### 1.0 Overall System configuration and general guidelines to be followed by the supplier:

#### 1.1 General Concept:

The system shall be designed to give a look of **tabletop thermal vacuum Chamber** with vacuum system mounted below the table. Standard Heating/ Refrigerating circulator shall be used for temperature cycling of thermal plate kept inside the Chamber. In-let and out-let pipes for thermal plate shall enter the Chamber through leak proof feed through. The circulation bath shall have Integrated programmer with real time clock to load, save and execute the temperature cycling. All the necessary system safely interlocks shall be the standard features of the circulator. Circulator shall be located adjacent to the Chamber and flexible lines with good thermal insulation shall be used to connect the bath with thermal plate. No complex electrical circuitry or computer is envisaged for system operation. Supplier shall design the system using standard components/ equipments. All the components shall provide silent operation with highest reliability. Bottom of the Chamber shall be at a convenient height from floor level to facilitate easy loading/ unloadin of test package in / from the Chamber. Supplier shall design the system most optimally to meet our requirement. Over sizing of components and equipments shall be avoided. Electrical consumption and dependence on other consumables shall be kept to the bare minimum essential.

Tentative drawings / schematics of Thermal Vacuum System are shown in Annexure–1 and Annexure–2. These schematics and dimensions are tentative and for conceptualization of system only.

#### 1.2 Chamber and Vacuum system:

Supplier shall use 304L for all parts of Chamber, vacuum piping, feedthroughs, clamps, hinges etc. attached to Chamber. Supplier shall ensure leak tightness of better than 1.0E-9 mbar L/sec (He) for all joints of Chamber, Vacuum system and thermal plates with its piping inside the Chamber. Supplier shall use only standard flanges for Chamber ports to ensure interchangeability and easy replacement. Supplier shall use seamless pipes especially inside the Chamber. Supplier shall avoid usage of flexible bellows etc. inside the Chamber unless it is most essential. If flexible bellows are must to be used inside the Chamber, it shall be of the best quality and reputed brand only. Vacuum system shall be mounted below the Chamber or adjacent to the Chamber with all built in vacuum gauging, interlocks and shall be chosen preferably from standard pumping station models available from reputed vendors. Vacuum system shall be interfaced to Chamber through gate valve of reputed make only. Gate valve shall be able to operate with one side Atm. Pressure and other side High vacuum and vice versa. All the valves shall be preferably electrically / Electro pneumatically operated. The working chamber baseplate height shall not exceed 1200mm from floor level.

Each chamber shall be supplied with **TWO** identical chain of vacuum systems shown in Annexure–3. Vacuum performance to be demonstrated with only one chain for acceptance purpose.

#### 1.3 Thermal System:

Heating/ Refrigerating circulating bath shall be chosen from the standard vendor supplying similar units for different applications. Heating and cooling of thermal plate is envisaged by this bath. Temperature cycling on the thermal plate kept inside the Chamber shall be executed by the circulating bath having integrated programmer to execute the profile with all safety interlocks and alarms. Thermal plate shall be fabricated from Aluminum / Copper material. This plate shall be manufactured to remain leak proof after several thermal cycling at high and low temperatures during its usage under high vacuum. Supplier shall explore the possibility to use the plate available from the different suppliers like Lytron, Tranter etc.

**Note:** There shall be one more additional redundant thermal bath of identical capacity which can be connected to the primary bath for one of the chamber. Vendor shall carry out the mounting arrangement with valves accordingly. For the second chamber, vendor shall keep the provisions for connecting this spare unit. (Total **THREE** identical bath shall be supplied.)

### 2.0 Chamber with doors:

#### 2.1 Type/Shape:

Similar to standard Box Coater type. Rectangular shape with two side doors opening.

#### 2.2 Size:

Overall size 750mm(W) x 720mm(D) x 500mm(H). This is indicative
values. Vendor is expected to optimize the overall size of the chamber without compromising on clear working space required.

