TECHNICAL SPECIFICATIONS FOR CONTINUOUS REAL TIME AMBIENT AIR QUALITY MONITORING ANALYSERS / STATION

Volume II

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West Bengal Pollution Control Board

SCHEDULE OF REQUIREMENTS

The equipment are intended for one Continuous Ambient Air Quality Monitoring Station (CAAQMS). The system should be completely functional. Any balance of material not specified but required for the purpose must be supplied by the vendors.

Sl.	Item / Analyzer Name	Quantity
1	Monitoring Station (Container based) for housing the CAAQM set up.	5
2	Air Conditioner (2TX2 & 1.5TX1), Split type	5
3	On line UPS (1X15 KVA, 1 hr. back up)	5
4	Sampling System having 10 port manifold	5
5	19" Rack cabinet to accommodate all analyzers	5
6	Ambient Oxides of Nitrogen ($NO/NO_2/NO_x/ NH_3$) Analyzer	5
7	Ambient Sulphur Dioxide (SO_2) Analyzer	5
8	Ambient Ozone (O_3) Analyzer	5
9	Ambient Carbon Monoxide (CO) Analyzer	5
10	Benzene Monitor / Analyzer	5
11	Multi calibration System for Gas calibration	5
12	Automatic $PM_{2.5}$ Particulate Matter Monitor	5
13	Automatic PM_{10} Particulate Matter Monitor	5
14	Meteorological Sensors for Wind Direction, Wind Speed, Vertical Wind Speed, Ambient Temperature, Relative Humidity, Solar Radiation & Barometric Pressure, Rainfall and Telescoping Crank – up Meteorological Tower	5 sets
15	Computer System consisting of one PC along with Laser Printer and DAS at each of Five (5) monitoring stations with peripherals and software for data acquisition / display / transfer and systems integration.	5
16	Installations for Continuous Automatic Monitoring Stations with Sampling line, Internal fitting, Instruments racks, Electrical connection from supply within 5 meter of the station and Gas line fittings, Tools (electrical and mechanical)	5 sets
17	Central server system with required UPS	1 set
18	Day light & Night visible data display (Display Board) system. All works, civil, mechanical, electrical and data connectivity (wired or remote) to be done	5
19	Modem/Data Card/Communication system to be established between the station, WBPCB head quarter and the CPCB AQI portal.	5 sets
20	RCC foundation, pillars, platform and misc. works - civil works only (In case the platform is at 1 meter height from ground)	1
21	RCC foundation, pillars, platform and misc. works - civil works only (In case the platform is at 4 meter height from ground)	1
22	RCC foundation, pillars, platform and misc. works - civil works only (In case the container is to be mounted on a roof top at a height between 3 to 10 meter)	1
The bidder must offer maximum three make/manufacturer for supply of 8 different base analyzers (identified by Sl. No. 6 to 13 of the equipment list) required by the Scope of Works.		
"RCC foundation, pillars, platform and misc. works - civil works only (In case the container is to be mounted on a roof top at a height between 3 to 10 meter)" means the bidder may be required to construct a room of same dimension of the container on the roof top at such height and all works in relation to such construction is to be assessed in this item.		

TECHNICAL SPECIFICATIONS

1.0 MONITORINGS STATION

1.1 Monitoring Station: is designed for housing the ambient air quality monitoring instruments to protect them from dust and heat. Temperature and Humidity sensors shall be installed in the housing for checking the humidity and temperature inside the station. Three Nos. 19" racks shall be installed inside the station so that the analysers are easily accessible from front & back for calibration and maintenance.

1.2 Dimensions: Inside length: Approx. 4200 mm
Inside width: Approx. 3500 mm
Inside height: Approx. 2500 mm

1.3 Frame: All the material used for the construction of the floor, frame, roof frame etc, the 4 corner posts and 8 integrated, reinforced container corners should be of metal. The exterior panel of the container shall be made of pre-coated MS Sheet of approved colour shade. All other steel parts should be hot dipped galvanized having minimum rate of galvanisation of 275 gram per square meter. All joints of like metal such as steel-to-steel or aluminium-to-aluminium shall be protected against corrosion by liberal application of joining compound. All joints of dissimilar metals such as steel to aluminium shall be protected against corrosion due to galvanic action by liberal application of dielectric compound as well as jointing compound on both mating surfaces. For lifting / fixing the container, International Standard eyebolts should be provided at the corners.

1.4 Paneling: The outer paneling will be of 1.2 mm of Pre-coated MS sheet to withstand external impacts and abrasions. Outer side of the MS Sheet i.e. exposed face of the sheet, shall be permanently colour coated with silicon modified polyester coating of dry film thickness (DFT) 20 micron (min.) of approved colour shade over primer. Inner face of the sheet shall be provided with suitable pre-coating of minimum 7 micron off-white colour. The inner paneling will be of PVC coated 2 mm thick aluminium sheet, fixed over an inlay of 4 mm marine plywood. 100 mm thick polyurethane insulation will be used between the outer and inner walls (Pre-coated MS sheet and Marine plywood) as insulating material. Z spacers if required shall be made out of at least 2 mm thick galvanized steel sheet of grade 275 as per IS:277

1.5 Floor: The floor will be laid in frame of 600 x 600 mm centre to centre with 50 x50 x 6 mm MS angle. The floor surface will be of 19 mm marine plywood covered with robust quality Vinyl flooring, 2 mm thick of approved colour. The floor should be of acid and alkaline resistant, waterproof, easily cleanable / washable. Bottom plate of thickness 2 mm hot dipped galvanised MS Plate shall be provided.

1.6 Outer Door: One door of size approx. 2000 x 900 mm will be provided at the front side (L = 4200 mm) of the station with isolated 3 – point locking & door handle flush fitted.

1.7 Electric Power Supply: The supply mains with electrical meter will be provided by the WBPCB within 5 mtr. of the installation of the CAAQM station. The bidder has to arrange drawing the power from this supply to the station where three-phase (3 Ø) electrical wiring will be laid in ducts. Copper wiring of appropriate gauge will be used. The terminal board should be mounted in a central power distribution box. Over voltage protection (e.g., appropriate earthing) for each phase shall be provided along with the lightning arrestor for the container. 2 numbers Emergency cut off switch & Thermostat

switch (35^0 C) for power disconnection, 6 free sockets and 3 fluorescent lamps for lighting will be provided. The station shall be properly grounded with chemical earthing or as per BIS Standards with proper plate and only copper strip at-least on 2 corners (diametrically opposite). One three phase energy meter (Digital Type) shall be installed. Weatherproof cubicles / enclosure for housing of MCB / TP & N Switch of main power termination (outside shelter) and weatherproof telephone junction box for terminations of telephone line are to be provided. Proper earthing for telescopic mast of meteorological system shall be provided. There should be conduction between the telescopic mast of the meteorological system and the station. The guy ropes or wires shall be provided for supporting the mast.

1.8 The housing will be partitioned as per drawing to create space for storing of gas cylinders, Meteorological mast & UPS. The size will be 2000 x 1400 x 2300 mm. A lockable door of size 900 x 2000 mm along-with 3 – Point locking system shall be provided on the outer wall of the housing. A 300 mm, single-phase (230 volts ± 10 volts AC and 50 Hz ± 3%) exhaust fan with safety grills will be provided. Mounting brackets in 2 levels for fixing of at-least 06 (six) gas bottles should be provided. Arrangements are to be made for auto switch off of the internal lights in case the station is left with the internal lights switched on.

Air conditioners shall be mounted on proper rust proof supporting structures with rubber blocks to avoid vibration of structures. Proper caging / grill should also be provided for the safety of ACs. Sun shades for external AC units shall be provided with fabricated pre-coated MS sheet (same as monitoring station) with supporting arrangements. AC unit's external piping shall be placed in GI trays. Cable trays fixed on exterior wall shall be covered with pre-coated MS sheet, of same colour shade of monitoring station. Roof top sheet to be levelled and sloped properly. Rain water spout shall be fixed at top with rain water down pipe at two corners. The external lights of the station should be **Solar operated**.

