INDIAN INSTITUTE OF TECHNOLOGY MADRAS
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V. Sathyanarayanan
Senior Manager (Project Purchase)

Ref: CIE/SMSH/007/2019
Date: 31.01.2019

Open Tender No: CIE/SMSH/007/2019

Due Date: 21st February 2019, 3pm

Pre-Bid meeting on 11th February 2019, 4 PM at the Department of Civil Engineering, IIT Madras.

Technical Bid opening meeting on 21st February 2019, 4:00 PM at Department of Civil Engineering, IIT-Madras.

Dear Sir/Madam,

On behalf of the Indian Institute of Technology Madras, offers are invited for the supply of **"Air Quality Analyzers"** conforming to the specifications given in Annexure I.

Vendor who can supply and integrate the above equipment alone need to respond to the tender please.

Instructions to the Bidder

I. **Preparation of Bids:** - The tenders should be submitted under two-bid system (i.e.) Technical bid and Financial bid.

II. **Delivery of the tender:** - The tender shall be sent to the addresses mentioned below, either by post or by courier so as to reach our office before the due date and time specified in our schedule.
The offer/bid can also be dropped in the tender box on or before the due date and time specified in the schedule.
The tender box is kept in the office of the:

Senior Manager,
Project Purchase,
IC & SR Building 2nd floor,
I.I.T. Madras,
Chennai – 600 036.

III. **Opening of the tender:** - The offer/bids will be opened by a committee duly constituted for this purpose. The technical bids will be opened first and will be examined by a technical committee which will decide the suitability of the bids as per our specifications and requirements. All bidders will be invited for opening of the technical bids. With respect to opening the financial bid, only technically qualified bidders will be called.

IV. **Prices:** - The price should be quoted in net per unit (after breakup) and must include all packing and delivery charges to the **Department of Civil Engineering.** The offer/bid should be exclusive of taxes and duties. The percentage of tax & duties should be clearly indicated separately. Kindly note that IIT Madras is eligible for concessional GST and relevant certificate will be issued.

In case of import supply, the price should be quoted without custom duty. IIT Madras is exempted from levy of IGST on Imports and eligible for concessional custom duty (not exceeding 5%) and the price should be quoted on EX-WORKS and CIP basis indicating the mode of shipment.

V. **Agency Commission**: - Agency commission, if any, will be paid to the Indian agents in rupees after receipt of the equipment and its satisfactory installation. Agency Commission will not be paid in foreign currency under any circumstances. The details should be explicitly shown in the tender document even in the case of 'Nil' commission. The tenderer should indicate the percentage of agency commission to be paid to the Indian agent. The foreign Principal should indicate the percentage of payment and it should be included in the basic price quoted originally (if any)..

VI. **Terms of Delivery**: - The item should be supplied to the **Department of Civil Engineering, IIT Madras** as per the Purchase Order. In case of import supply, the item should be delivered at the cost of the supplier to our Institution. The Installation/Commissioning should be completed as specified in our important conditions.

VII. **Technical Bid Opening:** The technical bid will be on 21st February 2019, 4:00 PM at the **Department of Civil Engineering, IIT-Madras.** The financial bids of those tenders who are technically qualified will be opened at a later date under intimation to them.

VIII. **IIT Madras** reserves the full right to accept / reject any tender at any stage without assigning any reason.

Yours sincerely,

V. Sathyanarayanan
Senior Manager (Project Purchase)
IC&SR Building, I.I.T. Madras,
Chennai – 600 036.

SCHEDULE

Important Conditions of the tender

1. The due date for the submission of the tender is **21.02.2019, 3 pm.**

   The offers / bids should be submitted in two bids systems (i.e.) Technical bid and financial bid. The Technical bid should consist of all technical details / specifications only. The Financial bid should indicate item-wise price for each item and it should contain all Commercial Terms and Conditions including Taxes, transportation, packing & forwarding, installation, guarantee, payment terms, pricing terms etc. The Technical bid and financial bid should be put in separate covers and sealed. Both the sealed covers should be put in a bigger cover. The Open Tender for supply of **"Air Quality Analyzers"** should be written on the left side of the Outer bigger cover and sealed.

2. **EMD: -** The **EMD in the form of account payee DD for 2% value of the item in favor of Registrar IIT Madras should be enclosed in the cover containing financial bid.** Any offer not accompanied with the EMD shall be rejected summarily as non-responsive.