2.3 Clear working space: Supplier shall ensure clear working space of not less than 550mm(L) X 520mm(W) X 400mm(H) above the top plate.

In case supplier needs to increase the overall size of the Chamber due to constraints posed by other system design aspects, supplier shall do so and take this change into account for design of other associated systems like Vacuum and Thermal too. Supplier shall clearly specify the Chamber size offered to meet this requirement of clear working space considering all other system design aspects.

**Note:** Supplier shall clearly mention the clear working space proposed to be made available w.r.t. their system design.

2.4 Material of construction: SS-304L: Supplier shall clearly specify the material offered and how the quality of the material and welding is planned to be ensured. All the parts welded to the chamber shall be of SS304L only.

2.5 Doors: Two Hinged door at both sides (having 750mm x 500mm size) with quick locking system. Door shall be openable by 90 degree and shall have provision to lock the door in opened position by means of mechanical stopper to restrict movement during loading / unloading of DUT to ensure safety of operator. Provision shall be made to clamp the door with chamber operated suitable number of quick clamps.

One 150NB view port shall be provided at the center of each door. View window shall be made out of highly finished Borosilicate/ Corning 7056/ Kodial glass sourced from highly reputed vendor only.

2.6 Ports on the Chamber: Following ports shall be provided on chamber which are exclusively for users apart from ports required for system.

<table>
<thead>
<tr>
<th>Port size and type</th>
<th>Quantity</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 100 ISO-K</td>
<td>6 Nos</td>
<td>Exact location of the above ports shall be finalized during detailed engineering.</td>
</tr>
<tr>
<td>DN 50 ISO - KF</td>
<td>4 Nos.</td>
<td></td>
</tr>
<tr>
<td>DN 25 ISO - KF</td>
<td>4 Nos.</td>
<td></td>
</tr>
<tr>
<td>DN 40 ISO - CF</td>
<td>1 No.</td>
<td></td>
</tr>
<tr>
<td>DN 150 ISO-K</td>
<td>2Nos</td>
<td>view ports shall be provided at the center of each door as described in point 2.5 above.</td>
</tr>
</tbody>
</table>

Ports required for Vacuum system, Thermal system & Feedthroughs for temperature sensors may be considered suitably by the vendor in addition to above specified ports.

2.7 Chamber finish External and Internal:

Chamber External PU / Epoxy painted of approved shade / electro polished.

Chamber Internal bright polished mirror finish / Electro- polished.

All port flanges bright polished and fitted with reputed SS hard wares. All surfaces in contact with Viton “O” rings shall be grounded to provide surface finish better than 1.6 micron.

2.8 Supporting structure:

Chamber shall be mounted on a table type structure with vacuum system mounted below the table. Structure shall be made by good quality structural steel having adequate capacity and shall be painted with good quality epoxy paint.

Four castor wheels of adequate capacity shall be provided below the structure for easy movement of the system. Out of four castors, two shall be of lockable swivel type and two shall be fixed type.