This paragraph is regarding the design of the container, and is only a sketchey one. The dimentions provided (including the drawings) are minimal ones. Individual bidders are to propose details on these items.

1.9 Station Furnishing:

(i) 19" racks – 3 Nos.

(ii) Fire extinguishers – 2 Nos.

(iii) Furniture:

a) Material - Furniture made of water resistant laminated board

b) Cupboard – As per drawing

c) Working table – Powdered coated MS frame size 1400 x 900 x 750 mm (w x d x h) and top 19 mm thickness Board

d) Revolving tilting chair – 2 Nos.

(iv) Miscellaneous

a) The exhaust gases from the analyser should be collected and discharged by a common exhaust pipe and vented.

b) Folding aluminium ladder for roof access

c) Thermometer for measuring the temperature of the station

d) Hygro Meter for measurement of Humidity inside the station

e) Mounting bracket for the ladder

f) No smoking stickers

g) Vacuum cleaner of reputed make with minimum 100 watt power

h) Tool Kit having following tools:

1. One screw driver set
2. One multi-meter (Philips, Mico make)
3. One box spanner set
4. One D spanner set
5. One watch maker set
6. One Hammer set
7. One precision screw driver set
8. One pliers set
9. One Tong tester

i) One Emergency LED Cluster light

j) Sign boards along-with logo of Central Pollution Control Board, Delhi / State Pollution Control Board, to be embedded with size 1500 x 900 mm on the front of the container and on the two side of the container, The name of the Station i.e. Continuous Ambient Air Quality Monitoring Station, (Location) both in English and Hindi or local language to be inscribed. The Signs boards to be mounted on the station with proper spacers.

1.9.1 **Container Foundation (RCC, at 1000 mm from ground)**

L X W 6000 x 6000 mm

Height 1000 mm from ground

Pillars: Nine concrete pillars of 1000 mm above the ground level and below the ground level with 200 x 200 mm beam and between pillar bricks to be used for filling the space. Outer wall of the foundation to be plastered with 1:4, Cement : Sand ratio and same has to be painted with weather proof coat.

Top of the platform: RCC 150 mm with concrete ratio of 1:1:2 and to plastered and covered with floor tiles.

Staircase: Staircase to approach the main door of the container and the UPS / Gas room door in the side to be provided and each step should not be more than 150 mm

1.9.2 **Container Foundation (RCC, at 4000 mm from ground)**

L X W 7400 x 6900 mm

Height 4000 mm from ground

Pillars: Nine concrete pillars of 4000 mm above the ground level and below the ground level with 200 x 200 mm beam and between pillar bricks to be used for filling the space. Outer wall of the foundation to be plastered with 1:4, Cement : Sand ratio and same has to be painted with weather proof coat.

Top of the platform: RCC 150 mm with concrete ratio of 1:1:2 and to plastered and covered with floor tiles.

Staircase: Staircase to approach the main door of the container and the UPS / Gas room door in the side to be provided and each step should not be more than 150 mm

1.9.3 **Container Foundation (RCC, at roof top)**

L X W 6000 x 6000 mm

Height On roof top

Pillars: Nine concrete pillars of 300 mm above the roof top with 200 x 200 mm beam and between pillar bricks to be used for filling the space. Outer wall of the foundation to be plastered with 1:4, Cement : Sand ratio and same has to be painted with weather proof coat.

Top of the platform: RCC 150 mm with concrete ratio of 1:1:2 and to plastered and covered with floor tiles.

Staircase: Staircase to approach the main door of the container and the UPS / Gas room door in the side to be provided and each step should not be more than 150 mm

The bidder may be required to construct a room of same dimension of the container on the roof top at such height and all works in relation to such construction is to be assessed in this item.

2.0 AIR CONDITIONER

2.1 Type: 3 Nos. split type, roof mounted of 5 star rating with an automatic timer. Separate Voltage stabilizer will be provided with each unit.

2.2 Capacity: 2.0 Ton (2 Nos.) and 1.5 Ton (1 No.). The indoor units should be running alternately at an interval of four hours with timer control and the

temperature inside the station should be maintained at 25^0 C inside during peak summer months.

2.3 Nominal Cooling: Btu /hr – 24000, Kcal / hr: 6000

2.4 Fan type: Propeller Fan

2.5 Fan Motor type: Permanent Split Capacitor, 1/8 Horse power

2.6 Control Type: Remote

2.7 Compressor: Reciprocating

2.8 Refrigerant: Eco Friendly

2.9 Power supply: 230 volts ± 10 volts AC and 50 Hz ± 3%.

3.0 ON LINE UNINTERRUPTED POWER SUPPLY (UPS)

3.1 Three phase 15 kVA UPS along with Automatic Delayed Restoration Device (ADRD) with 1 hour backup in full capacity should be provided for the smooth operation of one 2 Ton capacity split AC at the station.

3.1.1	Capacity		:	15 kVA
3.1.2	Technology		:	PWM using IGBT / MOSFETS
3.1.3	Crest Factor		:	More than 3: 1
3.1.4	Input	Voltage	:	430 V AC, 3 phase
		Voltage Range	:	± 25%
		Frequency	:	50 Hz ± 3%
3.1.5	Output	Voltage	:	Bidders' choice
		Voltage regulation	:	± 1%
		Frequency	:	50 Hz
		Frequency regulation	:	± 0.01%
		Waveform	:	Pure sine wave
3.1.6	Battery	Battery type	:	Sealed maintenance free
		Back up time	:	1 Hour at full load
		Battery Capacity	:	For required backup time
		Recharge time	:	5 hrs to 90% after complete discharge
3.1.7	Distortion		:	Less than 1% on linear load
3.1.8	Power factor		:	0.9 to 1
3.1.9	Indicator		:	L.E.D. – Battery Charge, Load level, on Line, over load, on battery, replace battery
3.1.10	Alarm		:	Audible alarm for battery backup, battery low, and fault
3.1.11	Protections	Surge	:	Surge suppression meets BIS or International standard
		Overload	:	Fuse & current limited
		Short circuit	:	Fuse & current limited & cut – off
		Battery low cut – off	:	No battery drain after cut - off
3.1.12	Overload Capacity		:	110% for continuous load
3.1.13	Efficiency		:	More than 90%
3.1.14	Environment	Operating Temperature	:	0 – 50^0 C
		Operating Humidity	:	10% to 95% (Non condensing)
		Audible Noise	:	Less than 45 db (at 1 meter)

4.0 AIR QUALITY ANALYSIS SYSTEM

(CO, SO_2, NO_x, NH_3, BENZENE, PM_{10}, $PM_{2.5}$ and O_3 Analysers)

(General Specifications for all Analysers)

4.1 The analysers should be 19" rack mounting model with facilities for fixing the analysers from front side.

4.2 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.

4.3 The analysers should operate at operating voltage 230 volts $\pm$ 10 volts AC and 50 Hz $\pm$ 3%. 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.

4.4 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%.

4.5 The Manufacturer shall provide minimum of 2 weeks of operational & preventive maintenance hands-on training for 6 persons of WBPCB

4.6 The analysers should be complete with calibration system. The calibration system should be delivered along-with respective span gas cylinders. The span gas concentration should be within 60 – 90% of first 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.

4.7 The calibration gases provided with the system shall have Traceability to NIST.

4.8 The analysers 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 analysers should be provided before solenoid valve to protect frequent chocking of solenoid valve.

4.9 The connector systems for out-going signal for recording and the computer terminal should be on back panel with screw type connecting pins.

4.10 All ambient gas analysers shall conform with the USEPA automated reference / TUV / EN or equivalent method designation as required by the specification for individual equipment / parameters. However, certificate of approval from USEPA is required for parameters covered by them.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 WBPCB AND CPCB websites). All analysers shall be micro – processor controlled with automatic calibration using an external dilution calibrator and calibration standards. All analysers and sensors should be fully integrated in the rack cabinet, fully calibrated & tested before supply and ready for start – up at the respective sites. Analyzer must exhibit performance equal to or better than values specified in the Calibration & test certificate provided with each analyzer.

