

## **BUDGETARY OFFER NOTICE**

Budgetary offers are invited from reliable, bonafide & experienced agency with required experience **Supply, Installation and Commissioning Of 03( Three) Nos. Continuous Ambient Air Quality Monitoring Stations ( CAAOMS ) At HDC** as per enclosed terms & conditions in Annexure- 'A' and Bill of Quantity Annexure- 'B'. All other terms and conditions not specifically mentioned will be as per the stipulations of trustees sanctioned KoPT's 'General Conditions of contract 'May 1993 [To see please visit [www.kolkataporttrust.gov.in](http://www.kolkataporttrust.gov.in)].

a. Budgetary Offer No.	I&CF/SDM/DOCK/BQ/001
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f. Last date of submission of Budgetary Offer	03.09.2018 Up to 17:00 hrs.

Details of the Terms & Conditions in Annexure- 'A' and Bill of Quantity Annexure- 'B'.are available in web site of Kolkata Port Trust [To see please visit [www.kolkataporttrust.gov.in](http://www.kolkataporttrust.gov.in)].

## **TERMS AND CONDITIONS Annexure- 'A'**

**“Supply, Installation and Commissioning Of 03 (Three) Nos. Continuous Ambient Air Quality Monitoring Stations ( CAAOMS ) At HDC, Kolkata Port Trust. ”**

**BUDGETORY QUOTATION NO. : I&CF / SDM / DOCK / BQ / 001**

**Price:** The quoted price shall be based on Free Door Delivery of materials as per BOQ along with testing and commissioning of the same i.e. the quoted price shall be inclusive of all charges (excluding GST) for transportation, handling, supply, delivery, unloading at site, deployment of all man power, installation, testing and commissioning with guarantee support (as per contractual conditions). GST rate in percentage of quoted price should be mentioned separately as extra.

### **6.2 SCOPE OF WORK:**

#### **A. Scope of Supply:**

AAQMS shall include monitoring of the following pollutant gases/parameters. Method of measurements and standards shall be as per CPCB (Central Pollution control Board) Notification published in Gazette on Nov 2009 :

- a) Sulphur Dioxide (SO<sub>2</sub> )
- b) Oxides of Nitrogen (NO-NO<sub>2</sub>-NO<sub>x</sub>)
- c) Suspended Particle Matter (PM<sub>10</sub>)
- d) Repeatable Suspended Particulate Matter (PM<sub>2.5</sub>)

Each AAQMS Station shall include the following and any other accessories as required to complete the system and meet the requirements of CPCB and West Bengal State Pollution Control Board.

- a) Necessary sampling system for AAQMS analyzers.
- b) In built Zero Air Generators. The zero air supply is controlled for each analyzer module separately.
- c) Mounting cabinet for analyzers and accessories.

One set of completely automatic micro meteorological data collection and recording station comprising wind speed, wind direction, air temperature, air humidity, rain fall recorder etc.

Detail specification of all analyzers is given later.

All tubes, fittings, interconnecting power, signal and control cables or any special cable within AAQMS shall be in scope of VENDOR.

**VENDOR shall provide weatherproof air conditioned enclosure for the outdoor system.**

**VENDOR shall provide all system programs & software with backups on storage media.**

VENDOR will be responsible for supplying all accessories as per approved drawings and as required for making the system complete. Purchaser will not procure any component, other than those supplied against this specification for the AAQMS.

All necessary hardware and software for functionally completing the system, on as required basis, shall be in vendor's scope of supply.

## **B. Scope of Services:**

- Vendor's scope of services shall include complete system engineering, design, configuration and programming services on system basis to ensure that the requirements and intent of specification are fully met.
- Vendor's scope shall also include supervision of laying and termination of all cables and conduits like inter cabinet cables, power supply cables, communication cables through separate conduit, prefab cables, special cables etc.
- Preparation and furnishing of all drawings, data, documents, information technical catalogues, Operation and Maintenance manuals, as built drawing etc.
- Preparation and furnishing of detailed Quality Assurance Plan (QAP) for all systems/equipment covered by this specification, for approval of purchaser/Engineer. Carrying out all quality assurance checks as per approved QAP shall be part of Vendor's scope of service.
- Participation in discussion with owner/purchaser/engineers and other equipment suppliers during various stages of Project implementation as required by the purchaser/engineers shall be part of Vendor's scope of service.
- Contractor shall be responsible to train the Owner's personnel in the field/Site .Providing all facilities to Purchaser's/owner's/Engineers for carrying out the Factory Acceptance Test (FAT) as per approved FAT procedures.
- Providing spares parts and support at reasonable cost during the service life of the plant.
- Vendor's proposal shall include all services, which may not be specifically stated herein but are needed for completeness of the equipment/system furnished by the Vendor and for meeting the intent and requirements of the specification.
- Guarantees and warranties for all equipment and systems furnished under the specification.

## **C. Field Services:**

- Vendor's scope of services shall include erection, supervision, testing, commissioning and handing over to final owner all systems supplied by them together with all accessories, auxiliaries and interfaces and associated equipment as specified herein in a fully operational condition acceptable to the owner at the site. Vendor's scope shall also include supervision of laying and termination of all cables, e.g. inter cabinets /inter system cables, Power supply cables, Communication cables through separate conduits, Prefab cables, Printer cables etc.
- Vendor is expected to post their qualified and experienced engineers at site for this purpose from the start of the erection activity to the completion of the PG testing, liquidation of punch points and handing over of AAQMS system to the satisfaction of the Purchaser/Owner.
- Commissioning engineers posted at site shall have previous experience of commissioning of AAQMS. Successful Vendor shall carry out Site acceptance test and handing over of AAQMS system to the satisfaction of the Purchaser/owner.
- Vendor's are requested to quote lump sum for field services considering a complete commissioning period for the stay of their field services team at site.