3.0 Package Details:

3.1 Package size: Two Packages having size of 465mm x 225mm x 250 mm(H) each shall be mounted on the thermal plate inside the Chamber during testing. Package plate size shall be 550mm(L) x 520mm(W) x 6mm(thk).
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2</td>
<td><strong>Package Weight:</strong> Total weight of the package is estimated to be 45 Kg (Aluminum alloy 6061)**.</td>
</tr>
<tr>
<td>3.3</td>
<td><strong>Package Heat dissipation:</strong> Total heat dissipation from the test package to be handled by thermal plate shall not be less than 150 Watts while –20 Deg. C on the base plate. (Package weight as mentioned in point 3.2 shall also be considered.)</td>
</tr>
<tr>
<td>3.4</td>
<td><strong>Package Material:</strong> Aluminum alloy 6061 may be considered for estimating cooling load and thermal heat calculation purpose etc.</td>
</tr>
<tr>
<td>4.0</td>
<td><strong>Vacuum System:</strong> <strong>FULLY AIR COOLED ONLY</strong></td>
</tr>
</tbody>
</table>
| 4.1     | **TMP based High Vacuum System:** Vacuum system shall consist of a standard fully air cooled high vacuum pumping unit with Turbo molecular pump, Dry backing pump and vacuum monitoring unit with required gauge heads. Two compact Pirani – Hot cathode gauge heads shall be mounted on the Chamber to monitor the Chamber vacuum. As shown in Annexure–3, Vacuum gauges G2, G3, G4, G5 shall be combined Pirani – Hot cathode gauge and identical. Vacuum gauges G1, G6, shall be Pirani gauge and identical. Supplier shall consider this in selection of vacuum monitoring unit.  
- Turbo-molecular pumping system shall be sized by the vendor to pump Chamber considering out-gassing from all the test hard wares like package, electrical wires, feedthroughs, temperature sensors, etc. at their respective temperatures. Packages may please be assumed as thermal black painted for estimating outgassing load and sizing vacuum system. 
- Pumping system shall be able to pump the Chamber from Atmospheric pressure through turbo pump. 
- Total pumping system shall pump the Chamber from Atmospheric pressure to attain less than 5.0E(-6) mbar in not more than 150 min with all hardware inside the Chamber at Ambient temperature and shall also be capable to attain and maintain less than 5.0E(-6) mbar within 150 min after attaining +80 Deg. C on thermal plate with all hard wares at respective temperatures, with test packages and package plate [550mm(L) x 520mm(W) x 6mm] duly mounted on the thermal plate inside the Chamber. i.e. in hot mode. Heating mode shall be activated soon after achieving vacuum level of 1.0E (-5) mbar inside the Chamber. 
- All the valves used shall be Electrically / electro pneumatically operated. Valve shall close immediately on power off. In case of electro pneumatically operated valves, supplier shall provide dedicated compressor of adequate capacity as a part of system in each unit. 
- Turbo molecular pump shall be interfaced to Chamber through gate valve of reputed make only. Gate valve shall be able to operate with one side Atm pressure and other side High vacuum and vice versa. 
- Supplier shall specify the no of cycles for which each type of valve can be operated prior to failure (MTBF valves in terms of number of cycles guaranteed by the manufacture) |
| 4.2     | **Redundant pumping system** One Identical high vacuum pumping system interfaced with chamber through high vacuum valve shall be provided as a hot redundancy and piping with required valves shall be provided in such a way that in case of any failure in one high vacuum pumping system or after prolonged operation, second chain can be operated immediately for evacuation of chamber. i.e. Each chamber shall have two identical TMP based high vacuum pumping chains. **However, vacuum performance as described in point 4.1 to be guaranteed by operating one chain only.** |
| 4.3     | **Residual Gas Analyzer (RGA)** One Residual Gas Analyzer (RGA) shall be provided on each chamber, with high vacuum isolation valves, for molecular
contamination monitoring and analysis and shall have following features.

a. Quadruple analyzer: Faraday type
b. Mass range 1-200 amu,
c. Detection limit: 2.0E(-11) mbar or better
d. Dual filament: Tungsten/ thoria coated iridium / yitria coated iridium (Y2O3/Ir)
e. Operating pressure maximum: 1x10E-4 mbar
f. Resolution better 0.5amu at 10% peak height
g. Control unit module with smart electronics shall have all required electronics attached to analyser head having indications for Filament-1, Filament-2, and Power, Communication etc. with all power and communication interface accessories.
h. It shall have independent total pressure gauge and filament trip box assembly for interlock protection of RGA.
i. User friendly Software compatible to latest version of Windows-OS and having feature for recording and presenting both measurement data as well as parameter records, including standard libraries and analysis tools. & allow the user to monitor partial pressures of gases in various modes e.g. trend graph, analog graph, leak mode, bar graph, 3D etc.
j. Dedicated PC shall be provided for RGA operation. Latest PC with Pentium processor with highest specification pre-configured for operation, data acquisition and storage with all suited software installed and ready for use shall be supplied. Supplier shall furnish the details of computer and accessories in their quote.