   The EMD of the unsuccessful bidders shall be returned within 30 days of the end of the bid validity period. The same shall be forfeited, if the tenderers withdraw their offer after the opening during the bid validity period. The Institute shall not be liable for payment of any interest on EMD. EMD is exempted for Micro and Small Enterprises (MSE) as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME).

   When no local agent, the foreign vendor can submit demand draft equal to 2% or wire transfer the amount to our account as detailed in the attachment (Annexure II) and enclose the proof with the financial bid.

3. **Performance Security: -** The successful bidder should submit Performance Security for an amount of 5% of the value of the contract/supply. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt from the commercial bank, Bank Guarantee from any nationalized bank in India. **The performance security should be furnished within 21 days from the delivery of the purchase order.**

   Performance Security in the form of Bank Guarantee:- Incase the successful bidder wishes to submit Performance Security in the form of Bank Guarantee, the Bank Guarantee should be routed through the Beneficiary Bank to the end user bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee from a Nationalized Bank of India.
   The Bank Guarantee should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.

4. **Indian agent:** If an Indian agent is involved, the following documents must be enclosed:
   Foreign principal's proforma invoice indicating the commission payable to the Indian Agent and nature of after-sales service to be rendered by the Indian Agent.
   - ✓ Copy of the agency agreement with the foreign principal and the precise relationship between them and their mutual interest in the business.

5. The offer/bids should be sent only for a machine that is available in the market and supplied to a number of customers. A list of customers in India and abroad with details must accompany the quotations. Quotations for a prototype machine will not be accepted.

6. Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid.

7. Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal.

8. **Validity:** Validity of Quotation not less than 90 days from the due date of tender.

9. **Delivery Schedule**: - The tenderer should indicate clearly the time required for delivery of the item (subjected to the executive committee-IITMadras approval). In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.
   If there is delay, the penalty will be @1% per week of delay subject to a max of 10% of the value of purchase order and if the delay is more than accepted time frame by IITM, the PO would be cancelled and liquidated damages will be enforced.

10. **Risk Purchase Clause**:- In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.

11. **Payment**:-
    (i) No Advance payment will be made for Indigenous purchase. However 90% Payment against Delivery and 10% after installation are agreed to wherever the installation is involved. In case of import supplies the payment will be made only through 100% Letter of Credit i.e. (90% payment will be released against shipping documents and 10% after successful installation wherever the installation is being done).
    (ii) **Advance Payment:** No advance payment is generally admissible. In case of specific percentage of advance payment is required, the Foreign Vendor has to submit a Bank Guarantee equal to the amount of advance payment and it should be routed through the Beneficiary Bank to the end user Bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee through a Nationalized Bank of India.

12. **On-site Installation**: - The equipment or machinery has to be installed or commissioned by the successful bidder within 15 to 20 days from the date of receipt of the item at site of IIT Madras.

13. **Warranty/Guarantee**: - The offer should clearly specify the warranty or guarantee period for the machinery/equipment. Normally the warranty should be for four years from the date of commissioning of the equipment. Any extended warranty offered for the same has to be mentioned separately (For more details please refer our Technical Specifications).

14. **Late offer**: - The offers received after the due date and time will not be considered. The Institute shall not be responsible for the late receipt of Tender on account of Postal, Courier or any other delay.

15. **Acceptance and Rejection**: - I.I.T. Madras has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.

16. **Do not quote the optional items or additional items unless otherwise mentioned in the Tender documents / Specifications.**

17. **Disputes and Jurisdiction**:

Settlement of Disputes: Any dispute, controversy or claim arising out of or in connection with this PO including any question regarding its existence, validity, breach or termination, shall in the first instance be attempted to be resolved amicably by both the Parties. If attempts for such amicable resolution fails or no decision is reached within 30 days whichever is earlier, then such disputes shall be settled by arbitration in accordance with the Arbitration and Conciliation Act, 1996. Unless the Parties agree on a sole arbitrator, within 30 days from the receipt of a written request by one Party from the other Party to so agree, the arbitral panel shall comprise of three arbitrators. In that event, the supplier will nominate one arbitrator and the Project Coordinator of IITM shall nominate on arbitrator. The Dean IC&SR will nominate the Presiding Arbitrator of the arbitral tribunal. The arbitration proceeding shall be carried out in English language. The cost of arbitration and fees of the arbitrator(s) shall be shared equally by the Parties. The seat of arbitration shall be at IC&SR IIT Madras, Chennai.

a. **The Applicable Law:** This Purchase Order shall be construed, Interpreted and governed by the Laws of India, Court at Chennai shall have exclusive jurisdiction subject to the arbitration clause.
b. Any legal disputes arising out of any breach of contact pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.