## **TECHNICAL SPECIFICATION:**

### **A. General Specifications for all Analyzers:**

1. The Analyzers should be 19" rack mounting model with facilities for fixing the analyzers from front side.
2. The ON/OFF switch and display of the entire important status signal viz. Sample flow, temperature, concentration, range switch, manual/auto mode, zero/span mode should be on front panel .
3. The analyzers should operate at operating voltage 230V +/- 10 Volts AC and 50 Hz +/- 3%. The power supply input to be protected against Spikes from and to the analyzer by an LC filter. The power connection cable should be CEE type complete with 15 Amps plug adaptable to Indian mains socket.
4. The analyzers must function properly in Indian conditions without any defect between 0-50 °C ambient temperature, 10-95% relative humidity and in high ambient dust levels. The data capture rate should not be less than 90%.
5. The Vendor/ manufacturer shall provide minimum of 1 week of operational & preventive maintenance hands –on training for at least two persons at the installation site.
6. The analyzers should be complete with calibration system. The calibration system should be delivered along with respective span gas cylinder/permeation tubes. The span gas concentration should be within 60-90% of first measuring range. The analyzer must have zero point internal Calibration system and in agreement with minimum detection limit of each analyzer. The calibration procedures are to be integrated into the software system for automatic calibration.
7. The analyzers shall be supplied with all ancillaries necessary for operation including external pump (if any) 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 analyzers should be provided before solenoid valve to protect frequent chocking of solenoid valve.
8. The connector systems for outgoing signal for recording and the computer terminal should be on back panel with screw type connecting pins.
9. All ambient gas analyzers shall conform to the USEPA automated reference or equivalent method designation as required by the specification for individual equipment. All analyzers shall be microprocessor controlled with automatic calibration using an external dilution calibrator and calibration standards. All analyzers and sensors should be fully integrated in the rack cabinet, fully calibrated & tested before supply and ready for start-up in the site. Analyzer must exhibit performance equal to or better than values specified in the specifications.
10. The Vendor/manufacturer shall specify the cross sensitivity of measurement for all analyzers.
11. Each set of analyzers shall be supplied with two copies of elaborate operation manuals comprising details in four parts:

Parts (I) should comprise installation, operational and troubleshooting details:

Parts (II) should have details about preventive, routine and corrective maintenance:

Parts (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.

12. **Digital output:** Multi drop RS 232/485 port shared between analyzer and computer for data status and control.
13. 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 analyzers shall have current US EPA reference or equivalent method designation and shall be of latest design. Vendor shall submit a standard operating Procedure for air quality monitoring stations to HDC within 15 days after placement of LOA. This standard operating procedure shall be approved by HDC S.S.O / Engineers. The standard operating procedure shall contain the following:

## **Operating procedures for all analyzers and meteorological sensors:**

Calibration procedures  
Calibration schedule  
Maintenance procedures  
Maintenance schedule  
Data validation procedures  
Quality Assurance procedures  
Sample quality assurance documentation  
Sample Air quality report

The calibration procedures for analyzers shall conform to US EPA methodologies and shall include, at a minimum, daily calibration checks, bi weekly precision checks and linearity checks every six weeks. All analyzers shall undergo full calibration every six weeks. Data obtained from these calibration checks and copies of associated Quality Assurance and calibration documentation shall be submitted to the Client along with Air quality Data.

Air quality Data shall be submitted to Client/WBPCB on a monthly basis in the form of an Air Quality report. This report shall include, at a minimum, tabular and graphic information on gas and dust concentrations as well as meteorological data for site. The data shall be reported in the form of 15 minute averages and shall include daily, weekly and monthly averages, minimums, maximums, standard deviations, total data captured and percent data capture. The Air quality report shall also include wind roses where wind speed and direction are measured.

Upon 24 hour notice from the Client, once per year, the Contractor shall agree to submit to an audit of calibrations, conducted using pre-approved US EPA methodologies, by a third party. The results of these audits shall be made immediately available to both Client & Vendor.

## **B. Specification of Sampling System:**

A suitable sampling system as specified by US EPA having 10 ports manifold and fitted with a suction pump to draw ambient air. System duly equipped with moisture removal systems should be provided for sampling of ambient air separately for gaseous and dust measurements.

Gases sampling system:

- a) Height of the sampling system : Approx. 1.0 meter above the roof
- b) Roof entry cut out; Stainless Steel
- c) Conduit; Stainless Steel
- d) Inner sampling system : Borosilicate glass
- e) Sampling Head: Stainless Steel
- f) Manifold; 10 port for tubes 6 X 1 mm. self-tightening
- g) Suction Pump Power Supply 230 V AC

## **C. Specification of 19" Rack:**

Suitable 19" rack cabinet to accommodate all analyses, calibrators, Zero air Generators, data logger etc. The dimension of the rack without doors, with aluminium section and rear of 2 mm steel sheet, one removable roof plate, fitted with 4 filling eyebolts. Four roof fixing screws included in package to replace the lifting eye bolts. One gland plate three part, one pair of 475 mm (19") mounting angles depth adjustable in 25 mm pitch pattern fitted on two fixing angles approximately 150 mm unit from the front standard. To accommodate panel width of 19" size: width = 600 mm, Height = 1400 mm and Depth = 800 mm. The 19" racks should be screwed to the floor of the station.