4.11 The manufacturer shall specify the cross sensitivity of measurement for all the analyzers.

4.12 Each set of analyzers shall be supplied with two copies of elaborate operation manuals comprising details in three parts:

Parts (I) should comprise installation, operational and trouble shooting 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; and

Parts (IV) Schematic diagram for possible repair & maintenance.

4.13 Digital Output:

a) Multi drop RS 232 port shared between Analyzers, Dust Monitor ($PM_{2.5}$ & PM_{10}), Meteorological Sensors and computer for data, status and control.

4.14 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 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 analyzers and meteorological sensors
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 analyzers shall conform to US EPA methodologies and shall include daily calibration checks, biweekly 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 Buyer along with the Air Quality Data.

Air Quality Data shall be submitted to the Buyer on a monthly basis in the form of an Air Quality Report. This report shall include tabular and graphic information on gas and dust concentrations as well as meteorological data for each site. The data shall be reported in the form of 15 minute averages and shall also 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 Buyer, once per year, the supplier 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 the supplier and Buyer.

5.0 SPECIFICATIONS OF SAMPLING SYSTEM

A suitable sampling system as specified by USEPA 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 measurement.

Gases sampling system:

5.1	Height of the sampling system:	Approx. 1.0 meter above the roof
5.2	Roof entry cut out:	Stainless Steel
5.3	Conduit:	Stainless Steel
5.4	Inner sampling system:	Borosilicate glass
5.5	Sampling head:	Stainless Steel
5.6	Manifold:	10 port for tubes 6 x 1 mm, self-tightening

6.0 SPECIFICATIONS OF 19" RACK

Suitable 19" Rack cabinet to accommodate all analyzers, calibrators, Zero air generators, data logger etc. The dimension of the rack without doors, with aluminum 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 eyebolts. 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 with anti-vibration pads. All nuts and bolts shall be cadmium coated.

7.0 AMBIENT AIR QUALITY MONITOIRNG ANALYSERS

(A) AMBIENT OXIDES OF NITROGEN (NO-NO_2-NOx) ANALYSER Conforming to USEPA Automated Federal Reference Method (FRM) Designation

01.	Principle	:	Chemiluminiscence
02.	Measurement	:	NO / NO_2 / NO_x in Ambient Air
03.	Display	:	Digital
04.	Ranges	:	Auto ranging 0-2000 PPB
05.	Minimum Detectable Limit	:	1 PPB
06.	Noise Level	:	0.5 PPB
07.	Zero Drift	:	< 1 PPB/24 Hrs.
08.	Span Drift	:	< 2% in 15 days of full scale
09.	Response Time	:	30 seconds or earlier
10.	Linearity	:	± 1% of full scale
11.	Calibration	:	Please see Multi-calibration section (Sl. No. J) and also calibration section in General Specifications (4.6 & 4.7).
12.	Output Signals or Analog Output	:	3 Analog output 0 – 1 V, 0 – 10 V, 0 – 20 mA or 4 – 20 mA
13.	Digital Output	:	Multi drop RS 232 port

(B) AMBIENT AMMONIA ANALYSER (NH_3)

01.	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
02.	Measurement	Ammonia in Ambient Air
03.	Display	Digital
04.	Ranges	Auto ranging 0-1000 PPB
05.	Minimum Detectable Limit	1 PPB
06.	Noise Level	0.2% of reading
07.	Zero Drift	< 5 PPB /24 Hrs.
08.	Span Drift	< 2% in 15 days of full scale
09.	NH_3/NO converter	Quartz at approx 1000^0 C
10.	Linearity	± 1% of full scale
11.	Response time	180 second
12.	Calibration	Please see Multi-calibration section (Sl. No. J) and also calibration section in General Specifications (4.6 & 4.7).
13.	Rise / fall Time 95% of the final value	< 30 Sec
14.	Digital Output	Multi drop RS 232 port
15.	Analog Output	0 – 1 V, 0 – 10 V, 0 – 20 mA, 4 – 20 mA

Oxides of Nitrogen analyzer with Ammonia converter will do.

(C) AMBIENT SULPHUR DIOXIDE (SO_2) ANALYSER Conforming to USEPA Automated Federal Equivalent Method (FEM) Designation

01.	Principle	:	Pulsed UV Fluorescence
02.	Measurement	:	Sulphur Dioxide in Ambient Air
03.	Lower Detectable Limit	:	1 PPB
04.	Ranges	:	Auto ranging 0 - 500 PPB
05.	Display	:	Digital
06.	Noise Level	:	0.50 PPB or 1% of the reading
07.	Zero Drift	:	< 1 PPB / 24 Hrs. With automatic zero compensation
08.	Span Drift	:	< 2 PPB full scale in 15 days
09.	Calibration	:	Please see Multi-calibration section (Sl. No. J) and also calibration section in General Specifications (4.6 & 4.7).
10.	Precision	:	0.5 ppb or 1% reading whichever is greater
11.	Output Signals or Analog Output	:	3 Analog output 0 – 1 V, 0 – 10 V, 0 – 20 mA or 4 – 20 mA
12.	Digital Output	:	Multiple drop RS 232

(D) AMBIENT OZONE (O_3) ANALYSER Conforming to USEPA Automated Federal Reference Method (FRM) Designation

01.	Principle	:	UV Photometric
02.	Measurement	:	Ozone in Ambient Air
03.	Display	:	Digital
04.	Range	:	Auto ranging 0 - 500 PPB
05.	Minimum Detectable Limit	:	2.0 PPB
06.	Noise	:	$\pm$ 1.0 PPB
07.	Zero Drift	:	< ½% per month
08.	Span Drift	:	< 1% per month
09.	Calibration	:	With built in Zero and span generator and also see Multi-calibration section (Sl. No. J)
10.	Linearity	:	Continuous $\pm$ 1%
11.	Output Signals or Analog Output	:	3 Analog output 0 – 1 V, 0 – 10 V, 0 – 20 mA or 4 – 20 mA
12.	Digital Output	:	Multiple drop RS 232

(E) AMBIENT CARBON MONOXIDE (CO) ANALYSER Conforming to USEPA Automated Federal Reference Method (FRM) Designation

01.	Principle	:	Non Dispersive Infra-Red (NDIR) with Gas Filter Correlation
02.	Measurement	:	Carbon Monoxide in Ambient Air
03.	Display	:	Digital
04.	Ranges	:	At least four ranges Auto ranging 0 - 100 PPM.
05.	Minimum Detectable Limit	:	0.1 PPM
06.	Zero Noise	:	0.05 PPM with time constant $\pm$ 30 seconds
07.	Zero Drift	:	< 0.2 PPM/7 days
08.	Span Drift	:	< 1% full scale in 24 hrs.
09.	Calibration	:	Calibration gas (CO) cylinder – 10 liters capacity. A Highly polished aluminum cylinder portable filled with 40 PPM NIST traceable Calibration gas has to be provided along-with the instrument for calibration purpose. It should also have pressure gas valve for Zero and Span gas.
10.	Linearity	:	Continuous $\pm$ 1%
11.	Output Signals or Analog Output	:	3 Analog output 0 – 1 V, 0 – 10 V, 0 – 20 mA or 4 – 20 mA
12.	Digital Output	:	Multiple drop RS 232

(F) PM_{10} MONITOR Conforming to USEPA Automated Federal Equivalent Method (FEM) Designation

Based on the principle of β-ray attenuation by particulate sampled through the instrument and collected on fiberglass filter tape. Before and after sampling β-ray radiation is measured by scintillation / G.M. counter. An internal microprocessor handles all sequences and automatically calculates the concentration of SPM.