20. All Amendments, time extension, clarifications etc., will be uploaded on the website only and will not be published in newspapers. Bidders should regularly visit the above website to keep themselves updated. No extension in the bid due date/ time shall be considered on account of delay in receipt of any document by mail.

Acknowledgement: - It is hereby acknowledged that the tenderer has gone through all the conditions mentioned above and agrees to abide by them.

SIGNATURE OF TENDERER
ALONG WITH SEAL OF THE
COMPANY WITH DATE

Annexure I

Indian Institute of Technology Madras (IITM) intends to install continuous ambient real time online air quality monitoring station (CAAQMS) at Jawaharlal Nehru Port Trust (JNPT), Navi Mumbai to measure Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_x), Ammonia (NH_3), Particulate Matter (PM_{10} and $PM_{2.5}$), Ozone (O_3), Carbon Monoxide (CO), Benzene, Toluene, Ethyl-Benzene, O,M,P-Xylenes(BTEX) notified under the National Ambient Air Quality Standards (NAAQS), Central Pollution Control Board (CPCB), New Delhi. The above system shall conform to the standards like FRM (USEPA), FEM (USEPA), TUV (EN) or equivalent.

SCOPE OF SERVICES

The Scope of Works under the package (air quality analysers and multipoint calibration) shall include:

A. The supply includes packing, transportation, insurance, custom clearance, port clearance and handling, inland transportation, inland transit insurance and delivery to Jawaharlal Nehru Port Turst (JNPT), IIT Madras-Environmental Laboratory, JNPT, Building No A85, Room No 5 & 6, Sector, JNPT Township, Uran, Navi Mumbai, Pin-400 707, installation, testing and commissioning of equipment and provision of training of IITM staff and students.

B. Warranty on the system required: The cost should include for two options: (i) 3 year warranty period from the date of complete installation and commissioning of the system and (ii) 2 years warranty with additional quote for one year extended warranty.

C. The instruments supplied should be Conforming to USEPA Automated Federal Equivalent Method (FEM), or equivalent method and approved by Central Pollution Control Board, Ministry of Environment Forests and Climate Change, Government of India.

D. Annual maintenance of the analysers for a period of three years (including the warranty period) from the date of commissioning of the station. Any parts / components, consumables etc. whatsoever needs replacement during the above mentioned period shall be provided and installed by vendor without extra cost.

E. Supplier has to mention the Span Drift per week & frequency of calibration required for all the analysers (PM_{10}, $PM_{2.5}$, SO_2, NOx, NH_3, O_3, CO, BTEX). All analysers shall undergo full calibration in every three months. Supplier has to calibrate the instrument and submit calibration report without any extra cost during the three years of operation and maintenance of Air Monitoring Station.

F. The original equipment manufacturer (OEM) should confirm in writing that the spares for the quoted model will be available for a period of ten years from the date of installation of the analysers.

G. It may be noted that mere quoting lowest rates will not entitle any firm to get the order. The quality of the item being offered, the past performance supply etc will also be taken in to consideration. Prior to award of purchase order the buyer can call any details, explanation, regarding technical & financial aspect.

MINIMUM TECHNICAL SPECIFICATIONS

The minimum technical specification requirements for the ambient air quality analysers to be installed are given in Technical Specifications of bid document. However, the actual technical proposal can have higher or better technical performance parameters and the minimum specifications proposed should not be taken as a constraint on the upper side. The technical specifications given in Technical Specifications of bid documents are descriptive and Selection Committee can consider technical proposals having similar specifications.

DATA MANAGEMENT AND QUALITY CHECKS

Data acquisition, transfer, storage and validation shall be according to US EPA standards and methodology followed by CPCB. All analyzers shall have current US EPA reference or equivalent method designation and shall be of the latest design.

Successful bidder shall submit a Standard Operating Procedure for the air quality monitoring station to the IIT Madras before award of the contract. The operating procedure shall be followed as per the recommendation of the manufacture as well as the filed condition of the customer. The Standard Operating Procedure shall contain the following:

A. Operating procedures for all analyzers and sensors
B. Calibration procedures and schedule
C. Maintenance procedures and schedule
D. Data validation procedures for each analyser
E. Data obtained from these calibration checks and copies of associated

TRAINING

The supplier shall provide the training to the students and staff of IIT Madras after installation of the analysers. Training should include but not limit to the following:

A. Inspection of the analysers.
B. Precautions in use of the analysers.
C. Basic measurement principle and operation of analyser..
D. Start-up and shutdown procedure of each analysers.
E. Calibration method.
F. QA/QC.
G. Data Validation & management and software application.
H. Safety precautions.
I. Basic maintenance procedure.
J. “Do’s” and “Don’ts” in operation of the analysers.
K. Others, which are deemed to be necessary by the Supplier.

