

JHARKHAND STATE POLLUTION CONTROL BOARD

HEC TA Division Building ,PO- Dhurwa, Ranchi- 834 004

INTERNATIONAL COMPETITIVE BIDDING



JSPCB

**SUPPLY, INSTALLATION , COMMISSIONING
AND
OPERATION & MAINTENANCE SERVICES
OF
CONTINUOUS AMBIENT AIR QUALITY MONITORING
STATION
(CAAQMS)
AT
Mines Rescue Centre, Dhanbad**

**BIDDING DOCUMENT
VOLUME-II**

(TECHNICAL)

TECHNICAL SPECIFICATIONS

1.0 MONITORING 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 analyzers 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. 2300 mm

External Dimension: (L X W X H) : 4400 mm X 3700 mm X 2600 mm

1.3 Frame : All the material used for the construction of the floor, frame, roof frame etc, the 4 corner post and 8 integrated, reinforced container corner should be of metal. All the steel parts should be galvanized @ 275 GSM, anti rust primed and painted. 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 Panelling : The outer paneling will be of 1.2 mm pre-coated of Galvanized sheet with RAL7001 colour code to withstand external impacts and

abrasions. The inner paneling will be of PVC coated 2 mm thick aluminum sheet, fixed over an inlay of 4 mm marine plywood. 100 mm thick polyurethane insulation will be used between the outer and inner walls (Galvanized Iron sheet and Marine plywood) as insulating material.

- 1.5 Floor : The floor will be laid in frame of 600 x 600 mm centre to centre with 50 x 50 x 6 mm MS angle. The floor surface will be of 19 mm marine plywood covered with robust quality Vinyl flooring, 3 mm thick of marine blue colour. The floor should be of acid and alkaline, resistant waterproof, easily cleanable/ washable.
- 1.6 Outdoor: 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. Lock should be of Godrej / Harrison make.
- 1.7 Electric Power Supply Box: Three- phase (3 ϕ) 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 for each phase shall be provided along with the lightning arrestor. 2 Nos. Emergency cut off switch & Thermostat switch (35^oc) for power disconnection, 6 free sockets and 3 LED lamps for lighting will be provided. The station shall be properly grounded at least on 2 corners (diametrically opposite) chemical earthing as per ISI with copper electrode in GI pipe and connecting the station and electrode with suitable copper wire is required. There should be conduction between the telescopic mast of the meteorological system and the station.

List of

Consumables:

All Fuses	: 02 set
Lightning arrestor	: 02 set
Emergency Switch	: 02 pcs
Thermostat	: 01 pc

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 shall be provided on the outer wall of the housing. A 300 mm, single-phase (230 volts ± 10 volts AC and Hz $\pm 3\%$) exhaust fan with 2400 RPM safety grills will be provided. Mounting brackets in 2 levels for fixing of at least 06 gas bottles should be provided.

1.9 Station Furnishing:

(i) 19” racks – 3 Nos. Accord / President make

(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. Godrej or any reputed Brand

(IV) Miscellaneous

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

b) Folding aluminium ladder for roof access (15 sheet)

c) Thermostat for measuring the temperature of station

d) Hygro Meter for measurement of Humidity inside the station

e) Mounting bracket for the ladder

f) No smoking stickers

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

- h) Tool Kit
 - 1 One screw driver set
 - 1 One multimeter Philips , Mico make
 - 1 One box spanner set
 - 1 One D spanner set
 - 1 One watch maker set
 - 1 One Hammer set
 - 1 One precision screw driver set
 - 1 One plier set
 - 1 One Tong tester
 - 1 One Emergency LED light

1.10

1. Container Foundation (RCC Foundation)

L X W 6000 x 6000 mm

Height 900 mm

Pillars Nine concrete pillar of 900 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 Sand, Cement ratio and same has to be painted with weather proof coat.

Top of the platform: RCC 150 mm with concrete ration of 1:1:2 and to platered and printed with weather proof paint.