01.	Principle	:	Continuous measurement of PM_{10} in ambient air
02.	Particle Size Cut Off	:	0 - 10 Microns
03.	Measuring Range	:	0 to 2000 $\mu g/m^3$
04.	Resolution	:	1% of the concentration
05.	Minimum Detectable Limit	:	2 $\mu g/m^3$
06.	Detector	:	Plastic Scintillator / GM Counter, Silicon Semiconductor Beta Detector
07.	Air Flow Rate	:	At - least 1.5 m^3 / hrs. (Adjustable to 1 m^3/hr)
08.	Filter Material	:	Glass Fiber Filter
09.	Display	:	LED / LCD
10.	Sampling Head	:	Dynamic heated sampling head for measurement of PM_{10}, with adjustable temperature 20 – 70 ^0C
11.	Calibration	:	Reference membrane facility should be provided for calibration of analyser.
12.	Compatibility	:	Analyser should be compatible with protocols mentioned in DAS section
13.	Roll Length	:	Approximately 30 meters
14.	Measurement Result	:	1 hr average or shorter

(G) $PM_{2.5}$ MONITOR Conforming to USEPA Automated Federal Equivalent Method (FEM) Designation

Based on the principle of β-ray attenuation by particulate sampled through the instrument and collected on fiberglass filter tape. Before and after sampling β-ray radiation is measured by scintillation / G.M. counter. An internal microprocessor handles all sequences and automatically calculates the concentration of SPM.

01.	Principle	:	Continuous measurement of $PM_{2.5}$ in ambient air
02.	Particle Size Cut Off	:	0 – 2.5 Microns
03.	Measuring Range	:	0 to 1000 $\mu g/m^3$
04.	Resolution	:	1% of the concentration
05.	Minimum Detectable Limit	:	2 $\mu g/m^3$
06.	Detector	:	Plastic Scintillator / GM Counter, Silicon Semiconductor Beta Detector
07.	Air Flow Rate	:	At - least 1.5 m^3 / hrs. (Adjustable to 1 m^3/hr)
08.	Filter Material	:	Glass Fiber Filter
09.	Display	:	LED / LCD
10.	Sampling Head	:	Dynamic heated sampling head for measurement of $PM_{2.5}$ with adjustable temperature 20 – 70 ^0C
11.	Calibration	:	Reference membrane facility should be provided for calibration of analyser.
12.	Compatibility	:	Analyser should be compatible with protocols mentioned in DAS section

13. Roll Length : Approximately 30 meters
14. Measurement Result : 1 hr average or shorter

Or

(H) Ambient Particulate Monitor based on the principle "Tapered Element Oscillating Microbalance" (TEOM) Conforming to USEPA Automated Federal Equivalent Method (FEM) Designation (EQPM-0609-182)

SPECIFICATIONS

TEOM 1405-DF Ambient Particulate Monitor 1405DF = Dual TEOM w/ FDMS

Regulatory Designations

- U.S. EPA approved PM-2.5 equivalent monitor (EQPM-0609-182)
- Menu-driven software for user interaction via 1/4 VGA display with touch screen
- Connecting and Interface Cables, and Vacuum Pump
- Consumables for average three year's operation (ambient)
- RPCOMM and ePort Software for Local or Remote Communication

Instrument Performance (3 l/min, 1s, stable conditions)

- Measurement Range: 0 to 1,000,000 µg/m³ (1 g/m³)
- Resolution: 0.5 µg/m³
- Precision: ±2.0 µg/m³ (1-hour average), ±1.0 µg/m³ (24-hour avg.)
- Accuracy for Mass Measurement: ±1%

Data Averaging and Output

- Real-time Mass Conc. Average: 1 hour rolling average updated every six minutes
- Long-Term Averaging: 1, 8, and 24 hr
- Data Output Rate: selectable from 10 sec to 24 hour

Operating Range

- The temperature of the sampled air may vary between-40 and 60 °C. The TEOM Sensor and Control Units must be weather protected within the range of 8 to 25 °C. An optional Complete Outdoor Enclosure provides complete weather protection.

Sample Flow

- Activol flow control system uses the mass flow sensors and the measured ambient temperature and pressure to maintain constant volumetric flow rates.
- Main Flow Rate: Fine PM filter: 3.0 l/min; Coarse PM filter: 1.67 l/min
- Bypass Flow Rate: 12.0 l/min

Data Storage

- Internal data logging of user-specified variables; capacity of 500,000 records.

Filter Media

- Sample Filter: Pallflex TX40, 13 mm effective diameter
- Sample Conditioner Filter: 47 mm diameter housed in an FRM-style molded filter cassette, maintained at 4°C. Suitable for collecting and archiving time-integrated PM samples for subsequent laboratory analysis.

Sample Conditioning

- Sample Equilibration System (SES) dryer lowers the main flow relative humidity and allows for mass transducer operation at 5°C over the peak air monitoring station temperature
- Purge Filter Conditioner contains a heat exchanger that maintains the temperature of the main flow and particle filter at 4°C to efficiently filter the volatile and non-volatile PM in the sample.

Data Output and Input

- ePort software to view and change system operation from PC
- Touch screen user interface
- Ethernet with embedded FTP server, USB, RS232, RS485
- 8 User-Defined Analog Outputs (0-1 or 0-5 VDC)
- 2 User-Defined Contact Closure Alarm Circuits
- 4 Averaged Analog Inputs (0-5 VDC) with user-defined conversion to engineering units

(I) BENZENE MONITOR / ANALYSER

1.0 GENERAL

A complete monitor / analyzer system including continuous automatic sampling (pump etc.), sampling, analyzer, detector, 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. Compatible to power supply (voltage 230 volts ± 10 volts AC and 50 Hz ± 3%). Continuous unattended measurement system of individual BTEX should work without cryogenic cooling. System should have protocol compatible to communicate & transfer data to main computer through modem and subsequently to CPCB/SPCB website preferably having features of security, data validation & alarms etc. 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**.** In cases of Benzene analyzer, if USEPA approval is not available, TUV or EN approval will do. A separate high purity nitrogen cylinder with double stage regulator is to be supplied with each Benzene analyzer.

2.0 TECHNICAL SPECIFICATIONS

2.1 AUTOMATIC SAMPLING (MONITOR) with 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 – one liter or more of ambient air over a 10-15 min sampling cycle. All sample transfer tubing's should be in stainless steel flow / pressure sensor to be preferred with digital display. Sample volume should be controlled by flow controller (dust protected) with volume measurement saved in memory.

2.2 DETECTOR

Photo Ionization Detector (**PID**) or other equivalent detector **as per EPA/EU/TUV** approved specs, 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.

2.3 MINIMUM SPECIFICATIONS

Lowest detector limit	:	0.1 $\mu g/m^3$ (0.03 ppb) or less for Benzene (There should be no interferences on Methyl-cyclopentane, 2, 2, 3 - trimethylbutane, 2, 4 - dimethylpentane, Tetrachloromethane, Cyclohexane, 2, 3 - dimethylpentane, 2 - methylhexane, 3 - ethylpentane , Trichloroethylene, n - heptane, isooctane with BENZENE components.)
Temperature Range	:	5 - 35^oC or more
Measuring Range	:	1 - 1000 µg / m^3 or better (0.3 ppb to 270 ppb)
Repeatability	:	Retention Time : <0.1% RSD Amount : <1.0% RSD
Typical Cycle Time	:	Total Cycle Time should not exceed 15/30 min. approx. i.e. Sample Collection Time - 15 min. approx. Analytical Time – 15 min. approx.

2.5 CALIBRATION UNIT WITH SPAN GAS / IN BUILT CALIBRATION WITH /PERMEATION TUBEs AND GAS MIXING / DILUTION FACILITY

Bidder is to propose the calibration system of this analyzer in detail. The calibration is to be established and continued with NIST traceable calibration gas for Benzene at appropriate concentration.

2.6 MEMORY AND CONTROL FACILITIES

Method auto load and system restart after power failure. Methods storage capacity with timed events programs for control of system parameters in permanent memory.
Diagnostics & Fault status; gas supply (low press). System stability (temperature and sample flow). Detector signal (low) and communication should be in digital form on monitor by LED's & be controlled from computer.
Output signals: Analog 0-1 mV, Serial RS 232 for data intermission and CP-BUS for monitor control from remote. Both digital & analog outputs should be available.