	AMBIENT AIR QUALITY ANALYSERS
	General specification for all analysers
1	The analysers should operate at operating voltage 230 ± 10 volts AC and 50 Hz ± 3% frequency. The power supply input to be protected against spikes from and to the analyser by an LC filter. The power connection cable should be CEE type complete with 15 Amperes plug adaptable to Indian mains socket.
2	The display of the entire important status signal viz. Sample flow, temperature, concentration, range selection, manual / auto mode, zero / span mode and all error messages should be on front panel.
3	The analysers must function properly in Indian conditions without any defect between 0 – 50^{o} C ambient temperature, 10 – 95% relative humidity and in high ambient dust levels. The data capture rate should not be less than 90% of operational time.
4	The Manufacturer shall provide comprehensive hands-on training for operational & preventive maintenance to IIT Madras students and staff for 4-5 persons after installation of the analysers at JNPT.
5	The analysers should be complete with calibration system. The calibration system should be delivered along-with respective span gas cylinder and permeation tubes. The span gas concentration should be at measuring range. The analyser must have zero point internal calibration system and in agreement with minimum detection limit of each analyser. The calibration procedures are to be integrated into the software system for automatic calibration & remote calibration.
6	Instruments must be capable of both bench calibration and in field auditing.
7	Results should be automatically compensated /corrected to NTP (normalized temperature and pressure) with possibility for humidity and oxygen correction.
8	The system should have facility of remote control by use of modem, RS232 or LAN.
9	The analyser should have an integrated signal handling system for logging values from external sensors, with a capacity of 20 or more channels.
10	All ambient gas analysers shall be approved by the USEPA / TUV / MCERTS / EN. However, in case of BTX and Ammonia Analyser specifications as given will be considered. Method of measurement used shall also comply with the stipulation on National Ambient Air Quality Standards (NAAQS) 2009 (Details of Methods of Measurement is available at MoEF & CC and CPCB websites). All analysers shall be micro–processor controlled with automatic calibration using an external dilution calibrator and calibration standards. All analysers should be fully integrated in the rack cabinet, fully calibrated & tested before supply and ready for start–up at the respective sites. Analyser must exhibit performance equal to or better than values specified in the Calibration & test certificate provided with each analyser.
11	The manufacturer shall specify the cross sensitivity of measurement for all the analysers.
12	Each set of analysers shall be supplied with two copies of elaborate operation manuals comprising details as below: Part (I) should comprise installation, operational and troubleshooting details; Part (II) should have details about preventive, routine and corrective maintenance; Part (III) should comprise details of all electrical, electronic and pneumatic circuit diagrams, details of each spare parts, catalogue No. etc. and details of each electronic card / PCB's; Part (IV) Schematic diagram for possible repair & maintenance. Part (V) Standard Operating Procedure (SOP) for each analyser and Part (VI) List of equipments and other accessories along with contact details of supplier.

1. PM_{10} SUSPENDED PARTICULATE MATTER (SPM) ANALYSER	
Specifications	
Principle	ß -ray attenuation Continuous measurement of PM_{10} in ambient air
Particle Size Cut Off	0-10 Microns
Measuring Range	0 to 2000 µg/m^3 (Low Range is preferable with auto selection range)
Resolution	0.1 µg/m^3 or better
Minimum Detectable Limit	2 µg/m^3 or lesser
Detector	Silicon Semiconductor Beta Detector
Air Flow Rate	At least 1.5 m^3/hr (Adjustable to 1.0 m^3/hr)
Filter Material	Glass Fibre Filter Long Roll (30 mm x 30m)
Display	LED / LCD / Digital
Unit	µg/m^3
Sampling Head	Dynamic heated sampling heads for measurement of PM_{10} with adjustable temp. 20 °C –50°C
Result	Averaged data for Minimum 15 minutes, 30 minutes, 1 hour and more intervals
Calibration	Reference membrane facility should be provided for calibration of analyser
Compatibility	Analyser should be compatible with protocols of DAS system to be used in station.
Analog Output	3 Analog output; 0 – 1 V, 0 – 10 V, 2 – 20 mA / 4 – 20 mA
Digital Output	Multiple drop RS 232, USB port /TCP/IP, Ethernet