## **D. Specification of System Equipment:**

### **1. AMBIENT AIR ANALYZERS:**

#### **a) AMBIENT OXIDES OF NITROGEN (NO/NO<sub>2</sub>/NO<sub>x</sub> –NH<sub>3</sub>) ANALYZER** (Conforming to US EPA Automated Federal Reference Method (FRM) Designation)

1. Principle : Chemiluminescence
2. Measurement : NO - NO<sub>2</sub>, NO<sub>x</sub> in Ambient Air
3. Display : Digital
4. Ranges : Auto ranging 0-1 ppm or 0-10 ppm
5. Minimum Detectable limit : <0.2 ppb
6. Noise level : <0.1 ppb
7. Zero Drift : < 1 ppb /24 hrs
8. Span Drift : < 1 ppb/7 days
9. Response Time : Automatic or Programmable (Minimum 40 seconds)
10. Linearity : +/- 1% of full scale
11. Calibration : calibration gas cylinders of known concentration along with pressure gas valve for span shall be provided along with instrument for calibration purpose.
12. Power Consumption : 160 VA
13. Power requirements : 115 V, 60 Hz – 230 V, 50 Hz
14. Output : RS 232/485 Ethernet & USB Port, Status Relay
15. Mounting : 19" rack
16. Display : Colour Graphic Display
17. Operating Temp : 5 – 40 °C

#### **b) AMBIENT SULPHUR DIOXIDE (SO<sub>2</sub>) ANALYZER** (conforming to US EPA Automated Federal Equivalent Method (FEM) Designation)

1. Principle : Pulsed UV Fluorescence
2. Measurement : Sulphur Dioxide in Ambient Air
3. Lower Detectable Limit : <0.4 ppb
4. Ranges : 0 -20 ppm
5. Display : Digital
6. Noise level : <0.2 ppb
7. Zero Drift : < 1 ppb/24 hrs with automatic zero compensation
8. Span Drift : < 0.5% /24 hr.
9. Calibration : Calibration Gas cylinders of known concentration along with pressure gas valve for span shall be provided alongwith instrument for calibration purpose.
10. Power requirement : 115 V, 60 Hz – 230 V, 50 Hz
11. Output : RS 232/485, Ethernet & USB Port
12. Mounting : 19" rack
13. Operating temp : 5 – 35 °C
14. Display : Colour graphic Display
15. Power Consumption : 43 W

## **2. MULTI CALIBRATION SYSTEM:**

### **a) Gas Calibration System:**

The calibration system for air monitoring equipment (listed above) should incorporate an automatic gas dilution calibrator, calibrator gas standards and a high performance zero air Generator to calibrate all of the analyzers in the system. The calibration cycles should be able to be configured through the Data Acquisition system at any specific time during day or night. It should be mounted on standard 19" rack'.

The dilution calibrator should be able to perform mixing of source gas, from the calibration gas bottles, with Zero air Generator, in order to generate a wide range of calibration gas concentration and minimizing the number of calibrator gas standards required. All the calibration gases provided along with the system must be NIST traceable. The system should include at least three permeation chambers and should accept a Permeation Tube up to 11 cm in total length and 2 cm in diameter. It should also have facility for Gas Phase titration (GPT), having Ozone generator of 6 ppm/ltrs. And the converter efficiency should be 100% for conversion of NO<sub>2</sub> concentration to NO. The system should also include calibration of Ozone analyzer.

### **b) Meteorological, Flow and Electronics Calibration:**

The supplier should provide calibration devices for all the meteorological and other electrical equipment mentioned above as per the specifications of the manufacturers.

Recommended spare parts and accessories required for the three years of normal operation should be supplied along with the calibration system.

**c) Zero Air Generator** (Make of Generator should be of Analyzer manufacturer only, Indigenous generators are not acceptable)

Zero Air Generator to be provided as a source of ultra-high purity zero air for ambient instrument needs. This modular unit is to be configured for the removal of a variety of pollutant gases. Clean dry air can be supplied via a self-contained compressor. This device can be used for the calibration of environmental instrumentation.

- a) Output : 20 SLPM @ 30 psig
- b) Dew point : -20 °C up to 15 LPM
- c) Dryer : Regenerative heatless drier
- d) Power requirements : 220 – 240 V AC 50 HZ
- e) Mounting : 19 " rack mounted

### **d) Calibration Gas Cylinders**

Calibration Gas cylinders of 10 lit. capacities with SS316 Regulator of make INOX/PRAXAIR/BOC

## **3. SUSPENDED PERTICULATE MATTER (SPM) MONITOR** (Conforming to US EPA Automated Federal Reference Method (FRM) Designation)

Based on the principle of  $\beta$  -ray attenuation by particulate sampled through the instrument and collected on fiberglass filter tape. Before and after sampling  $\beta$ -ray radiation is measured by silicon Semiconductor Beta Detector. An internal microprocessor handles all sequences and automatically calculates the concentration of SPM.