4.4 Chamber Venting: Through 5 micron filter in a reasonable time but not more than 30 min. Supplier shall also provide parallel arrangement with needed fittings etc. to fill the Chamber with Nitrogen gas bottle.

4.5 O rings and seals: Viton / OFHC Copper gaskets as required by the system design.

4.6 Leak tightness: Supplier shall ensure better than 1.0E-9 mbar L/sec leak tightness for all welded joints of the Chamber, Vacuum system, thermal plate and its piping inside the Chamber. Leak tightness of all O-ring joints shall be better than 5.0E-9 mbar L/sec. Supplier shall clearly specify the level of leak tightness offered and the method of measurement proposed.

5.0 Thermal System: FULLY AIR COOLED

5.1 Heating / Cooling System: Standard air-cooled heating / Refrigerating circulating bath shall be chosen from the reputed vendors who are supplying similar units. Heating and cooling of thermal plate is envisaged by this thermal bath. The bath shall have Integrated programmer to load, save and execute the thermal profile. There shall be provision to store 6 thermal cycles each having 60 steps. The bath shall have standard features like – LCD dialog display for convenient interactive operation, key pad for set points and menu functions, self-optimizing temperature control, PT-100 external sensor and it’s connection for measurement and control, required safety interlocks and alarm system for smooth operation, High temperature cut-off, Rs.232/485 / Ethernet interface for on line communication, active and proportional cooling control, pump of adequate capacity to circulate fluid etc. The bath shall have adequate Heating / cooling capacity to achieve and maintain different temperatures in specified time as mentioned in point 5.3 Supplier shall size the thermal bath considering appropriate heat load, heat transfer efficiency and heat load generated by circulating pumps of thermal bath and accordingly select the bath from standard manufacture with proven heritage like- Julabo, Lytron, Thermo scientific, Hubber and Lauda.
<table>
<thead>
<tr>
<th>Section</th>
<th>Specification</th>
</tr>
</thead>
</table>
| **5.2** Thermal Base plate: | a) Thermal plate shall be a rectangular plate of about **600mm X 570mm size** mounted at the bottom most elevation inside the Chamber. Material of the same shall be Aluminum / Copper duly anodized on external surfaces to give protection against oxidation. This plate shall have cavities / grooves / serration’s or flow paths to allow thermal fluid to flow. Supplier shall use the state of the art techniques available to achieve best thermal efficiency. Supplier shall include required in / out feedthroughs at the Chamber interface and about 2m flexible lines with good thermal insulation to connect thermal bath with thermal plate. Supplier shall provide adequate no’s tapped holes with helicoils of reputed make for mounting of packages. Exact location and details of these holes shall be finalized later. Supplier shall consider about 100 such holes for estimating work involved in each base plate.  
 b) Homogeneity of temperature on this plate shall be ensured within 5 Deg. C between any two points on this plate throughout its operating range of temperature. Supplier shall control emmissivity of different components e.g. Chamber inner surface, thermal plates, piping etc. to achieve required heat exchange between different surfaces to meet functional aspects of the system.  
 c) Supplier shall also provide required sensor for control of temperature on this plate plus one redundant sensor. Temperature control and homogeneity of temperature on this plate shall be verified. This plate shall also have 24 nos. **PT100 (Class A, 4 wire) sensors (RTD)** fixed on it to monitor the plate temperatures. Exact mounting location for these RTD shall be finalized mutually as a part of acceptance test philosophy. RTD shall be of reputed brand and shall have rugged beads with Teflon extension wires of about 1.5 m to reach the electrical feedthroughs on the chamber.  
 d) Supplier shall provide display of these 24 temperature channels through dedicated paperless data recorder available in the market. |
| **5.3** Temperature pull up / pull down rate on the top plate: | ➢ -20 Deg C to +80 Deg C in 180 min with package heat load assisting the pull up mode.  
 ➢ +80 Deg C to –20 Deg C in 180 min with package heat load in action against pull down mode.  
 ➢ -50 Deg C shall be demonstrated by supplier on thermal plate without any package heat dissipation in reasonable time. Package heat dissipation of all the packages shall be switched off. (Package weight as mentioned in point 3.2 shall be considered for this mode.) |
| **5.4** Temperature control required on Thermal plate: | ➢ Between –50 Deg C to –20 Deg. C, temperature on this plate shall have to be controlled within 2 Deg C(+/−1 deg) of set temperature with out any package heat load and the control of temperature shall have to be demonstrated on this plate.  
 ➢ Between –20 Deg C to +80 Deg C temperature on this plate shall have to be controlled within 2 Deg C(+/−1 deg) of set temperature with package heat load in active mode and the control of temperature shall have to be demonstrated on this plate with this condition. |
| **6.0** Electrical, Instrumentation and data acquisition: |  
 | **6.1** Configuration: | As most of the equipments of vacuum & thermal system to be selected as standard module, no complex electrical panel is |
Supplier shall give power to vacuum system and thermal system from the power panel by using standard plug socket. As far as possible, all the equipments shall have requirement of single-phase 230V/50Hz power requirement. System shall be configured with all proven electrical switchgears, hard wares and with electrical standards. Supplier shall include all the required electrical safety protections for all equipment as applicable like MCB, ELCB, fuses, single phase preventor, reverse phasing preventor etc.