2. $PM_{2.5}$ SUSPENDED PARTICULATE MATTER (SPM) ANALYSER	
	Specifications
Principle:	ß-ray attenuation continuous measurement of $PM_{2.5}$ in ambient air
Particle Size Cut Off	0 - 2.5 Microns
Measuring Range	0 to 1000 µg/m^3 (Low Range is preferable with auto selection range)
Resolution	1% of concentrate
Minimum Detectable Limit	2 µg/m^3 or lesser
Detector	Silicon Semiconductor Beta Detector /Geiger Muller Detector (subject to US EPA approval)
Air Flow Rate	At least 16.7 lpm.
Filter Material	Glass Fiber Filter Long Roll (30 mm x 30 m)
Display	LED / LCD / Digital
Units	µg/m^3
Sampling Head	Suitable heated sampling heads for measurement of $PM_{2.5}$ with adjustable temp. 20–50 ºC
Linearity	±1% of full scale
Printer	Inbuilt and integrated with RS232
Measurement Result	Averaged data for Minimum 15 minutes, 30 minutes, 1 hour and more intervals
Calibration	Reference membrane facility should be provided for calibration of analyser
Compatibility	Analyser should be compatible with protocols of DAS system to be used in station.
Analog Output	0–1 V, 0–10 V, 2–20 mA / 4–20 mA
Digital Output	Multiple drop RS 232, USB port /TCP/IP, Ethernet

3. SULPHUR DIOXIDE (SO_2) ANALYSER	
Specifications	
Principle	UV Fluorescence
Measurement	Sulphur Dioxide in Ambient Air
Lower Detectable Limit	0.5 PPB
Ranges	Auto ranging 500 PPB (Low Range is preferable)
Display	Digital LCD/LED f. Noise Level : 0.20 PPB
Response time	60 seconds to 95% of concentration
Zero Drift	< 0.5 PPB /24 h with automatic zero compensation
Span Drift	< 0.5 PPB full scale in 24 h
Linearity	1% of full scale
Compatibility	Analyser should have internal Zero and accept external Zero and span calibration facility
Analog Output	0 – 1 V, 0 – 10 V, 2 – 20 mA / 4 – 20 mA
Digital Output	Multiple drop RS 232, USB port /TCP/IP ,Ethernet

4. OXIDES OF NITROGEN (NO-NO_2–NOx-) ANALYSER	
Specifications	
Principle	Chemiluminescence
Measurement	NO, NO_2, NOx in Ambient Air

Display	Digital /LCD/LED
Units	PPB, µg/m^3
Ranges	Auto ranging 0-2000 ppb (Low Range is preferable with auto selection range)
Minimum Detectable Limit	< 0.5 PPB
Noise Level	>0.2 PPB
Zero Drift	< 1 PPB / 24 h
Span Drift	<2% in 15 days of full scale
Response Time	30 seconds or earlier
Linearity	±1% of full scale
Flow rate	1–3 Litres/ minute
Additional features	Analyser should have internal Zero and accept external Zero and span calibration facility
Analog Output	0–1 V, 0–10 V, 2–20 mA / 4–20 mA
Digital Output	Multiple drop RS 232, USB port /TCP/IP, Ethernet
5. AMMONIA (NH_3) ANALYSER	
Specifications	
Principle	Chemiluminiscence NH_3 conversion to NO by oxidation. NO_2 also converted to NO. The difference obtained by measuring NO in output of two sample stream as equal to NH_3
Measurement	NH_3 in Ambient Air
Display Digital	LCD / LED
Ranges	Auto ranging 0-1000 PPB
Minimum Detectable Limit	1.0 PPB or better
Noise Level	0.2% of reading
Zero Drift	< 1 PPB/ 24 h
Span Drift	< 5 PPB /24 Hrs.
Response Time	If directly measures Ammonia 60 Seconds. If it is integrated with NOX analysers as ammonia converter then 180 seconds or earlier inclusive of start of NOx sampling
NH_3/NO converter	Quartz at approx 1000^oC
Analog Output	0 – 1 V, 0 – 10 V, 2 – 20 mA / 4 – 20 mA
Digital Output	Multiple drop RS 232, USB port /TCP/IP, Ethernet
6. OZONE (O_3) ANALYSER	
Specifications	
Principle	UV Photometric/absorption/ chemiluminescence
Measurement	Ozone in Ambient Air
Display	Digital
Ranges	Auto ranging 0-500 PPB(Low Range is preferable with auto selection range)
Minimum Detectable Limit	< 0.6 PPB