2.7 Hardware/Software(s)

Latest PC with operating system/software. Basic Window based latest software's (English version) consisting instrumental control features as well as data storage, acquisition, processing and handling in desired/customized format including sorting of data (1 / 4 / 8 / 12 / 24 hourly, days wise /date wise reporting as microgram / m^3 or ppb (selectable) & averaging, data capture rate s etc.).

Data presentation / graphical & statistical processing & data transfer to Excel including time series, correlation matrix etc. is required.

Communication software with protocol compatible to communicate & transfer data from BENZENE monitor to central computer through modem (preferably including sample chromatogram) and from central computer to WBPCB and CPCB servers and website preferably having features of security, data validation & alarms etc.

System should have remote access to BENZENE monitor.

Resident program as well BENZENE control / monitor user program with monitor startup / off / status, blank / calibration and sample gas measured, fault status, carrier gas if any, and communication errors indications. Updation of response factors automatically after calibration run. Auto tune facility. Raw data storage capacity without erase minimum for three month or more.

(J) MULTICALIBRATION SYSTEM

Calibration system should provide for the calibration of the air quality analysers, data acquisition system, meteorological equipment, and gas calibration system. This calibrator should have two (2) mass flow calibrators. One dedicated zero air generator is to be supplied with each multi point calibrator for each station. One dedicated zero air generator is to be supplied with each multi point calibrator for each station. The cost of each such item is to be compounded with the calibrator.

a) Gas Calibration System:

The calibration system for air monitoring equipment (listed above) should incorporate an automatic gas dilution calibrator, calibration gas standards and a high performance zero air generator to calibrate all of the analysers in the system. The calibration cycles should be able to be configured through the Data Acquisition System at any specific time during the day and 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 concentrations and minimising the number of calibration gas standards required. All the calibration gases provided along-with the system MUST be NIST Traceable (certificate should be provided). It should have facility for Gas Phase titration (GPT), having Ozone generator of 6 PPM / Liters and the converter efficiency should be 100 % for conversion of NO_2 concentration to NO.

The system should also include calibration of Ozone analyzer.

b) Meteorological, Flow and Electronics Calibration

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

8.0 METEOROLOGICAL MONITORING SYSTEM

The meteorological instrumentation should be interfaced directly with the Data Acquisition System after passing through a lightning protection isolation box. A crank - up telescopic 10 meters tower should be erected for mounting of meteorological sensors. The relative humidity and solar radiation sensors should be mounted on the tower. All sensors should be NIST (National Institute for Standards and Technology, USA) traceable. The specifications are follows:

(a) WIND SPEED

Range (Operation)	:	0 – 60 m/s or better
Sustainability	:	Up-to 75 m/sec
Accuracy	:	± 0.5 m/sec or better
Resolution	:	0.1 m/sec
Sensor Type	:	Ultrasonic
Threshold	:	0.5 m/sec or less
Response time	:	10 sec or better

(b) WIND DIRECTION

Range	:	0 – 359 degree
Accuracy	:	± 5 degree or better
Resolution	:	1 degree
Sensor type	:	Ultrasonic
Threshold	:	0.5 m/sec or less
Response time	:	10 sec or better

(c) AMBIENT TEMPERATURE

Range	:	-10 ° C to 60 ° C
Accuracy	:	± 0.2 ° C or better (with radiation shield)
Response	:	10 seconds in still air

Sensor type	:	Resistance type
Response time	:	10 sec or better

(d) RELATIVE HUMIDITY

Range	:	0 to 100% RH
Accuracy	:	± 3.0 % or better
Resolution	:	1%
Sensor type	:	Capacitive / Solid State
Response Time	:	10 sec or better

(e) SOLAR RADIATION

Range	:	0 to 1500 W/m^2 or better
Accuracy	:	± 5.0 % or better
Resolution	:	$5W/m^2$

(f) RAINFALL

Range	:	0.2 mm to 100 mm /hr
Accuracy	:	± 5% or better
Resolution	:	0.2 mm
Sensor type	:	Tipping bucket rain gauge or any other suitable sensor
Response Time	:	10 sec or better

(g) TELESCOPIC CRANK – UP METEOROLOGICAL TOWER

The wind speed, wind direction, temperature, relative humidity and solar radiation sensors are to be mounted on the Meteorological Tower. The tower is to be a free standing four section telescopic tower provided with a hand crank to raise and lower the instruments mounted on the tower. Specifications are as follows:

Extended Height	:	10 meters
Retracted Height	:	2 metres
Wind load Limit	:	0.7896 sq. m. (8.5 sq. ft) at 50 mph
Number of Sections	:	4
Construction material	:	Galvanised steel or aluminium

Note: Humidity and temperature sensors are to be supplied with weather and thermal radiation shield made of anodized aluminium and sensor should be supplied with all necessary cables, connector and mounting arrangements as required.

(h) SPECIFICATIONS OF DATA LOGGER

Detail specification of the Data Logger is to be provided by the Bidder.

9.0 SPECIFICATION OF SOFTWARE FOR CAAQMS.

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A DATA ACQUISITION SYSTEM IN THE STATION

SPECIFICATIONS OF STATION SOFTWARE

The station software captures data from all channels in the system and stores in the Personal Computer. Personal computer is used for calibration and configuration of each channel.

1) Data Acquisition

a) Frequency of data acquisition
   i) User selectable 1, 5, 30, 60, 120 second averaging duration online digitally.
b) Channel size
   i) 32 Channels or more supported
   ii) Expandable to 64 channels, if required in future
c) Data input
   i) Either Analog (0-1 volt / 0-10 volt / 2-20mA / 4-20mA)
   ii) Or Digital (firm will develop the protocol, if required without additional cost within project duration) to configure with the PC.
d) User configurable channels, stations and equipments with communication parameters.
e) Analyzer data channel should comprise of Name, Units, Communication Address, Validity Range, Operation and Error Status.
f) Provision to incorporate conversion factors such as PPB to $\mu g/m^3$ etc.
g) Software should be equipped to configure the analysers with it, irrespective of the output mode i.e. Analog or Digital (RS 232) of the instrument.
h) System should read raw data values of the analyzers and meteorological instruments and duration of averaging data should be user selectable like 10 / 20 / 30 / 40 / 50 / 60 seconds.
i) The output should be converted into realistic data in prescribed units.

2) Data Collection

a) Software should collect each second data.

b) Average data over user selectable time (1, 5, 30, 60 seconds time interval) period.
c) Operational status, Error status, calibration status and calibration values observed from the analyzer should be captured and should be made available along with the data with a frequency of maximum five minutes.
d) System should collect of the diagnostics of the instrument comprising actual diagnostics parameters and their values at least once in every five minute to check the state of the health analyzer.
e) Calibration parameters
    i) Provision to entering calibration, span calibration values of gas cylinder/permeation to devices
    ii) Provision for collecting zero calibration, span calibration values(pre calibration & post calibration) in to the database for further analysis.
    iii) Provisions to collect electronic system pre calibration & post calibration to ascertain the percentage deviation/ correction apply during each calibration.

3) Data Storage

a) Data along-with diagnostic, calibration, alarms should be stored at station computer at a defined path.
b) Interval of data dumping will be same as defined in the data collection
c) System should be capable to keep every second acquired data from 32 channels for a period of minimum five years.
d) Data stored should be plain text format
e) No data encryption should be done at the station and if encryption is done than decryption procedure should be made available in soft file format to check the data at station at any point of time. To convert data on continuous basis for exporting to any other software, if required, procedure should be available without any licensing.