All the temperature sensors used in this system shall have temperature measurement accuracy of +/- 0.7 K considering operational temperature range, total measurement chain including sensor, cables, feedthroughs and measuring instrument. Supplier shall specify the make and type of temperature sensors offered in this system.

Temperature control on thermal plate is envisaged by PT-100 of thermal bath and operation of thermal bath to achieve and maintain the temperature as per the preloaded thermal cycle as well as execution of thermal cycle shall be done by Integrated programmer/controller provided in thermal bath.

Supplier shall provide 24 nos. PT100 (Class A, 4 wire) RTD temperature sensors to monitor top plate temperature. These sensors shall have rugged beads with Teflon extension wires of about 1.5m to reach the electrical feedthroughs on the chamber. Foil type RTD may also be considered by supplier. Supplier shall provide display and data logging of these 24 temperature channels through standard paperless data recorder available in the market.

6.2 Data acquisition and recording system:

Supplier shall provide a standard paperless data recorder having suitable number of universal type of channels and essential accessories like digital input/Out card, analog input card, CF card etc. In addition to temperature logging, chamber vacuum shall also be displayed and recorded in one of the channel.

The data recorder shall have features like TFT LCD display with required no. of universal type of channels, standard adequate memory to store the test data, additional 128MB memory card, various display formats in alphanumeric and graphical form, RS 232 / RS 485 / Ethernet interface, infrared detector for protection of monitor's life etc. Supplier shall select the best suited recorder from the vendors having proven heritage.

6.3 Operation Modes:

Semi automatic as well as manual mode of operation. Supplier shall consider execution of repeated thermal cycling of the package through profile mode of operation executed through internal programmer/controller of thermal bath.

6.4 Vacuum Feedthroughs:

Supplier shall include High Vacuum compatible electrical signal feedthroughs on the chamber for temperature sensors. These feedthroughs must be leak tight to meet the leak rate requirement of less than 1.0E-9 mbar l/sec (He). Supplier shall work out adequate quantity of feedthroughs required and include in the offer. Supplier shall specify the total no and size of feedthroughs included in the offer.

6.5 Safety protections:

System design shall provide adequate safety interlocks and protections to ensure Test package safety, System safety as well as Personnel safety during operation and storage of the system. As a part of safety and maintenance supplier shall include essential signs, marks, write-up etc.