Noise Level	±0.3 PPB
Zero Drift	< 0.5 % per month
Span Drift	< 1% per month
Linearity	±1% of full scale
Response Time	<30 S to 95%
Additional features	Analyser should have internal zero and accept external zero and span calibration facility
Analog Output	0 – 1 V, 0 – 10 V, 2 – 20 mA / 4 – 20 mA
Digital Output	Multiple drop RS 232, USB port /TCP/IP, Ethernet
7. CARBON MONOXIDE (CO) ANALYSER	
Specifications	
Principle	Non Dispersive Infra-Red (NDIR) with Gas Filter Correlation
Measurement	Carbon monoxide in Ambient Air
Display	Digital
Ranges	At least four ranges Auto ranging 0-100 ppm (Low Range is preferable with auto selection range)
Minimum Detectable Limit	0.05 PPM
Zero Noise	0.02 PPM with time constant ± 30 seconds
Zero Drift	< 0.1 PPM for 24 h.
Span Drift	< 0.5% of full scale in 24 h.
Linearity	±1% of full scale
Response Time	30 Seconds or less
Compatibility	Analyser should have internal Zero and accept external Zero and span calibration facility
Analog Output	0–1 V, 0–10 V, 2–20 mA/ 4–20 mA
8. AMBIENT BTEX ANALYSER	
Specifications	
General	A complete analyser system comprising of sampling pump, transfer line, analyser, detector, calibrator, computer hardware and software for instrument control, data storage, display, acquisition, processing and for selective determination of volatile compounds in ambient air optimized for Benzene, Toluene, Ethyl Benzene and o,m, p –Xylenes. Continuous unattended measurement system of individual BTEX should work without external cryogenic cooling. System should have protocol compatible to communicate & transfer data to DIIM. Raw data storage capacity without erase minimum for three month or more. The system should be delivered with all necessary spares, consumables, tubing etc. for making it functional.
Technical specifications	A single stage membrane Pump to collect ambient sample automatically in an inbuilt adsorption trap. Subsequently, the sample will be dissolved and injected on wide bore capillary gas chromatographic separation. Sample volume controlled by thermal mass flow controller (dust protected). Sample flow range may be 20 -100 ml/min or more (adjustable). Sample volume should be between 400 ml –1litre or more of ambient air over a 10-15 min sampling cycle. All sample transfer tubing should be in stainless steel and

	flow & pressure sensor to be preferred with digital display.
Detector	Photo Ionization Detector (PID) or other equivalent detector as per EPA/EU/TUV/MCERT approved specifications, which do not require hydrogen or other gas to operate it. The system should have auto-clean & auto calibration facilities. PID Lamp eV should be 10.6eV. PID sensitivity sensor should be available to check sensitivity.
Principle	Based on gas Chromatographic separation and Photo Ionization Detector (PID)
Measurement	Benzene, Toluene, Ethyl-benzene, m.p-Xylene and 0-Xylene.
Display	Digital – LCD/LED
Ranges	0 –1000 µg/m^3 or better (0.3 – 270 ppb)
Minimum Detectable Limit	0.2 ppb (0.65µg/m^3) for 15 min cycle for Benzene (There should be no interferences on Methylcyclopentane, 2, 2, 3 - trimethylbutane, 2, 4 - dimethylpentane, Tetrachloromethane, Cyclohexane, 2, 3 - dimethylpentane, 2 - methylhexane, 3 - ethylpentane , Trichloroethylene, n - heptane, isooctane with BTX components).
Temperature Range	5 - 35^{o}C or more 0 - 100 PPB (0.32 – 325 µg/m^3)
Repeatability Retention Time	<0.1% RSD
Concentration	<1.0% RSD
Typical Cycle Time	Total Cycle Time should not exceed 15 min i.e. Sample Collection Time -15 min approx.; Analytical Time- 15 min approx..
Sample Volume	1 litre for 15 min cycle
Desorption tube	Carbotrap
Pre concentration	Carbopack Span Check Built in permeation bench with NIST certified Benzene& Toluene permeation tube.
Calibration	The Analyser should be capable to calibrate through Multi Calibration System also. Please see Multicalibration section And also calibration section in General Specifications
Analog Output	0 – 1 V, 0 – 10 V, 2 – 20 mA / 4 – 20 mA
Digital Output	Multi drop RS 232 port, USB port /TCP/IP, Ethernet