- 1. Principle : Continuous measurement of PM<sub>10</sub> in ambient air.
- 2. Particle size cut off : 0 – 10  $\mu$
- 3. Ranges : 0-100 / 0-200 / 0-500 / 0-1000 / 0-2000/0-5000 / 0-10000  $\mu\text{g}/\text{m}^3$
- 4. Lower detectable limit (according to cycle and flow) : 0.5  $\mu\text{g}/\text{m}^3$  with PM<sub>10</sub> inlet (24h average)

5. Cycle time : 1/2, 1, 2, 3, 6, 12, 24 h, user-selectable
6. Sample collection period : 1/4, 1/2, 1, 2, 3 h, user-selectable
7. Counting time : 10 to 300 sec, user-selectable
8. Source : sealed Carbon 14
9. Detector : high performance Geiger-Müller counter tube
10. Sampling flow rate : 1.0 to 1.5 m<sup>3</sup>/h, user-selectable
11. Sampling spot area : 2.0 cm<sup>2</sup>
12. Standard filter : fiberglass tape (width 35 mm, length 30 m)
13. Sampling tube : straight vertical tube
14. Power supply : 230V/50Hz (115V/60 Hz)
15. Consumption : 330 VA (pump included)
16. temperature : + 10 to + 40°C
17. Housing : 19" rack / 6U

#### **4. RESPIRABLE SUSPENDED PARTICULATE MATTER (RSPM) MONITOR** (Conforming to US EPA Automated Federal Equivalent Method (FRM) Designation)

Based on the principle of  $\beta$ -ray attenuation by particulate sampled through the instrument and collected on fiberglass filter tape. Before and after sampling  $\beta$ -ray radiation is measured by Silicon Semiconductor Beta Detector. An internal microprocessor handles all sequences and automatically calculates the concentration of SPM.

1. Principle : Continuous measurement of PM<sub>2.5</sub> in ambient air
2. Particle size cut off : 0-2.5  $\mu$
3. Ranges : 0-100 / 0-200 / 0-500 / 0-1000 / 0-2000 / 0-5000 / 0-10000  $\mu$ g/m<sup>3</sup>
4. Lower detectable limit (according to cycle and flow) : 0.5  $\mu$ g/m<sup>3</sup> with PM<sub>10</sub> inlet (24h average)
5. Cycle time : 1/2, 1, 2, 3, 6, 12, 24 h, user-selectable
6. Sample collection period : 1/4, 1/2, 1, 2, 3 h, user-selectable
7. Counting time : 10 to 300 sec, user-selectable
8. Source : sealed Carbon 14
9. Detector : high performance Geiger-Müller counter tube
10. Sampling flow rate : 1.0 to 1.5 m<sup>3</sup>/h, user-selectable
11. Sampling spot area : 2.0 cm<sup>2</sup>
12. Standard filter : fiberglass tape (width 35 mm, length 30 m)
13. Sampling tube : straight vertical tube
14. Power supply : 230V/50Hz (115V/60 Hz)
15. Consumption : 330 VA (pump included)
16. temperature : + 10 to + 40°C
17. Housing : 19" rack / 6U

#### **5. SPECIFICATIONS OF METEOROLOGICAL SENSORS:**

The meteorological instrumentation should be interfaced directly with the Data Acquisition System after passing through a lightning protection isolation box. A crank-up telescoping meteorological 10 meters tower to be used to mount the meteorological instrumentation. The relative humidity and solar radiation sensors should be mounted on the tower.

##### **a) Wind Direction**

The sensor to provide low starting threshold , fast response and accuracy over a wide operating range in adverse environmental conditions. Specifications are as follows:

1. Principle : Vane coupled to linear endless potentiometer
2. Accuracy : +/- 4%

3. Wind Direction Operating Range : 0-359 degrees

4. Starting Threshold : 0.5 m/s

5. Distance Constant : 1.1 m. of air maximum

6. Damping ratio : 0.4 at 10 initial angle of attack

7. Temperature operating range : -40°C to 60°C

#### **b) Wind Speed**

The anemometer to provide a low starting threshold, wide dynamic response and high accuracy over a wide range of wind speeds and a variety of environmental conditions. Specifications for the wind speed sensor are as follows:

1. Principle : Frequency proportional to wind speed

2. Maximum operating range : 0-50m/s

2. Distance constant:

Vinyl : 1.5m of air maximum

Stainless Steel : 2.4 m of air maximum

Heavy Duty : 3.0 m of air maximum

3. Temperature Range : -40°C to 60°C

4. Accuracy : 0.2m/s or 1%, whichever is greater

5. Impedance : 4.7 kohm

6. Power Requirement : 12V DC, 4.5 mA or 6VDC at less than 1 mA

#### **c) Vertical Wind Speed**

The anemometer specifications are as follows:

1. Maximum operating range : 30m/s

2. Starting threshold : 0.2m/s

3. Output : m/s

#### **d) Ambient temperature**

Temperature measurement system specifications are as follows:

1. Principle : Standard Platinum RTD element

2. Calibrated Temperature range : 0°C to 50°C

3. Response : 10 seconds in still air

4. Linearity : +/-0.1°C

5. Accuracy : 0.15°C

#### **e) Relative Humidity**

1. Sensor : Solid state Capacitive type

2. Measuring Range : 0 to 100% RH

3. Accuracy : +/- 1.0% (5-95% RH)

4. Response time : < 2 minutes for RH 10% to 90%

< 5 minutes for RH 40-90%

Typically 20 seconds

5. Linearity : Better than +/- 2%

6. Reproducibility : 0.5%

7. Temperature Range : 40°C to 60°C

#### **f) Solar Radiation**

The detector should be able to measure short-wave radiation which comprises the direct component of sunlight and the diffuse component of skylight. Specifications are as follows:

1. Sensitivity : 80  $\mu\text{A}$  /1000 W m<sup>2</sup>
2. Temperature dependence : 0.15% per °C Max
3. Response Time : 10  $\mu\text{s}$
4. Linearity : 1% from 0-3000 watts m<sup>2</sup>
5. Cosine response : Corrected up to 80 angle of incidence
6. Orientation : No effect on instrument performance
7. Calibration : Calibrated against an Eppley Precision Spectral Pyranometer (PSP) under natural day light conditions. Absolute error under these conditions is 5% maximum, typically 3%.

#### **g) Barometric Pressure**

Specifications are as follows:

1. Operating range : 800 to 1100 bar
2. Proof pressure : 2 bar
3. Operating temperature : -40°C to 85°C
4. Compensated Temp. Range : -10°C to 60°C
5. Non linearity and hysteresis : 0.1% FS
6. Repeatability : 0.2% FS
7. Temperature shift : 0.3% FS/10 °C
8. Response time : 1 msec
9. Long term stability : 0.1% FS

#### **Rainfall sensor**

1. Principle : Tipping Bucket Rain Gauge
2. Accuracy : Better than 5%
3. Operating Temperature : -40°C to 50°C

#### **I) Telescoping Crank-up Meteorological Tower**

The wind direction, wind speed, vertical anemometer and temperature sensors are to be mounted on the Meteorological Tower. The tower is to be a free standing four section telescoping tower provided with a hand crank to raise and lower instrument mounted on the top section. Specifications are as follows:

1. Extended height : 10 meters
2. Retracted Height : 2 meters
3. Wind load limit : 0.7896 sq.mt (8.5 sq.ft) at 50 mph
4. Number of sections : 4
5. Construction material : Galvanized steel or Aluminium

#### **6. SPECIFICATIONS OF DATA LOGGER**

Data logger with 8 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, 1/2 hr, 4 hrs., 8 hrs., 24 hrs., 1 month and year. Communication between data logger and computer using standard RS 232 connector capable of connecting at least 12 stations.

## **7. SPECIFICATIONS OF STATION COMPUTER (MINIMUM CONFIGURATION)**

Pentium Dual Core 2 Processor, 2 GB RAM, 250 GB HDD, CD/DVD Combo Drive, 19" TFT Monitor, 2 serial & 1 parallel ports, Standard WINDOWS Operating System, standard keyboard, mouse with pad and Color Laser printer. Software : Windows (Latest Version) with Anti-Virus software like Norton/McAfee/QuickHeel with online continuous up gradation.

## **8. DATA ACQUISITION SYSTEM**

The Data Acquisition System (DAS) should be able to collect and store meteorological data and air quality data from all instruments listed above. The DAS should be Data logger designed to acquire, transmit process and store data. DAS should include following minimum features:

- Industry standard RS 232 Communication enabling digital/analog communication with all supported monitoring and meteorological equipment.
- Supports remote communication through radio, switched telephone, cellular telephone, as well as short haul modems- Capable to send SMS message to cellular diveds for location specific , or in the event of fault or in case of data limitation error.
- Data storage space for minimum 30 days of 5 minute historical data
- Captures minimum, maximum, average values and standard deviations
- Lightning & surge protection facilities
- Full control over calibration cycle periods
- Password protection
- DAS should be designed for unattended use.
- DAS should have 6 to 8 line of fully pixilated graphic display (LCD) for data & setup parameters to be viewed.

## **9. ANALYTICAL SOFTWARE**

The supplier should provide Windows based software for data acquisition from the DAS and for statistical analysis and reporting of the monitored parameters mentioned above. Analysis and reporting software should possess following minimum features:

- Windows compatible
- File format conversion capable
- Statistical analysis of data for maximum, minimum, average and standard deviation for various time intervals using the monitored data
- Tabular & Graphical format for report production
- Wind rose graph
- File export facility
- Windows based printer support

## **10. CENTRAL STATION COMPUTER SPECIFICATIONS**

Pentium Dual Core 2 Processor, 2 GB RAM,  
250GB HDD, CD/DVD Combo Drive, 19" TFT  
Monitor, 2 serial & 1 parallel ports, Standard  
WINDOWS  
keyboard, mouse with pad and Color Laser  
printer. Software : Windows and Anti-Virus (latest)

## **11. COLOUR LASER PRINTER FOR CENTRAL STATION**

1. Speed (pages per minute) : At least 24 Black 7 white and at least 6 colour
2. Resolution : 600 X 600 dpi
3. RAM : 32 MB expandable to 64 MB
4. Main tray capacity : At least 60 sheets
5. Interface : Parallel & USB
6. Operating System : Windows
7. Power Supply : 230v +/- 10 V AC, 50 HZ+/- 3%

## **12. DISPLAY BOARD SPECIFICATION**

1. Size of Display : 1" (H) x 5" (L)
2. Visibility Range : 50 mtrs
3. Readability Range : 50 mtrs.
4. No. of LED text line : Double line
5. Display of colour elements :Colour (Red)
6. Operating & non-operating : 0-500 °C
7. Smallest character size : 200mm
8. Language : English
9. Display casing :Weather proof casing
10. Communication : Through GSM Modem
11. Display format : Scrolling

**Central AAQMS Ambient Air Quality Monitoring System, DAS system shall perform following functions:**

- To collect all data from individual AAQMS stations at prescribed time or on request.
- Ability to manage multiple remote AAQMS systems, especially diagnostic feature to check the health of each system.
- Monitoring, analyze, report generation and archiving of data.
- Transmit data to Electronic display board through serial link/wireless/wired option
- All features of workstation AAQMS can be accessed from central station.

