated ..... 20... to supply.....  
..... (Description of Goods and Services) hereinafter called "the order".

**AND WHEREAS** it has been stipulated by you in the said order that the Supplier shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with the Supplier's performance obligations in accordance with the order.

**AND WHEREAS** we have agreed to give the Supplier a Guarantee:

**THEREFORE WE** hereby affirm that we are Guarantors and responsible to you, on behalf of the Supplier, up to a total of.....  
..... (Amount of the Guarantee in Words and Figures) and we undertake to pay you, upon your first written demand declaring the Supplier to be in default under the order and without cavil or argument, any sum or sums within the limit of ..... (Amount of Guarantee) as aforesaid, without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

This guarantee is valid until the .....day of.....20.....

Signature and Seal of Guarantors

.....

Date.....20....

Address:.....

.....

All correspondence with reference to this guarantee shall be made at the following address: **National Institute of Technology Mizoram, Chaltlang, Aizawl, Mizoram, India: 796012**

**MANUFACTURERS' AUTHORIZATION FORM**

No.

Dated \_\_\_\_\_

**The Director  
National Institute of Technology  
Aizawl-796012, Mizoram**

Dear Sir:

We..... who are established and reputable manufacturers of .....having factories at-----  
(address of factory) do hereby certify that .....(Name of the Authorized Dealer)is our authorized dealer to quote against your tender enquiry no ..... **,Last Date of Submission is:**

No other Company other than .....  
(Name of the Authorized Dealer) is authorized to quote of our products against this Tender Enquiry No.....

Yours faithfully,

(Name)

(Name of manufacturers)

**TECHNICAL SPECIFICATION FOR APPLIED THERMODYNAMICS LABORATORY**

<b>SL NO</b> .	<b>TECHNICAL SPECIFICATION</b>		<b>QTY</b>
1.	<b>BOILER MODEL</b>	<b>Quantity</b>	<b>01 Set</b>
	Model Of Lancashire Boiler	1	
	Model Of Cornish Boiler	1	
	Model Of Babcock And Wilcox Boiler	1	
	Model Of Locomotive Boiler	1	
	Model Of Cochran Boiler	1	
	Vertical Water Tube Boiler	1	
	Model of Lamount Boiler	1	
	Model of Benson Boiler	1	
	Model of Loeffler Ler	1	
	Model of Valox Boiler	1	
	Model Of Marcet Boiler	1	
	Model Of Stirling Boiler	1	
	Model Of Nestlar Boiler	1	
2.	<b>SECTIONAL WORKING MODELS OF PETROL &amp; DIESEL ENGINE</b>	<b>Quantity</b>	<b>01 Set</b>
	Sectional Working Model Of 2 Stroke Petrol Engine	1	
	Sectional Working Model Of 4 Stroke Petrol Engine	1	
	Sectional Working Model Of 2 Stroke Diesel Engine	1	
	Sectional Working Model Of 4 Stroke Diesel Engine	1	