9. Multipoint Calibrator along with zero air generator for the application of Gases Calibration

	General Specifications
1.	The supplier has to supply the calibration gas cylinder (highly polished aluminum 10 liters water capacity), along with SS Regulator, traceable to NIST for each components (SO_2, NOx, CO, NH_3, Benzene & Toluene) along with SS regulator for the multipoint calibration. The synthetic air and N_2 cylinder (99.99% purity with certificate) should be in Carbon Steel cylinder of 47 Liters water capacity along with SS Regulator.
2.	The analysers shall be supplied with all ancillaries necessary for operation with pump (preferably in-built) and any other items such as charcoal scrubber, Teflon air sample intake filter, drier, Teflon tubing suitable for connection to air sampling manifold. All such items are to be itemized. Dust filter in all the analysers should be provided before

	solenoid valve to protect frequent chocking of solenoid valve.
3.	The connector systems for out-going signal for recording and the computer terminal should be on back panel with screw type connecting pins.

Zero air generator including:
1. Zero air (contaminant free) supplier.
2. Compressed air source (Portable).
3. Dryer (permeation).
4. Scrubber and air cleaner

Specifications	
General	Can be used as Manual and Remote multi point generation/dilution of Gas concentration from low to several level concentration of span gas cylinders. The multi gas calibration system should meet the USEPA/ automated Federal Reference Method (FRM) / Federal Equivalent Method (FEM), TUV/MCERTS/EN specifications.. Preference is to USEPA and in case it is not available, other approvals shall also be quoted
	Gas cylinders supplied along with dual regulator
Gas Input for dilution	02 Nos (100-125 kPa minimum)
Mass Flow Controller for Dilution	02 Nos (10 SLPM)
Dilution Ratio	minimum 10:1 to 2000:1
Gas Input for Source	04 Nos (100 KPa minimum)
Zero air flow	0-15 l/min
Mass Flow Controller for Source	02 Nos (50 SLPM)
Flow accuracy	1–2 %
Flow Repeatability and linearity	0.2–0.3 %
Operating Pressure	100–300 kPa
Range	0–20 ppm with 0.05–0.075 ppb precision with 0.2 ppb maximum noise
Output concentration	1–4500 ppb with 1% repeatability
Operating temperature	Room Temperature ^{o}C
Operating Voltage	100–240V 50/60 Hz Indian Standard

10. DATA LOGGER AND SOFTWARE FOR DATA ACQUISITION SYSTEM	
Specifications	
Data logger	Capable to connect 12 analog and 24 digital inputs.
	Ability to log channels at different intervals and should have capability of averaging and displaying real time data and averaged data over a period of 1 min, 10 min, ½ hr, 4 hrs, 8 hrs, 24 hrs, 1 month and year.
	Communication between data logger and computer using standard RS232 connector. Capable of connecting at least 10 stations. PC may also be used.
Data Acquisition System	**Data Acquisition System :** Latest software for data acquisition from the DAS and for statistical analysis and reporting of the monitored parameters
	The data Acquisition System (DAS) should be able to collect

	transmit via RS232 and store meteorological data and air quality data from all instruments.
	Support remote communication through radio, switched telephone, cellular telephone, as well as short haul modems. Capable to send SMS message to Cellular devices for location-specific or in the event of fault or in case of data limitation error.
	The data storage capacity must be very high and dual protected storage
	The software should support all sorts of Statistical analysis of data for maximum, minimum, average and standard deviation for various time intervals and for various pictorial presentations and interpretations
	The software should able to generate wind rose and pollution rose using raw data, validated data and with the manual input of data. ~~already stored data and by accepting any kind of numerical inputs~~
WARRANTY PERIOD AND MISCELLANEOUS	
	Specifications
General	Submission of details of other terms and conditions and cost separately for supply of indigenous, imported materials and for comprehensive (including payment of electricity, telephone) CAMC during warranty period and two (02) years and beyond the warranty period shall be quoted.
Digital Output	Multi drop RS 232 port shared between Gas Analysers, Dust Analyser ($PM_{2.5}$& PM_{10}), Meteorological Sensors and Computer for data, status and control. Communication should have a USB port, TCP/IP Ethernet connection.
Quality Control and Standard	Data shall be collected and validated according to US EPA standards, using the methodologies included in 40 Code of Federal Regulations. All analysers shall have current US EPA reference or equivalent method designation and shall be of the latest design. The supplier shall submit a Standard Operating Procedure for the air quality monitoring stations to the Buyer at the time of bid submission. This Standard Operating Procedure shall be approved by the Buyer prior to award. The Standard Operating Procedure shall contain the following: i. Operating procedures for all analysers ii. Calibration procedures iii. Calibration schedule iv. Maintenance procedures v. Maintenance schedule vi. Data validation procedures