Monitoring and report generation of AAQMS for the whole power station shall be centralized system and shall be carried out through a centralized Windows operating system PC based DAS or through web browser installed in PC located at central control room. For this purpose all individual analyzer data from each AAQMS Stations by suitable communication link.

### **13. SPECIFICATION FOR ANALYSER SHELTER**

#### **i) General**

The Analyzer shelter is to be supplied as a completely assembled unit suitable for installation on a concrete pad or as a standalone unit. All internal piping and tubing will terminate in bulkhead connections. Internal wiring will terminate in external junction boxes. All equipment including tubing, conduit fittings, junction boxes, etc. will be installed so as not to interfere with the removal of analyzers, sample handling systems and related equipment. Accessibility for maintenance will be given prime importance.

#### **ii) Construction**

The Analyzer shelter should consist of a self-framing exterior skin assembled on rigid primed and painted steel superstructure. All materials used in the construction to be non-combustible.

- a) Wall panels designed to be completely weather resistant. The design provides for expansion and or contraction of the structure over the complete range of ambient temperatures as described in the Environmental Conditions without causing harmful buckling or opening of joints etc. Materials of construction to be 2 mm thick GI Sheet for external walls and 18 gauges Galvanized steel for internal walls with ribbed interlocking.
- b) The wall panels of the shelter to be insulated and designed for the given ambient conditions. Insulation thickness of glass/rock wool to be approximately 80 mm.
- c) Roof panels design and construction to be completely weather resistant. The design provides for expansion and contraction over the given ambient temperature ranges described in the Environmental Conditions without causing harmful buckling or opening of joints etc.
- d) The base structure of the shelter to be constructed ISMC (150/125)/ISM B (100) welded properly and adequately sized to ensure structural rigidity to prevent deformation during dragging, lifting, loading and unloading of the shelter.
- e) The Roof panels to be insulated with 80 mm thick rock wool insulation.
- f) All insulation materials should be fire retarding.
- g) The analyzer house should have two doors: one as the main entrance and the other for partition to keep cylinders and batteries.
- h) The door to be mounted on special hinges to ensure gas tight construction of shelter.
- i) The main entrance should carry a plate indicating the plant area number and the tag list of all analyzers inside the shelter
- j) Doors to be sturdy double walled, insulated with rock wool and open to outside. Each door should also have a window with transparent toughened safety glass.
- k) Analyzer shelter should meet the standards of the Uniform Building Code with the following Design loads.

Roof : 20lb/sq. ft live load

Wind : 35lb/sq. ft at 0.30 ft. above grade elevation

Seismic Zone :No. 3

- l) All tubes and cable entries to the shelter are by special means. Multi cable Transit Blocks -to ensure gas tightness of the shelter
- m) The floor to be fabricated with anti-slip sheet and sealed continuously to ensure no loss of Pressure.

#### **iii) Air Conditioning**

Air conditioning System to be designed sufficiently to create good environment by controlling the climatic condition through SPLIT TYPE air conditioner (1 Working & other Standby) . Capacity of each should be 1.5 Ton (Minimum). Analyzer shelters to be equipped with air conditioning unit skid mounted and is designed to keep the inside atmosphere of the shelter at a constant temperature of 24°C +/- 3°C to obtain repeatability and reliability of the analyzers and also a comfortable working environment.

#### **iv) Lighting**

- a) Illumination level in the shelters will be at a minimum of 300 lux at 750 mm elevation inside the shelter. Maintenance factor shall be 0.65.
- b) External Dome type lighting shall be under the overhangs to provide sufficient illumination for maintenance work.
- c) Power switches for internal and external lighting will be provided near to the main entrance on the outside of the shelter.

#### **v) Power Distribution**

- a) 415V AC 3 Phase 4 wire redundant supply would be provided. Distribution of 230 V AC 1 phase (UPS & Non UPS) through circuit breaker to be done in shelter for supply analyser panel, sockets, lights, AC and auxiliary equipment in or around shelter.
- b) Each of the main systems shall have an individual isolation circuit breaker mounted next to the individual power users.

#### **vi) Wiring**

All power, signal and alarm wiring will be in accordance with the National Electric Code.

#### **vii) Painting**

##### **a) Structural**

The painting includes scraping, chemical cleaning, one coat primer, one coat of Epoxy Zinc chromate Red oxide primer and two coats of Epoxy finish Paint. The surface coating takes sufficient care of removing all the contaminants thus ensuring against premature and complete coating failure.

The preliminary cleaning removes Grease, oil, paint and dirt which prevent pickling acid from coming in contact with the scale or mist. Precautions will be taken to avoid air bubbles and uneven coat thickness.

##### **b) Internal Sheet Metal**

The internal walls shall be powder coated. Painting for the shelter is completed in every respect before dispatch. No painting will be done at site except touch up of scratches made during site erection.