	Gas Turbines Or Turbojet Engine	1	
3.	<b>ACTUAL CUT SECTION WORKING MODELS OF SINGLE CYLINDER ENGINE - PETROL &amp; DIESEL</b>	<b>Quantity</b>	<b>01 Set</b>
	4 Stroke 1 Cylinder Diesel Engine - Manual Driven Actual Cut Section Model	1	
	2 Stroke 1 Cylinder Petrol Engine - Manual Driven Actual Cut Section Model	1	
	4 Stroke 1 Cylinder Petrol Engine - Manual Driven Actual Cut Section Model	1	
4.	<p><b>COMPUTERIZED VARIABLE COMPRESSION RATIO DIESEL ENGINE TEST RIG WITH EDDY CURRENT DYNAMOMETER AND MOTORING TEST FACILITY</b></p> <ol style="list-style-type: none"> <li>1. Type of Engine : Single cylinder, Four stroke Water Cooled Diesel Engine, Kirloskar make</li> <li>2. Type of Loading : -With Eddy Current Dynamometer <ol style="list-style-type: none"> <li>(i) <b>Air intake measuring system</b> : Air tank fitted with Air Flow Transmitter</li> <li>(ii) <b>Fuel measuring system</b>: Fuel measuring system consists of a fuel tank, Fuel Sensor.</li> <li>(iii) <b>Combustion Pressure Sensor</b> : Piezoelectric Sensor with low noise cable</li> <li>(iv) <b>Crank Angle Sensor</b> : Resolution 1° with TDC pulse, Kubler Germany make</li> <li>(v) <b>Torque Measurement</b>: Load Cell with Transmitter.</li> <li>(vi) <b>Temperature Sensor</b> : Temperature Sensors with Transmitters.</li> <li>(vii) <b>Water Flow Measurement</b> : By Rotameters for engine and calorimeter</li> <li>(viii) <b>Exhaust Gas Calorimeter</b> : Pipe in pipe type made of Stainless Steel, insulated with ceramic wool and aluminum cladding</li> <li>(ix) <b>Engine Interface</b> : Load Transmitter, Temperature Transmitter, Air Flow Transmitter, Fuel Flow Transmitter, Combustion Pressure Sensor, Crank Angle Sensor</li> <li>(xi) The whole equipment should be well designed and supported by a good quality painted rigid M.S. Structure</li> </ol> </li> <li>3. The equipment should consist of single cylinder, four stroke diesel engine connected to dynamometer for loading.</li> <li>4. It should be provided with necessary equipment and instruments for combustion pressure, and crank-angle measurements.</li> <li>5. These signals should be interfaced to computer for P-θ &amp; P-V diagrams.</li> <li>6. The equipment should also consist of air intake, fuel measuring unit, temperature measuring unit and exhaust gas calorimeter with temperature measurement system.</li> <li>7. An arrangement should be provided for changing the compression ratio of the engine by increasing the clearance volume of the engine.</li> <li>8. The equipment should enable study of engine performance for brake power, indicated power, frictional power, BMEP, IMEP, brake thermal efficiency, indicated thermal efficiency, Mechanical efficiency, volumetric efficiency, specific fuel consumption, A/F ratio and heat balance</li> <li>9. The educational software and data logging package should be there for this unit.</li> <li>10. It should provide a comprehensive educational software environment within which the investigations can be performed.</li> </ol>		<b>01 No.</b>

	<ol style="list-style-type: none"> <li>11. The software should run in latest Windows operating system. Interfacing the set up with computer using software should do the real time data acquisition.</li> <li>12. Data should be transferred in Excel Files for further calculations, plotting graphs, printing etc. Sample readings should be tabulated according to requirement of experiment under study and results obtained can be compared</li> <li>13. Special arrangement should be provided for motoring test with Motor (Kirloskar / Simens make), of compatible capacity to perform the test.</li> <li>14. The test rig should have the scope to vary the injection point of the Diesel engine.</li> <li>15. It should have the scope to determine Brake Power, fuel consumption and calculate specific fuel consumption, BMEP, Brake Thermal Efficiency at various loads.</li> <li>16. It should have the scope to determine Air Intake and calculate volumetric efficiency, A/F ratio</li> <li>17. It should have the scope to determine Indicated Power and calculate Friction Power, IMEP, Indicated Thermal Efficiency &amp; Mechanical Efficiency.</li> <li>18. It should have the scope to study of Engine Performance and study of pressure V/S crank angle (P-<math>\theta</math>) and pressure V/S volume (P-V), plot under various loads.</li> <li>19. PC with i3 processor, 2GB RAM with latest windows operating system and 17" LCD monitor along with laser printer and UPS.</li> </ol>	
5.	<p><b>COMPUTERISED VARIABLE COMPRESSION RATIO PETROL ENGINE TEST RIG WITH EDDY CURRENT DYNAMOMETER AND MOTORING TEST FACILITY</b></p> <ol style="list-style-type: none"> <li>1. Type of Engine should be Single cylinder, Four stroke Air Cooled Petrol Engine</li> <li>2. Type of Loading should be Eddy Current Dynamometer</li> <li>3. Air intake measuring system should be Air tank fitted with Air Flow Transmitter</li> <li>4. Fuel measuring system should consists of a fuel tank, Fuel Sensor.</li> <li>5. Combustion Pressure Sensor : Piezoelectric Sensor with low noise cable</li> <li>6. Crank Angle Sensor Resolution should be with 1 TDC pulse</li> <li>7. Torque Measurement should be Load Cell with Transmitter.</li> <li>8. Temperature Sensors should be with Transmitters.</li> <li>9. Water Flow Measurement : By Flow Sensor for engine and calorimeter</li> <li>10. Exhaust Gas Calorimeter should be Pipe in pipe type made of Stainless Steel, insulated with ceramic wool and aluminum cladding</li> <li>11. Engine Interface should be Load Transmitter, Temperature Transmitter, Air Flow Transmitter, Fuel Flow Transmitter, Combustion Pressure Sensor, Crank Angle Sensor</li> <li>12. Special arrangement should be provided for motoring test with Motor (Kirloskar / Simens make), of compatible capacity to perform the test.</li> <li>13. Valves (10 Nos.) will be provided along with setup as spare.</li> <li>14. Provision should be provided to change spark timing.</li> <li>15. The whole equipment should be well designed and supported by a good quality painted rigid M.S. Structure.</li> <li>16. The setup should consist of single cylinder, four stroke petrol engine connected to dynamometer for loading.</li> <li>17. It should be provided with necessary equipment and instruments for combustion pressure and crank-angle measurements.</li> <li>18. These signals should be interfaced to computer for P-<math>\theta</math> &amp; P-V diagrams.</li> <li>19. The equipment should also consist of air intake measuring unit, fuel measuring unit, temperature measuring unit and an exhaust gas calorimeter.</li> <li>20. The equipment should enable the study of engine performance for brake power,</li> </ol>	01 No.