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

1.11 PVC bill boards logo of Jharkhand State Pollution Control Board, Ranchi and Central Pollution Control Board, Delhi 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 equipment i.e. Continuous Ambient Air Quality Monitoring Station, Dhanbad both in English and Hindi language to be inscribed. The bill boards to be mounted on the station with proper spacers.

2.0 AIR CONDITIONER

2.1 Type: 2 Nos. split type operated alternately by an automatic timer. Separate Voltage 2.3 stabilizer will be provided with each unit.

2.2 Capacity: 2.0 Ton make Hitachi or Blue star with 4 indoor unit. Two indoor units running simultaneously or 4 indoor unit of 1 Ton capacity each out of which two each should run simultaneously.

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

2.4 Refrigerant: Eco friendly

2.5 Power supply: 230 volts ± 10 volts AC and 50 Hz $\pm 3\%$

3.0 ON LINE UNINTERRUPTED POWER SUPPLY (UPS)

Three phase 15 KVA UPS along with Automatic Delayed Restoration Device (ADRD) with 4 hours backup in full capacity should be provided for the smooth operation of the station.

3.1	Capacity	: 15.0 kVA
3.2	Technology	: PWM using IGBT / MOSFETS
3.3	Crest Factor	: More then 3:1
3.4	Input	Voltage : 415 V AC
		Voltage Range : $\pm 25\%$
		Frequency : $50 \pm 3\%$
3.5	Output	Voltage : 415 V AC
		Voltage regulation : $\pm 1\%$
		Frequency : 50 Hz
		Frequency : $\pm 0.01\%$

		regulation	
		Waveform	: Pure sine wave
3.6	Battery	Battery type	: sealed maintenance free
		Back up time	: 4 Hrs (full load) 64 nos x 120 AH battery
		Battery Capacity	: Depends upon backup time
		Recharge time	: 5 hrs to 90% after complete discharge
3.7	Distortion		: Less then 1% linear load
3.8	Power factor		: 0.8 to 1
3.9	Indicator		: L.E.D. – Battery Charge, Load level, on Line, over load, on battery, replace battery
3.10	Alarm		: Audible alarm for battery back up, battery low and fault
3.11	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
3.12	Overload Capacity		: 110% for continuous load
3.13	Efficiency		: More then 90%
3.14	Environment	Operating Temperature:	0-50°C
		Operating Humidity	: 10% to 95% (Non condensing)
		Audible Noise	: Less then 45 db (at 1 meter)
3.15	UPS Size		: Not exceeding 1000 x 1000 x 1000 mm
		make :	Ups should be of reputed make like Tata Libert / Emersion/ APC

4.0 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 single 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 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 main socket.
- 4.4 The analysers 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 85%. or better.
 - 4.5 The Manufacturer shall provide minimum of 2 weeks of operational & preventive maintenance hands-on training for at least two person at the installation site.
 - 4.6 The analysers 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 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 permeation tube and the calibration gases provided with the system shall have traceability to NIST with certification accuracy of $\pm 5\%$ in accordance with the permeation Bench temperature. Gases should also be supplied in Aluminum cylinder with certification accuracy $\pm 3\%$ and traceable 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 sampling intake filter, drier, Teflon tubing suitable for connection to air sampling manifold. All such items are to be itemised. 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 or equivalent method designation as required by the specification for individual equipment. 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. Analyser must exhibit performance equal to or better than values specified in the specifications.
- 4.11 The manufacture shall provided 03 years warranty for the entire system. Annual Maintenance charges and Comprehensive maintenance charges for the entire system after the warranty period should be specified.
- 4.12 The manufacture shall provide price list of the spares and ensure their availability for the next at least 8 years beyond the warranty period.
- 4.13 The manufacturer shall specify the cross sensitivity of measurement for all the analysers.
- 4.14 Each set of analysers 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 ; and
 - Parts (iii) should comprise details of all electrical, electronic and pneumatic circuit diagram, details of each spare parts, catalogue No. etc. and details of each electronic card / PCB's.
 - Parts (iv) Schematic diagram for possible repair & maintenance.
- 4.15 Digital Output
- Multi drop RS 232 port shared between analyser and computer for data status and control.