#### **viii) Size of the shelter**

Size of the shelter should be 4mt. (L) X 3 mt, (W) X 2.7 mt. (H) with partition for keeping cylinders and batteries.

### **14. UNINTERRUPTED POWER SUPPLY SPECIFICATION**

1. Capacity : 5.00 KVA
2. Technology : PWM using IGBT
3. Input : Voltage 230V AC,  
Voltage Range +/- 20%  
Frequency 50Hz +/- 3%
4. Output : Voltage 230V AC  
Voltage Regulation +/-1%  
Frequency 50Hz  
Frequency Regulation +/- 0.01%
5. Battery Type : Sealed Maintenance free, Back up Time 1 hr. (Full Load)  
Battery capacity depending on back up time

Recharge time 5 hrs.to 90% after complete discharge  
 6. Distortion : Less than 1% on linear load  
 7. Power Factor : 0.8 – 1  
 8. Indicator : LED – Battery charge, load level, online, over load, on battery, replace battery  
 9. Alarm : Audible alarm for battery Back Up, Battery low, fault  
 10. Protection : Surge- Surge Suppression meets BIS/ International standard.  
 Overload – Fuse & current limited,  
 Short Circuit - Fuse& current limited & Cutoff  
 Battery Low Cutoff – No battery drain after cut-off.  
 11. Overload capacity :110% for continuous load  
 12. Efficiency : More than 90%  
 13. Environment : Operating temperature – 0°C to 50°C  
 Operating Humidity – 10% to 95% (Non Condensing)  
 Audible Noise – Less than 45dB (at 1m)

#### **TERMINAL POINTS & SERVICES TO BE PROVIDED BY PURCHASER**

1. HDC will provide one redundant three phase power supply feeders in room designated for housing CAAQMS.
2. HDC will provide LAN & Broadband Connectivity with static IP Address. For showing the data in Display Board necessary Power Connectivity & LAN Connectivity/ Signal Cable should be provided by WBPDCCL in the location of Display Board.
3. HDC will provide RCC Solid Base, Display Board stand, Electrical & Electronic Earth Pit, Earthing materials and Lightning Arrester subject to submission of related drawings and specifications as necessary for RCC Solid Base, Display Board stand, Power connections, Electrical & Electronic Earth Pit, Earthing materials and Lightning Arrester by VENDOR within 15 days of receipt of LOA.

#### **OTHER REQUIREMENTS TO BE FULFILLED BY VENDOR**

1. All instruments to be supplied should be USEPA Compliant and would require certificates which are to be attached.
2. Vendors should preferably furnish document of use of their equipment in Government or Public Sector Undertaking.
3. Vendor needs to produce certificates whether they are manufacture or supplier/ dealer. For suppliers/dealers offer should be accompanied by authorization certificates from manufacture on non-judicial stamp paper for supporting commissioning, installation sales and service for 15 years.
4. Vendor should also ensure server availability in CPCB/WBPCB. Vendor will provide the facility for sending data to CPCB and WBPCB Servers directly from site.
5. All analyzers to be supplied should be in line with the Gazette published in November 2009 as per CPCB instruction and as per the methodology mentioned in Gazette.

**Price Variation:** Quoted prices shall be firm and fixed till execution of the above work. No Escalation / Variation on the prices on any account will be considered for adjustment/payment.

**Completion period:** The Job will be executed in all respect within 06 (Six) month from the date of receipt of the order letter.

**Inspection:** The materials will be inspected at all the sites, by the representative of Sr. Dy. Manager (Dock), I&CF or his authorized representative shall have the right to inspect the work and the deployed instruments/equipments to carry-out the work during the contract period.

## **MAINTENANCE PERIOD :**

The Contractor shall maintain the works allotted to him as per Clause 9.0 of the General Conditions of Contract for a period of **24 (Twenty Four) months** from the date of completion as certified by the Engineer or his representative in Form G.C. 1.

**Validity:** The validity of the offer should not be less than 120 days from the date of opening of the offer.

## **15. TAXES :**

The quoted rates should include all other Taxes excluding GST. GST as applicable shall be paid extra against proper invoice submitted by the successful contractor.

The contractor will be required to submit GST compliant invoice with all required details and also to be required to file timely and proper return so as to enable KoPT to get due input credit against GST paid of.

In case of any failure on the above account, GST amount even if paid by KoPT shall be recoverable from the contractor, along with applicable interest if any.

**BILL OF QUANTITIES Annexure- 'B'**

**Tender For “Supply, Installation and Commissioning Of 03(Three) Nos. Continuous Ambient Air Quality Monitoring Stations ( CAAOMS ) At HDC, Kolkata Port Trust.”**