	<p>indicated power, frictional power, BMEP, IMEP, brake thermal efficiency, indicated thermal efficiency, Mechanical efficiency, volumetric efficiency, specific fuel consumption, A/F ratio and heat balance.</p> <ol style="list-style-type: none"> <li>21. Rotameters should be provided for cooling water and calorimeter water flow measurement.</li> <li>22. The educational software and data logging package should be there for this unit.</li> <li>23. It should provide a comprehensive educational software environment within which the investigations can be performed.</li> <li>24. The software should run with latest Windows operating system. Interfacing the set up with computer using software should do the real time data acquisition.</li> <li>25. Data should be transferred in Excel Files for further calculations, plotting graphs, printing etc.</li> <li>26. Sample readings should be tabulated according to requirement of experiment under study and results obtained can be compared</li> <li>27. The test rig should have the scope to vary the ignition point of the petrol engine</li> <li>28. It should have the scope to determine Brake Power, fuel consumption and calculate specific fuel consumption, BMEP, Brake Thermal Efficiency at various loads.</li> <li>29. It should have the scope to determine Air Intake and calculate volumetric efficiency, A/F ratio</li> <li>30. It should have the scope to determine Indicated Power and calculate Friction Power, IMEP, Indicated Thermal Efficiency &amp; Mechanical Efficiency.</li> <li>31. It should have the scope to study of Engine Performance and study of pressure V/S crank angle (P- <math>\theta</math>) and pressure V/S volume (P-V) plot under various loads.</li> <li>32. PC with latest windows operating system and 17" LCD monitor along with laser printer and UPS.</li> </ol>	
6.	<p><b>AUTOMATED CLEVELAND FIRE &amp; FLASH POINT APPARATUS</b></p> <ol style="list-style-type: none"> <li>1. All petroleum products with flash points should be above 79°C and below 400°C except fuels</li> <li>2. Automatic NCL 220 Cleveland flash tester should be used for determining fire and flash points by open cup method. The Cleveland method applies to the petroleum products whose flash point in open cup should be higher than 79°C, except fuel oils, which are generally tested with the closed cup method.</li> <li>3. The apparatus should be equipped with a brass crucible, a Pt 100 probe, electronic regulator and a manual scanner flame.</li> <li>4. The temperature slope should also automatically controlled through electronic regulation.</li> <li>5. The NCL 220 is delivered ready for use.</li> <li>6. For use on AC 230 V, 50 Hz - 0.3 A - External dimensions : 350x250x330 mm (<math>\pm</math>10 kg)</li> <li>7. It should be able to determine the flash point and fire point of all petroleum products having a flash point between 79°C and 400°C</li> </ol>	01 No.
7.	<p><b>PLAIN OXYGEN BOMB CALORIMETER WITH OXYGEN BOMB AND DIGITAL THERMOMETER</b></p> <ol style="list-style-type: none"> <li>1. Operator Time per test should be 25 min</li> <li>2. Repeatability (%RSD) should be 0.20</li> <li>3. Calorimeter Type should be Static</li> <li>4. Bomb Type should be Removable Bomb and Bucket</li> <li>5. Calorific value should be up to 12000 calories</li> </ol>	01 No.