	vii. Quality Assurance procedures viii. Sample quality assurance documentation ix. Sample Air Quality Report The calibration procedures for the analysers shall conform to US EPA Methodologies and shall include daily calibration checks, by weekly precision checks and linearity checks every six weeks. All analysers shall undergo full calibration in every three months. Data obtained from these calibration checks and copies of associated Quality Assurance and calibration documentation, shall be submitted to the IIT Madras. The Air Quality Report shall include tabular and graphic information on gas and PM concentrations as well as meteorological data. The data shall be reported in the form of 1 minute averages and shall also include hourly, daily, weekly and monthly averages, minimum, maximum, standard deviations, total data captured and percent data captured. It should also have stat validation mechanism and delayed data check mechanism. The Air Quality Report shall also include wind roses where wind speed and direction are measured. Annual maintenance of analysers for 3 years (including warranty period)

General terms and conditions

- The supplier/vendor must be an original equipment manufacturer or the sole authorised agent/dealer/seller of the proprietary item.
- The system should be delivered within 8 - 10 weeks from the opening of the letter of credit or issue of purchase order, whichever is later.
- Costs and related information should be given only in the financial bid.
- The cost should include for two options: (i) 3 year warranty period from the date of complete installation and commissioning of the system and (ii) 2 years warranty with additional quote for one year extended warranty, including CIP up to Navi Mumbai.
- Prices quoted should be valid for at least 90 days.
- Item-wise break up of cost should be provided for the different items (parts).
- IIT Madras reserves the right to exclude some items from the purchase.
- The payment conditions consist of 90% LC at site and 10% after installation and satisfactory training.
- The system should be installed and commissioned with no additional cost.
- Training at JNPT, Navi, Mumbai should be provided with no additional cost.
- Two copies of the system manual should be provided in CD form.
- There must be a local service agent in India.

Technical Bid should comprise of the following:

- Detailed Technical brochure
- Detailed technical write up explaining how each of the Technical Specifications are complied with.
- The list of at least three Institutions/R&D units/Industry where similar installations have been supplied in India/abroad including contact details (name of the person in-charge, email and phone number) is to be provided.
- EMD SHOULD NOT BE ENCLOSED IN THE TECHNICAL BID

After Sales, Service & Application Support:

Vendor should have after sales service support centre and application support centre for the offered System at India to provide prompt services, application support for various applications of our interest.

Reference:

Quoted model should have at-least 3 installation in India/Abroad. Three performance certificates of the quoted model in reputed institutions in India should be enclosed duly signed and stamped by the concerned scientist. Recent Performance should be enclosed.

Annexure II

CENTRE FOR INDUSTRIAL CONSULTANCY & SPONSORED RESEARCH (IC&SR)
INDIAN INSTITUTE OF TECHNOLOGY MADRAS
CHENNAI 600 036

B NAGARAJAN
JOINT REGISTRAR (IC & SR)

Project Accounts
July 22, 2016

TO WHOMSOEVER IT MAY CONCERN

In connection with project, **US currency may be transferred to CANARA BANK, IIT - MADRAS Branch** with the following details.

FOR TRANSFER OF CURRENCY US DOLLAR

Please Credit in USD **(THROUGH)**

JP MORGAN CHASE, NEW YORK
SWIFT CODE: CHASUS33

For Credit to

USD ACCOUNT No: 001-1395969, of CANARA BANK INTERNATIONAL DIVISION MUMBAI

For Further Credit to

ACCOUNT NO: **2722101001741 of IIT Chennai – Swift Code: CNRBINBBIIT OF THE REGISTRAR, IIT, MADRAS**

JOINT REGISTRAR (IC & SR) i/c
संयुक्त कुलसचिव (आई.सी. एवं एस.आर.)
JOINT REGISTRAR (IC & SR)
आई.आई.टी. मद्रास
I.I.T. MADRAS

This is to certify that the particulars furnished are correct.

For Canara Bank

Senior Manager
Canara Bank - IIT Madras branch

Senior Manager
I.I.T. Madras, Chennai - 36

CANARA BANK * CHENNAI * I.I.T.

एस.अरवींदन
S.ARAVINDAN
वरिष्ठ प्रबंधक Senior Manager
भा.अ.सं.S.P.No.31649

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