4) **Data Display (Statistical analysis of data)**

a) In 4-in-4 graphs, 4-in-1 graph and / or 16-in-1 graph formats
b) In terms of 4-in-1 table format
c) Real time multi – graphs over user selectable time period.
d) Display of graphic & tabular display of the current data.
e) Graphical form should comprise of 4-4 graphs, 4-1 graphs in user defined format i.e. 1, 5, 10, 15, 30 min, 1hour, 4, 8, 24 hour, 30 days and yearly. (user definable time series)
f) Tabular form should comprise of 4 channel list in user defined format i.e. 1, 5, 10, 15, 30 min, 1hour, 4, 8, 24 hour, 30 days and yearly. (user definable time series)
g) Station instruments basic configuration etc. should be visible on screen continuously.
h) Main window for real time display of all measured parameters with status of all analyzers/sensors.
i) Statistical analysis tools like regression analysis, co-relation analysis and other analysis as per industry standards in the field of environment should be available and if not the firm should develop these for WBPCB AND CPCB within a time frame.
j) The system should have procedures for normal analysis tools like calculation of data with respect to a threshold value, average, minimum, maximum, calculation of violating value with respect defined values (Air Quality Standards) for defined period for the database etc.
k) Data analysis of diagnostics parameters
l) Data analysis of Pre calibration and post calibration data (if facility not available can be developed)

m) Data analysis of corrections applied of each calibration cycle (if facility not available can be developed)

5) Data Backup

a) There should be defined data backup procedure through which data can be extracted from station computer in simple text format / excel (user definable).
b) There should be defined restore procedure also to restore the data in case of data loss.
c) A display screen should be available to update the user about data availability.

6) Data Validation automatic checks at station software

a) Zero level and span level checks if performed cyclically and defined results are not obtained up to +/- 5% (user definable 0-10%) then system should alarm the user of system failure and the recorded alarm should be transmitted to central software.
b) After instruments perform the calibration the results obtained should be recorded and should be transmitted to central computer.

7) Data validation requests generated at station computer

At least three tier request generation and request acceptance system procedure is desired. Details are given in the **Annexure –I**.

a) Inbuilt checks capability may be provided, where if instrument throws erratic data software can check automatically and display message and send information in the form of corrected data in corrected database to be approved by the central software at central level. (facility if not available needs to be developed by the system provider)
b) There should be provision of two databases one is raw database and another corrected database. (facility if not available needs to be developed by the system provider)
c) Validation of data through calibration database Pre calibration & post calibration values collected.

8) Calibration of systems

a. Calibration window for analyzer for the calibration from computer.
b. Remote Access to Calibration: Calibration exercise need to be done remotely. All necessary arrangements for it should be made in the system.
c. Calibration data file may be prepared separately.
d. Calibration database need to be formed, stored and transmitted to central.
e. Calibration cycles to be as per the models of the instruments.
f. Calibration records should store the calibration values displayed by instrument.
g. Diagnostics during calibration should also be recorded.

9) Location of station

a) Fixed Station location to be recorded
b) Moving station location to be recorded
c) Latitude and longitude of stations be recorded

10) Data transfer to Central System and Other Servers

All data captured at station computer should be transferred to central software.

a) User selectable time frame for transmission of data to central server.
b) Diagnostics (actual diagnostics parameter values recorded each time in the station), configurations(station channel configurations), alarms(generated alarms) should be transmitted.

c) The bidder has to ensure and facilitate online and real time transfer of data to the WBPCB AND CPCB server(s) as and when required and as per direction(s) of the WBPCB AND CPCB.

11) Data transfer to Display Boards

The system provider is responsible to make necessary software provisions to connect output on display boards. The formats of files may vary, the formation of defined formats is the responsibility of system provider for the project duration. Location of the display Board will be a prominant place within the city. GPRS assisted technology for data transfer to the Board is preferred.

a) Software should be capable to transfer and display online data on display board at the station location.
b) The data in user defined formats (customizable) should be made available for continuous display.

B DATA ACQUISITION SYSTEM AT THE CENTRAL STATION

SPECIFICATIONS OF CENTRAL SOFTWARE

Data communication system handles the data transmission of an ambient air quality network and receives incoming messages / signals from remote stations. The central software processes signals and data and displays it on the web and other interfaces. Detailed requirement is as below:

1) Software at Central Station

a) Software should not have any restriction on number of locations and computers either technologically or in terms of licensing.
b) Should display multiple stations on - line data (momentary values) in tabular text and graphic format.
c) Data should be received by the central from all locations within 5minutes duration or at user defined time intervals.
d) Data along-with diagnostics and calibration details should be transmitted at central from all connected locations.
e) Should support dialup systems, broadband connectivity, wireless connectivity, 2G or 3G or any new technology which shall be in place during project time should be compatible and if not need to developed by the system provider up-to project duration without additional charges.
f) Should have the remote control facilities for calibrations (Zero & Span) of instruments and measuring range modifications.
g) Should have facility for displaying data communication error reports, image management which should be recorded and should be available for display.

2) Data Display at Central Station

a) In 4-in-4 graphs, 4-in-1 graph and/or 16-in-1 graph formats
b) In terms of 4-in-1 table format
c) Real time multi – graphs over user selectable time period.
d) Display of graphic & tabular display of the current data like simple 3D line and column chart, polar diagnostics and 3D perspective column chart.
e) Graphical form should comprise of 4-4 graphs, 4-1 graphs in user defined format i.e. 1, 5, 10, 15, 30 min, 1hour, 4, 8, 24 hour, 30 days and yearly. (user definable time series)
f) Tabular form should comprise of 4 channel list in user defined format i.e. 1, 5, 10, 15, 30 min, 1hour, 4, 8, 24 hour, 30 days and yearly. (user definable time series)
g) Display of data using selectable name of different stations.

h) Generation of Wind Roses, Pollution Roses (12 & 16 directional i.e. 0 degree, 22.5, 45, 67.5, 90 and 360 degree) with user defined time limits.
i) Calculate vector mean of wind direction.
j) Programmable down loading of data.
k) Comparison of data w.r.t. Standards in Graphical form and tabular form with information of values exceeds the Standards.
l) Specific data zooming facility
m) Database correction procedure
n) Separate user ID and Password for correction of database so that all regional level users if authorized can validate their regions data and the events be recorded along-with ID and time.
o) Data validation trail recording.

3) Data Export

a) Customizable data format developing capability required.
b) Possibility to export the data files in Excel, Text and other formats Tabular form should be in user defined format i.e. 1, 5, 10, 15, 30 min, 1 hour, 4, 8, 24 hour, 30 days and yearly.
c) Compulsory and on-line and real time transfer of data from the central DAS to the Database of the WBPCB. This has to be complied as a precondition of commissioning.

4) Data Import

a) In case of communication medium phase there should a mechanism to shift the data into Pen drive (Physical medium for data collection) physically and a procedure to import the same on central software.

5) Printing

a) Possibility to connect different types of printers and auto printing facility for all displays generated throughout the analysis of data at any point of time.

6) Data Validation automatic checks at Central software

a) Zero level and span level checks if performed cyclically and defined results are not obtained up to +/- 5% (user definable 0-10%) then system should generate alarm the user of system failure and the recorded alarm should be transmitted to central software and stored. There should be provisions to read these alarms in a database for corrective actions and for comparison of data for acceptability or rejection.
b) After instruments perform the calibration the results obtained should be recorded and should be transmitted to central computer and stored.
c) There should be provisions to configure at least 08 alarms for any given instrument auto check.

7) Data validation requests management at central computer (if not available facility may be developed by the firm)

a) Data validation requests sent by station computer should be recorded and the system should provide a window to user to accept or reject the reasons mentioned by the user end.
b) Inbuilt checks capability should be provided, which can be configured by the administrator at central to put alarms according to requirement on data, errors generated or on diagnostics of systems.
c) The software at central should have facility to log in data validation requests. These requests will carry the erroneous data for user selected period and for which user at station will request to change the data due to environmental or instrumental operation conditions. These requests will reside in central location and whenever user at central agrees the data will be changed in the

validated database. Hence, system will have two types of databases 1) Raw database which can never be touched 2) which has to be modified and corrected as per agreed conditions. The detail of user requesting or applying changes in corrected database should be recorded with time.