	<ol style="list-style-type: none"> <li>6. Bucket Filling would be manual</li> <li>7. Oxygen Filling: would be manual</li> <li>8. Bomb Washing would be manual</li> <li>9. Temperature Resolution should be 0.002°C</li> <li>10. Bomb Calorimeter consists of: <ol style="list-style-type: none"> <li>(i) Plain Oxygen vessel Calorimeter</li> <li>(ii) Oxygen combustion vessel</li> <li>(iii) Ignition unit</li> <li>(iv) Digital Thermometer</li> <li>(v) Oxygen Filling connection,</li> <li>(vi) Fuse wire for 500 tests</li> <li>(vii) Support stand for the bomb head and calorimeter cover</li> <li>(viii) Benzoic acid pellets (pk/100)</li> <li>(ix) Operating instructions manual.</li> </ol> </li> <li>11. Accessories should include with the instrument <ol style="list-style-type: none"> <li>(i) Valve Knob</li> <li>(ii) O – Ring NBR 2-3/8ID X 18CS pk/12</li> <li>(iii) O – Ring NBR 3/16ID X 1/16CS pk/12</li> <li>(iv) iv) O – Ring NBR 7/16ID X 1/16CS pk/12</li> </ol> </li> </ol>	
8.	<p><b>EXHAUST GAS ANALYSER / COMBUSTION GAS ANALYSER</b></p> <p><b>TECHNICAL DETAILS:</b></p> <ol style="list-style-type: none"> <li>1. Gases to be measured : CO, O<sub>2</sub>, CO<sub>2</sub>, SO<sub>2</sub>, NO, NO<sub>2</sub>, C<sub>x</sub>H<sub>y</sub>, and combustion efficiency</li> <li>2. Sensors should be Electro-chemical Sensors and CO<sub>2</sub> NDIR</li> <li>3. Gas Flow should be 1 to 2.5 litre /min</li> <li>4. Temperature Measurable should be upto 500 °C or better</li> <li>5. Operating Temperature should be 0-50 °C</li> <li>6. Power Supply Operated with Built in rechargeable battery or Main 230 V ±10 VAC, 50 Hz ±3%</li> <li>7. Flue Gas Probe : Stainless Steel Shaft with rubber handle</li> <li>8. Pre Programming should be For Natural Gas, light Oil, heavy Oil, LPGs, Propane, Butane, Coke, Coal etc.</li> <li>9. Weight should be Light Weight / Portable</li> <li>10. Calculation of flue gas dew point. should be 0 to 99°C td</li> <li>11. Max. humidity load should be +70 °C dew point temperature at a measurement input of analyzer gas.</li> <li>12. Max Dust Load should be 20g/m<sup>3</sup> dust in a flue gas</li> <li>13. Pump Flow should be -300mbar to +50mbar</li> <li>14. Dilution should be Automatic measurement range extension through auto Dilution of all Sensors, factor 5.</li> <li>15. Gas measuring unit should be ppm or mg/m<sup>3</sup> or %</li> <li>16. External cooling loop facility.</li> <li>17. Thermally separated sensor chamber</li> <li>18. Easy Emission software for data read out easily edit, filed and managed</li> <li>19. Optional fresh air valve for long term measurement, incl. measuring range extension with dilution factor 5 for all sensors.</li> <li>20. Option peltier gas preparation incl. peristaltic pump for automatic condensate evacuation.</li> <li>21. For any one sensor, measuring range extension for individual slot with the</li> </ol>	01 No.



	<p>following selectable dilution factors: 0, 2, 5, 10, 20, 40</p> <ul style="list-style-type: none"><li><b>22.</b> Easy replacement of cells/sensors without tools, within seconds.</li><li><b>23.</b> Advanced instrument diagnosis function for gas path check, sensor check and error diagnosis</li><li><b>24.</b> Fresh air rinsing / zeroing system is available.</li><li><b>25.</b> The system analyzer has an integrated moisture removal system to ensure that gas should be completely dry before entering the analyzer.</li><li><b>26.</b> Memory of the analyzer should be of 2, 50,000 readings.</li><li><b>27.</b> Large color graphic display with application-specific menu and the display unit should be integrated within the analyzer.</li><li><b>28.</b> The instrument should calculate Efficiency, flue Gas Loss &amp; Excess Air</li></ul>	
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