5.0 SPECIFICATIONS OF SAMPLING SYSTEM

A suitable sampling system as specified by USEPA having 10 port 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.

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 SPECIFICATION OF 19" RACK

Suitable 19" Rack preferably accord or president make cabinet to accommodate all analysers, calibrators, Zero air generators, data logger etc. The dimension of 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 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. All the cables and pneumatic tubing should be concealed under the ceiling or racks / Ducts

7.0 SPECIFICATION OF AMBIENT AIR ANALYZERS

(A) AMBIENT OXIDES OF NITROGEN (NO_x) + AMMONIA ANALYZER
Conforming to USEPA Automated Federal Reference Method (FRM)
Designation

01. Principle : Chemiluminescence

- 02. Measurement : NO-NO₂-NO_x + NH₃ 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
with built in permeation Bench and NIST certified ± 5% at appropriate Bench temperature
- 11. Calibration : Please see calibration section
- 12. consumables and spares : recommended requirements of 3 years of continuous operation.

(B) AMBIENT SULPHUR DIOXIDE (SO₂) ANALYZER Conforming to USEPA Automated Federal Equivalent Method (FEM) Designation

- 01. Principal : Pulsed UV Fluorescence
- 02. Measurement : Sulphur Dioxide in Ambient Air
- 03. Lower Detectable limit : 1 PPB
- 04. Ranges : Auto ranging 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 calibration section
with built in permeation Bench and NIST certified ± 5% at appropriate Bench temperature

10. Consumables and spares : Recommended requirements of 3 years of continuous operation.

(C) AMBIENT OZONE (O₃) ANALYZER Conforming to USEPA Automated Federal Reference Method (FRM) Designation

- 01. principle : UV Photometric
- 02. Measurement : Ozone in Ambient Air
- 03. Display : Digital
- 04. Ranges : Auto ranging 0-500 PPB
- 05. Minimum Detectable limit : 2.0 PPB
- 06. Noise : ± 1.0 PPB
- 07. Zero Drift : $< \frac{1}{2}\%$ per month
- 08. Span Drift : $< 1\%$ per month
- 09. Flow Rate : 1-3 Liters/ Minute
- 10. Calibration : Please see calibration section with built in Zero and span generator
- 11. Consumables and spares : Recommended requirements of 3 years of continuous operation.

(D) AMBIENT CARBON MONOXIDE (CO) ANALYZER 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 ± 30 sec
- 07. Zero Drift : < 0.2 PPM/7 days

08. Span Drift : < 1% full scale in 24 hrs.
09. Calibration : Calibration gas (CO) cylinder – 47 lit.
and portable one each with known
concentration has to be provided along
with the instrument for calibration
purpose. It should also have pressure gas
valve for Zero and span gas.
Please see calibration section.
11. Consumables and spares : Recommended requirements of 3 years
of continuous operation.

(E) BTX MONITOR / ANALYZER

1.0 GENERAL

A complete monitor / analyzer system including automatic sampling (pump etc.), detector, calibrator, computer hardware and software for data display, acquisition, processing and instrument control 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 \pm 10volts AC and 50 Hz \pm 3%). Continuous unattended measurement of individual BTX samples. System should work without cryogenic cooling. System should have protocol compatible to communicate & transfer data to main computer through modem. Raw data storage capacity without erase minimum for three month or more.

2.0 TECHNICAL SPECIFICATIONS

2.1 AUTOMATIC SAMPLING (MONITOR)

Analytical instruments / pump (single stage membrane) monitoring for automatic sampling, concentration of the organic compounds on an adsorption trap. Subsequent sample injections by thermal adsorptions and separation by wide bore capillary gas chromatography. Sampling 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.

2.2 SAMPLE TRAP

Light weight stainless steel mini trap containing selective adsorbents (activate charcoal or carbotrap or tenax G.R. or chromosorb 106), integrated heating element and temperature sensing by thermocouple, operating temperature range 40-200°C.