6.6 UPS with 1 hour battery backup

Vendor should evaluate the entire load of the total system and decide the capacity of the UPS. The vendor shall add 25% additional capacity of total load and finalize the UPS. It shall also be capable of run the inductive load. UPS shall have proper isolation transformer and it shall be online.
<table>
<thead>
<tr>
<th>7.0</th>
<th>General Terms and Conditions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>Quantity</td>
</tr>
<tr>
<td>7.2</td>
<td>Preliminary Design of the system offered:</td>
</tr>
<tr>
<td>7.3</td>
<td>Calibration certificates:</td>
</tr>
<tr>
<td>7.4</td>
<td>Size of the System and total Space required:</td>
</tr>
</tbody>
</table>
| 7.5 | Electrical Power and other utilities required: | ![ ]Supplier shall clearly specify the estimated connected power as well as estimated peak power consumption of the system offered considering different operation mode described above.  
**The system expected shall be fully air cooled type requiring no other utilities.** |
| 7.6 | Supplier shall clearly specify: | List, Quantity and brand of major equipments and hard wares like Dry pump, Turbo Molecular pump and its control units, Vacuum Valves, Heating / Refrigeration bath, data recorder, Temperature sensors, flexible hoses, electrical hard ware, any other equipment / major hard wares offered and included in the commercial offer. Supplier shall source the major equipment / hardware from the preferred vendor as follows:  
- **Vacuum pumps:** Pfeiffer, Varian, Alcatel, Edwards, Oerlikon Leybold, Adixen, Agilent.  
- **Vacuum valves:** VAT, Pfeiffer, MKS, MDC, GNB, Vacuum research  
- **Vacuum gauges:** Pfeiffer, Leybold, Agilent, MKS, Granville Phillips.  
- **Residual Gas Analyzer (RGA):** MKS, Hiden, Pfeiffer Analytical Ltd, Horiba  
- **Thermal bath:** Julabo, Lytron, Thermo scientific, Hubber, Lauda.  
- **Thermal plates:** Lytron, Tranter, R- theta etc.  
- **Paperless data recorder:** Brain child, HTA, ASTRO-MED, ABB, Eurotherm, Honeywell, Yokogawa, Omega, Onetemp, Redlion  
- **Electrical feedthroughs:** Plug-in, Positronics, Cermaseal, KJL, Glenair, ITT Cannon, Amphenol, Accuglass, in2connect, mdcvacuum, ceramtec, Sri Hermetics, rhseals, VACOM  
- **Switch gear items, Protection relays Contactors:** Siemens, Allen Bradley, L&T, Schneider, Cutler Hammer, Telemecanique, ABB.  
- **Temperature sensors (PT100)**-Omega, Febrica, Minco, Technofab.  
- **Online UPS:** Delta, Libert, APC |
| 7.7 | Vendor’s experience and eligibility criteria | a) It is essential that supplier possess the adequate experience in executing custom designed high vacuum chambers. Supplier must mention such experience clearly in their offer.  
b) Supplier should have executed at least one such project having 1m diameter (or rectangular shape) thermal vacuum chamber with operational vacuum level of 1.0E(-5) mbar or better in last five years. Supplier shall furnish previous references where similar systems had been fabricated and supplied by him in past with details like contact person, |
address, PO value and brief specification achieved at the time of system acceptance by the customer.
c) Average annual financial turnover of vendor during the last five years should be at least 1 crore (10million INR). Bidder shall enclose audited balance sheet of last 3 years along with their offers.