7. Data Display at Web (**if not available facility may be developed by the firm**)

a) System should have standard web display software in place.
b) Central software should be capable to show the data in predefined formats at website on a physical map.
c) The data from Corrected database shall be displayed on the web.
d) Current data should be displayed on web page.
e) There should be provisions to show no. of violations occurred, percentage of violation occurred at stations parameters comparing hourly, 8 hourly, 24 hourly and yearly standards
f) Provision is required to change standard value, since standard values do change after certain period of time as per Govt. policy.
g) Displayed web page should have facility of providing information to all with respect to environment as well as to provide specific files for downloading.
h) The logo of both WBPCB and CPCB should be displayed on webpage.
i) The disclaimer have to be provided on the webpage
j) Some predefined queries have to be developed to display the data on web page. A search page needs to be developed for converting data into meaningful format for the general public. Help in developing such kind of systems can be taken from existing running system at www.cpcb.gov.in/caaqm and www.cpcb.gov.in/cpcbpa.
k) The current data displayed on the web should have comment inserting facility at individual data and for running data as well Iike if any station instrument out of order then station official should be able to display message "Instrument under maintenance".
l) Similarly, when data goes beyond a defined limit it should automatically display a predefined message as comment on webpage as "Data under Scrutiny".
m) Automatic e-mail messages to be generated for the identified end users to start a corrective action.
n) Station photos to be uploaded for the display along-with the data.
o) User defined 05 pages may be developed additionally, if required by WBPCB designs for which may be decided mutually.

9) Data display at display board outside the office at central location also

Data display is also required at regional and central locations for which software provision has to be made at each location.

10) Remote Procedures (**if not available facility may be developed by the firm**)

a) Central software should have capability to allow to connect any station instrument through remote.
b) Central software administrator should be able to go for remote calibration of any of the systems.
c) Software should be capable to operate remote stations configurations.
d) Control panel window should be available for controlling each analyzer.
e) Alarm window for valid alarms of all analyzers and sensors.
f) It should have transparent data – connection to each analyzer from remote.
g) System should be capable to remotely configure all stations through remote location using configuration file to maintain the uniformity. The configuration command from central or from regional location should be active.

11) Data Reports Generation

a) To prepare reports hourly, weekly, monthly, yearly in user defined interval and formats.
b) Mean, Median, Percentile, Maximum, Standard deviation, Frequency analysis and Maximum Frequency analysis.
c) System should have predefined user selectable procedures through which reports of any specific station or multi stations reports upto four parameters can be generated as per user selected time frame.
d) Data Comparison
Software should be able to compare any of the four channels irrespective of type of data in the system with respect to each other on a single time scale user selectable.
e) Data Comparison on different time scale
Software should be able to compare data on the basis of different time scales like one station (x) parameter (y) of one given date is compared with other station (z) parameter (y) on any other date in a single graph.
f) Data reports, calibration reports and status reports with user time periods.
g) Historic multi – curves / graphs over user selectable time period.
h) Report generation over user selectable time period (instantaneous or averaged over a period of 1, 15, 30 min, 1 hr, 4, 8, 12, 16 and 24 hrs etc.).
i) Diurnal variation, standard deviation, regression and other statistical parameter reporting possibilities with various available mathematical methods.
j) If required separate report generation procedures have to be developed for which firm will be responsible for project duration.

C. Compatibility

Should have compatibility with the latest Operating System with a contract of 05 (five) years from the date of supply of software for providing assistance to operate system at WBPCB and CPCB and all the new patches developed for the software during these 05 years without additional cost. Software should have capability of data transmission with the presently available PROTOCOL (list attached).

D. Security

a. System should have the facility to have it Password protected or without password as decided by WBPCB AND CPCB at the time of implementation.
b. System software should be totally secured and any antivirus software required to run the system for the complete project duration has to be managed by the system provider.

E. Other Technical Conditions

1. Hardware required for data transmission has to be made available by the firm and there should not be non-compatibility.
2. Firm should have the capability to develop the Software PROTOCOL for data transmission from any system available in the field in future during next 05 years or up-to the project period.
3. Should support the latest formats of Windows 32 bit or 64 bit or any other available platform like Linux etc.
4. Manual of complete system should be provided.
5. Firm should provide the hardware required for data acquisition along with all the software's required like OS, MS. Office, Networking software, Remote functionality software, Data uploading software on website, Data display software if required, and should maintain hardware for project duration.
6. Since, system has to be placed in NIC domain for which the web software developed along-with the database and web server software should be certified by CERT-IN empanelled vendors for vulnerability. The system provider is responsible for fulfilling all criteria required to place the system at NIC domain. The firm will be responsible for entire duration of the project for any vulnerability if noticed by NIC.
7. The computers required for the work to be supplied by the bidder. Scope of supply of computer lies exclusively with the bidder Details specifications of the system is to be provided by the bidder with bid document. Transfering of data (1) to the Central Server (to be supplied and installed through this project) at WBPCB head office and then to the WBPCB air quality web server database, (2) to the WBPCB AND CPCB server at Delhi and (3) to the server for National Air Quality Index are mandatory. Respective guidelines as available in the WBPCB AND CPCB web site are to be incorporated in the scope and implemented.
8. Scope of supply of the Display Board exclusively lies with the Bidder.

F. DETAILS OF DESIRED DATA VALIDATION SYSTEM

Annexure-I

At least three tier request generation and requests acceptance procedure is desired in the system. It is presumed that level 1 is station, level 2 is Central location at regional level and level 3 at Central level.

The regional and central levels will have central station computers and software installed and stations will have station computer installed with station data acquisition software and data transmission software.

The flow of data has to be from station to Regional Level and then to Central level. It is desired that environmental database has to be corrected for instrumentation issues as well as for the environmental issues. Hence, officials available at stations will communicate with central and state levels through system itself by commenting on the data. The respective data can be picked up from the database at station itself, corrected to the desired numbers and then transmitted to regional level central computer where, the administrator of system if agrees to the changes desired then data flows to the next level else request is rejected. If request will come to Central server for accepting or rejecting then central level should have authority of accepting or rejecting the data. If central level agrees to the changes than data should be changed in the corrected database else request should be rejected. Hence, there should be provisions for accepting or rejecting data at all three levels accordingly. Here, whenever such requests are generated, concerned administrators need to be sent email alerts.

G. List of protocols for which CAAQM software should support

Bayern-Hessen	Intercomp5	FH62 Konf.	ChemPro 100
Intercomp 6	Intercomp 1	PVM100	MultiPD II
LabCom	Metek USA-1	VC820	X am 7000
Unor, Oxor	AK R+P	TSI 30222/25	HG Monitor 3000
Defor	MBF	Blendmaster	ESM FH40G
Multor	Gemi	Klimet	Travelpilot DX-V
Adam Module	Uras 14 Modbus	Thygan	AK Conf.
CLD700	Binos1000	USA Turbulence	Thermo Instr.
FH62	HP34970A	Thies DL14/15	PR820R
Hygrowin	Almemo	Innova1312	PAC3
Gesytec II	Modbus	Multiwarn II	Data Collect SDR
RFM433	DGH Module	MeteoBus	VDO Navigation
NMEA183	BH/Timo 9600	Windobserver	

H. Internet Connectivity

WBPCB will provide one Broad Band and one Leased Line (not less than 2 MBPS) connectivity for each station. The arrangement for data porting to the display boards are to be made by the bidder – be it wired or not.