**BUDGETORY QUOTATION NO. : I&CF / SDM / DOCK / BQ / 001**

<b>No.</b>	<b>Description</b>	<b>Qty.</b>	<b>Unit Price In FOR - Rs.</b>	<b>Total Price In FOR – Rs.</b>
	<b>Continuous Ambient Air Quality Monitoring System consisting of the following:</b>			
1.0	<b>Sulphur Dioxide (SO<sub>2</sub>) Analyzer</b> based on UV – Fluorescence Principle – <b>Model AF22e</b> suitable for 230 V, 50 Hz. power supply, built-in solenoid valve for manual/ auto calibration, built-in zero air scrubber for zero calibration & RS 232 port for Serial communication with Data Acquisition System  <b>(US –EPA Approval No. EQSA-0802-149)</b> <b>(Technical Details enclosed)</b>	3 Nos.		
2.0	<b>Oxide of Nitrogen (NO<sub>x</sub>) Analyzer</b> based on Chemiluminescence principle <b>Model AC32e</b> suitable for 230 V, 50 Hz. power supply, built-in solenoid valve for manual/ auto calibration, & RS 232 port for Serial communication with Data Acquisition System  <b>(US – EPA Approval No. RFNA-0202-146)</b> <b>(Technical details enclosed)</b>	3 Nos.		
3.0	<b>PM<sub>2.5</sub> Analyser</b> based on <b>Beta Ray Attenuation</b> principle <b>Model MP101M LCD</b> suitable for 230V AC, 50 Hz. Power supply with C-14 Radioactive source, Pump, PM <sub>2.5</sub> Inlet, Standard foil for calibration. RS 232 & Ethernet port for Serial communication with Data Acquisition System  <b>(US-EPA Approval No. EQPM-1013-211)</b> <b>(Technical details enclosed)</b>	3 Nos.		

4.0	<b>PM<sub>10</sub> Analyser</b> based on Beta Gauge detection principle <b>Model MP101M LCD</b> suitable for 230V AC, 50 Hz. Power supply with C-14 Radioactive source, Pump, PM <sub>10</sub> Inlet & Standard foil for calibration.  <b>(US-EPA Approval No. EQPM-0404-151)</b> <b>(Technical details enclosed)</b>	3 Nos.		
5.0	<b>Multipoint, Multi Gas Calibrator, Model MGC101</b> suitable for 230V AC, 50 Hz. with the following: <ul style="list-style-type: none"> <li><input type="checkbox"/> Mass Flow Controller based for Dilution air &amp; Span Gas</li> <li><input type="checkbox"/> Inlet ports for external span gases</li> <li><input type="checkbox"/> RS 232 interface</li> <li><input type="checkbox"/> In built Zero air generator</li> </ul>	3 Nos.		
6.0	Calibration Gas Cylinder made of Aluminium with SS regulator & valve (1 Cylinder for each Gas) for following Gases:			
6.1	SO <sub>2</sub>	3 Nos.		
6.2	NO	3 Nos.		
7.0	<b>Gas Sampling System &amp; Hood</b> Gas Sampling system consisting of SS gas sample inlet, peltier based moisture removal facility, manifold & tubings to the analyzers.	3 Nos.		
8.0	<b>Standard 19" Rack Cabinet(Double Bay Rack)</b> with Telescopic slides, Overload protection, Power Distribution box, Cooling fans, Dust filters & pneumatic plumbing to accommodate Analyzer, Calibrator & Accessories	3 Nos.		
9.0	<b>Weather Monitoring Station</b> consisting of the following Parameters: <ul style="list-style-type: none"> <li>a) Combined Wind Speed &amp; Direction</li> <li>b) Combined Temperature &amp; Relative Humidity</li> <li>c) Liquid Precipitation (Rainfall) Sensor</li> <li>d) Solar radiation</li> <li>e) Barometric Pressure</li> <li>f) Meteorological Mast -10 Meters</li> <li>g) Interface unit</li> </ul>	1 Set		
10.0	<b>Shelter Room</b> as per the technical Specification with all the accessories, Lighting & Wearing	3 Nos.		
11.0	<b>Split Type Air Conditioners</b> with auto switch	6 Nos.		

	over circuit. Make: Blue Star/ Voltas/ LG/ equivalent.			
12.0	<b>UPS</b> , Capacity 5 KVA, 230 VAC, 50 Hz. Make: Aplab/ APC/ Uniline or equivalent make with 4 hrs. battery backup for all the Analysers only  (UPS is only for Analyzers and DAS & not for Air conditioners.)	3 Nos.		
13.0	<b>Single Colour 6' x 2' sized LED Display Board</b>	1 No.		
14.0	<b>Local Data Logger</b> - PC based Data Acquisition System with <b>SAM WI License Software</b> suitable for Storing, Logging, Reporting, Printing data from above offered Analysers. PC with specifications as under:  Pentium Dual Core 2 Processor, 2 GB RAM, 250 GB HDD, CD/DVD Combo Drive, 19" TFT Monitor, 2 serial & 1 parallel ports, Standard WINDOWS Operating System, standard keyboard, mouse with pad and Color Laser printer.	3 Nos.		
15.0	<b>Central Data Logger</b> - PC based Data Acquisition System with <b>XR Premium License Software</b> suitable for Storing, Logging, Reporting, Printing data, Validation and communicating with above offered Local DAS. PC with specifications as under:  Pentium Dual Core 2 Processor, 2 GB RAM, 250GB HDD, CD/DVD Combo Drive, 19" TFT Monitor, 2 serial & 1 parallel ports, Standard WINDOWS Operating System, standard keyboard, mouse with pad and Color Laser printer.	1 No.		
16.0	<b>Installation , Commissioning &amp; Training</b> at site at HDC	Per station		
	<b>TOTAL PRICE IN INR :</b>			

**Note:** Quoted price should be excluding GST. All other incidental charges for the execution of the contract should be included. The rates should remain firm during the tenure of contract period.

**The following must be quoted:**

**Present percentage rate of GST : ..... as extra on quoted prices.**

(Signature and seal of of the Bidder)