| 7.8 | Quality control Plan: | Supplier shall furnish their standard QC plan used during execution of similar systems. |
| 7.9 | Demonstration of specifications, Acceptance test and Transportation: | Supplier shall assembl the total system at his premises and demonstrate all the specifications to the purchaser prior to dispatch. Supplier shall disassemble the system and transport safely. Suppliers shall organize for required loading/unloading shifting of all system components to the place of installation of this system. Supplier shall assemble and integrate the system at new Bopal campus, SAC. Supplier shall again restore system specifications demonstrated prior to dispatch and demonstrate the same to purchaser as per mutually agreed acceptance test plan. Acceptance test plan shall be generated by supplier during the course of execution in consultation with the purchaser. |
| 7.10 | Training to operators of the purchaser: | Supplier shall provide a thorough on job training to at least 10 operation personnel for a period of 7 days at purchaser’s site prior to system acceptance. |
| 7.11 | Guarantee Period: | Supplier shall guarantee the failure free operation of the system for a period of not less than 24 months from the date of acceptance of the system at purchaser’s site. This is mandatory requirement and must be complied in the offer. |
| 7.12 | Compliance and Deviation Table: | ➢ Supplier shall furnish detailed compliance table w.r.t. all the specifications described above.  
➢ Supplier shall furnish detailed deviation list, if any w.r.t. above specification. Please give detailed justification for proposed deviation. |

| 8.0 | Checklist for No. of documents to be enclosed in the offer: |
| 8.1 | Technical bid: | Supplier shall furnish following details / documents in their technical bid:  
➢ Detailed description of the system offered w.r.t. each of the above specification.  
➢ Detailed list of scope of supply included in the offer.  
➢ List of major items as specified at 7.6 above along with make and model number.  
➢ Catalogs, leaflets, brochures, application notes etc. for all the major components and equipment’s proposed.  
➢ MTBF values of the components/equipments proposed.  
➢ Preliminary design calculation made to arrive at sizes of various equipments and components.  
➢ Compliance table with remarks.  
➢ Deviation table if any with remarks and detailed justification.  
➢ Un-priced commercial bid.  
➢ Any other details relevant to the requirement. |
| 8.2 | Commercial bid: | Supplier shall furnish following details / documents in their commercial bid:  
➢ Commercial bid with price  
➢ Price break up for Vacuum chamber with ports, door chamber opening mechanism etc.  
➢ TMP based vacuum system with vacuum valves, vacuum gauges and associated instrumentation.  
➢ Thermal system with Heating/Refrigeration circulating bath thermal plate and associated pipings.  
➢ Price break up for data acquisition system including temperature sensors and paperless data recorder.  
➢ Price break up for Miscellaneous items if any (Include all left out elements giving details) |
<table>
<thead>
<tr>
<th>Sr No</th>
<th>Price head</th>
<th>Quantity*</th>
<th>Price in INR*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic price for design, manufacture, testing and supply to SAC new Bopal campus, Installation and commissioning including standard warranty of 24 months from the date of final system acceptance at SAC and fully complying tender requirement.</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Packing and forwarding charge</td>
<td>LOT</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Installation and commission charges at site including all consumable like Gases, oil, grease, acceptance testing etc.</td>
<td>LOT</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Additional identical thermal bath with associated pipings, valves</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Subtotal of Sr No 1+2+3+4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>All taxes, duties and exemptions applicable and considered to be quoted separately. (Provide full details of applicable rates, exemptions and their validity etc.)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Spares and accessories as required to maintain the system after the expiry of warranty shall be quoted separately with list, quantity and per unit charges for each chamber. (This will not be taken in to account for price comparison)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Important Note:**

*: If price is quoted in other currency, please mention the currency and its exchange rate considered on the date of submission of this tender.

**: Vendor shall clearly state if Excise duty exemption is required to be provided by SAC, Ahmedabad. Vendor shall clearly specify all applicable taxes and duties against Sr.No.6 above.
ANNEXURE – 1

TENTATIVE DRAWINGS / SCHEMATICS OF THERMOVAC SYSTEM

(THese SCHEMATICS AND DIMENSIONS ARE TENTATIVE AND FOR CONCEPTUALIZATIN OF SYSTEM ONLY.)

[Diagram of THERMOVAC SYSTEM]
Note:
1) VACUUM GAUGE G1 & G6 SHALL BE PIRANI GAUGE.
2) VACUUM GAUGE G2 TO G5 SHALL BE COMBINED PIRANI - HOT CATHOD GAUGE

SCHEMATIC DIAGRAM FOR THERMAL VACUUM SYSTEM