I. Checklist to compare Firm's Technical capability table for specifications of Software

S. No.	Details	Capability of firm's software as on date	Firm agree or disagree to develop software in future	If firm agrees to develop application then time frame from individual activity
1.	Data transfer interval Max. 5 minutes from all locations?			
2.	System will transmit data along with diagnostics. If yes then how many channels diagnostics values shall be transmitted to central and at what duration?			
3.	System will transmit data along with Calibration values (Pre cal and Post			

	Cal)?			
4.	System has remote calibration procedures in place for Regional level and central level both?			
5.	System has remote configuration facility for regional and central level both?			
6.	System has database validation procedure in place?			
7.	Web software already developed or not?			
8.	If Web software is available is it modifiable as per WBPCB AND CPCB need by the firm?			
9.	Whether agree to develop five web pages as per mutual discussion			
10.	Web software with password and or without password			
11.	Password providing facility available at regional levels			
12.	Statistical tools available at web software or not?			
13.	System provider is capable of placing system in NIC domain			
14.	System provider will provide certification from CERT-IN empanelled firms			
15.	Data import from other files			
16.	Data export to other files			
17.	Pre defined queries to be inbuilt for providing data to public whether these are already available or to be developed if yes then time frame?			
18.	Standards comparison and exceedances be reported on web			
19.	Different types of predefined formats of report preparation available or not?			
20.	support various protocols available till date as listed provided or not?			
21.	If new protocol based software is to be developed whether firm will			
22.	Unlimited Number of stations supported by Central Server software or not? If not then support for how many stations will be provided			

23.	System compatibility with Dialup/BB/2G/3G/Wireless available or not? If not then what technologies supported as on date? What time frame if other to be develop.			
24.	Software has Wind rose reports generating capability			
25.	Software has pollution rose generating facility			
26.	Software has diurnal variation facility			
27.	Software has mathematical tools			
28.	Software has 16 channels display at on page			
29.	Software has data communication error reports			
30.	System has error correction procedure			
31.	Software has parallel data display reports			
32.	Software has virtual channel deployment capacity			
33.	Software has data encrypting procedures at stations or not? If yes then data can be retrieved from station or not?			
34.	Software compatible for ANDROID technology			
35.	System Provider will provide all Hardware required at station and Central			
36.	System Provider all necessary software required for data acquisition, display, Analysis, website uploading etc.			

10.0 SPECIFICATIONS OF DAY LIGHT & NIGHT VISIBLE DATA DISPLAY SYSTEM

10.1	Size of display System	:	4' x 12'
10.2	Visibility range	:	200 Meters (Day Time)
10.3	Nos. of display Line	:	4
10.4	Display of colour elements	:	Multi Colour (Red, Green and Blue)
10.5	Minimum life span of the system	:	10 Years
10.6	Smallest Character Size	:	260 mm x 190 mm (approx.)
10.7	Operating and Non Operating Temperature	:	0 – 50 ^{o} C
10.8	Humidity Tolerance Range	:	0 – 100%
10.9	Languages supported by the display	:	English & Hindi
10.10	Color Gradient	:	Cluster LED based

10.11 Display Characters (Example):

S. No.	Parameters	Concentration ($\mu g / m^3$)	Standard Limit ($\mu g / m^3$)
10.11.1	Particulate Matter (PM_{10})	400	100
10.11.2	Particulate Matter ($PM_{2.5}$)	160	60
10.11.3	SO_2	35	80
10.11.4	NO_2	79	80
10.11.5	CO	3320	2000
…..	……..	…….	…….
…..	……..	…….	…….

The display of above variable data should be supported with moving messages / slogans to be changed from time to time

10.12	Input Power requirement	:	Cluster LED based
10.13	Display Mounting	:	Weather proof casing to cope up with local condition
10.14	Computer System	:	Software compatible with latest version
10.15	General	:	The display system should be capable to transfer the data from computer to Display Board through Modem System. The system should also have the facility to display the environment message, environmental picture through video camera / VCR / CD Player etc. for public awareness.

The display board is to be mounted within a distance of 100 meter from the station and is to be mounted on a steel structure at a height of 4 meters (ground to bottom of board) on three concrete pillars of 1ft X 1ft dimension.

11.0 Spares and consumables for all items covered in this bid.

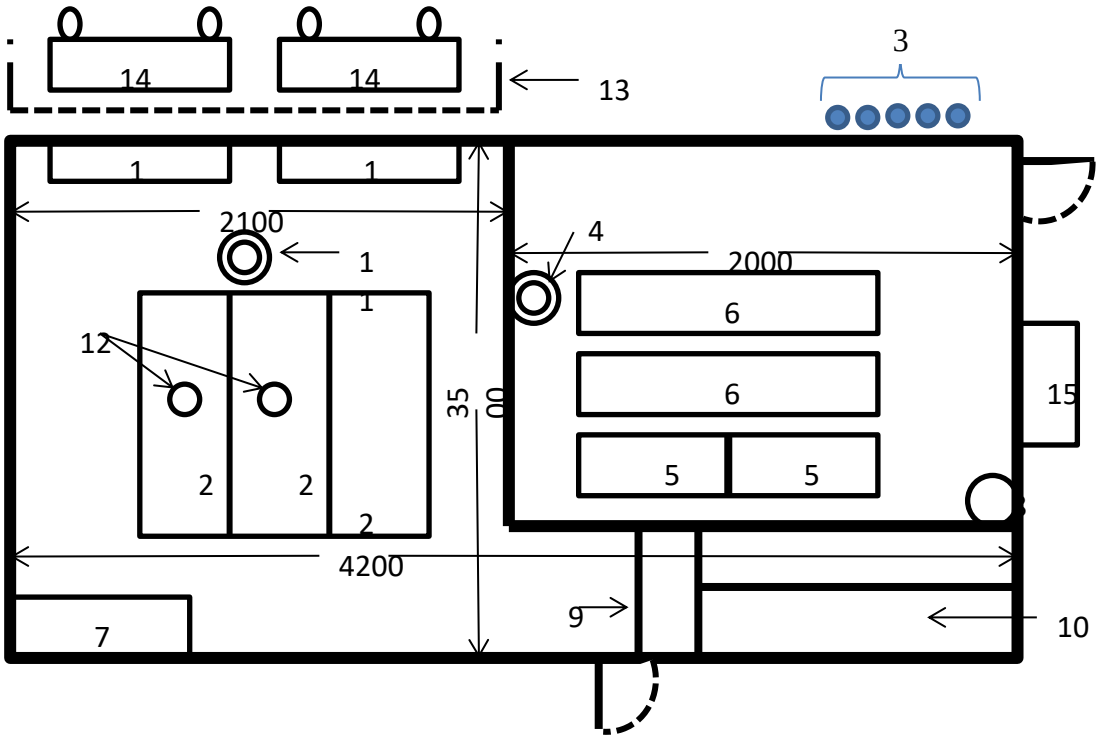
The successful bidder shall ensure a steady stock of all required brand new spares and consumables at their "office-cum-service-center within West Bengal preferably in Kolkata" or in the stations. Spares and Consumables, whenever supplied to the office-cum-service-center or the stations, should be enlisted in a register and their use and disposal should also be recorded appropriately. Such repository of spares and consumables shall be checked and audited from time to time by the Board and loss of performance of the system due to non-availability of spares or consumables shall be covered by the CPG during that material time. Spares and consumables for 3 months of operation depending on the last year's consumption shall have to be handed over to the WBPCB at the time of closing of the contract along with the list and use history.

12.0 Calibration Gas and Cylinders.

Calibration gases are essential consumables. All required calibration gases are to be supplied and refilled in due time by the successful bidder for the entire period of the contract. Every batch of calibration gas has to be of highest quality and accompanied with the certificate traceable to NIST. Date expired calibration gases should never be used. All the calibration gases are to be supplied in separate cylinders (with double stage regulator) for each monitoring station. All the cylinders have to have a calibration certificate traceable to the NIST. The certifying authority has to have appropriate accreditation for such certification. Cost of this item may be compounded with that of the respective analyser. All cylinders are to be placed outside the shelter in a separate cage.

13.0 Lightning arrestor and earthing.

Appropriate lightening arrestor and separate electrical earthing is to be established for each station. Apart from that two more earthings for (1) instruments and (2) electrical line are also to be established. The cost of this item may be compounded with the item "Installations for Continuous Automatic Monitoring Stations with Sampling line, Internal fitting, Instruments racks, Electrical connection from supply within 5 meter of the station and Gas line fittings, Tools (electrical and mechanical)".



1 . Roof Mounted Split AC
2 . 19" Rack
3 . Gas Bottles
4 . Mast for Meteorological Sensors
5 . Battery Box for UPS
6 . UPS Unit (5 and 10 kVA)
7 . Electric supply Box
8 . Exhaust fan
9. Working Table
10. Racks for spare parts
11. Ambient Air Sampling System
12. Dust Sampling System ($PM_{2.5}$ & PM_{10})
13. Sun Shed
14. Air Conditioning unit
15. UPS Room AC (1 Ton Capacity)

All Dimensions are in mm

Drawing of Continuous Ambient Air Quality Monitoring Station