2.3 HEATING OVEN

Metal oven having space for installation of wide bore capillary column, pre-column and temperature sensor. Operating temperature 40-100 °C or more.

2.4 COLUMNS

Approx 5 m pre-column (for back flushing) and approx. 10m- 50m length analytical column (higher length to be preferred). Both columns capillary (0.22 mm – 0.32 mm I.D. or / and wide bore i.e. 0.53 mm I.D) coated with suitable column packing capable of separating all analyte of interest (i.e. 94-95% dimethylpolysiloxane & 5-6% cyanopropylphenyl or CP WAX52 / DB5 / 624 or equivalent), film thickness between 1 and 2 µm.

2.5 DETECTOR

Photo Ionization Detector (PID)	:
PID Lamp eV	: 10.6 eV
Lowest detector limit	: 0.1 µg/m ³ (0.03 ppb) for Benzene
Detector Diagnostics	: PID sensitivity sensor / check facility

2.6 OPERATING CONDITIONS

Temperature Range	: 5-35° C or more
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Concentration Range	: 1-1000 $\mu\text{g}/\text{m}^3$ (0.3 ppb to 270 ppb)
Repeatability	: Retention Time : < 0.1% RSD Amount : < 1.0% RSD
Typical Cycle Time	: Total Cycle Time – 15 min approx Analytical Time- 15min. approx.

2.7 CALIBRATION UNIT WITH SPAN GAS / PERMEATION TUBES AND GAS MIXING / DILUTION FACILITY

The certified permeation tubes, span or calibration gas mixture (low conc range) with S.S. container / cylinder, regulators & filters. With calibration unit having gas flow (approx): 10 ml / min (calibration gas); 1.4-2.0 lit/min (dilution gas). Auto gas selection option for automatic calibration for ppb level calibration gas (10-30 ppb of individual compound of interest). Dilution device for calibration gases. Manual and software selectable values for sample, calibration span and blank zero air gases. Dilution factor between 1:50 to 150. The permeation tubes should be certified at $\pm 5\%$ and should be traceable to NIST. The calibration gas in Aluminium cylinders with regulators should also be certified at $\pm 3\%$ and traceable to NIST.

2.8 GAS SUPPLY & CONTROL

Mass flow controller and pressure regulators with pressure gauge for carrier gas. Intel pressure regulator with pressure limit switches for all necessary gases. Needle valves with quick shut off valves for zero air.

2.9 MEMORY AND CONTROL FACILITIES

Method auto load and system restart after power failure. Methods storage capacity with timed events programme for control of system parameters and valves in permanent memory. Busy (operational) status; calibration/sample gas selection. Fault status; gas supply (low press). System stability (temperature and sample flow). Detector signal (low) and communication errors. Status indicated on monitor by LED's & 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.

3.0 Software's:

Window based latest software's (English version) consisting instrumental control features as well as data acquisition, processing and handling in desired format including sorting of data (1/4/8/12/24 hourly, days wise/ date wise reporting as microgram / m³ or ppb (selectable) & averaging etc.). Data presentation / graphical & statistical processing & data transfer to Excel or latest software facility. Communication software with protocol compatible to communicate & transfer data from BTX monitor to central computer through modem (preferably including sample chromatogram). System should have remote access to BTX monitor.

Resident programme as well BTX control / monitor user programme with monitor start-up / off / status, blank / calibration and sample gas measured, fault status, carrier gas, and communication errors indications. Updation of response factors automatically after calibration run. Updation of retention times after every sample analysis. Auto tune facility. Raw data storage capacity without erase minimum for three month or more.

4.0 SPARES FOR 3 YEARS

One set of each including columns, filters / traps for removal of dust & unwanted impurities (moisture/ hydrocarbon); spare parts / electronic cards and sufficient septas, ferrules, dust filters, Teflon tubing etc & other consumables usually get exhausted during first 3 years of operation apart from one set as essential part with main instrument.

(E) MULTICALIBRATION SYSTEM

a) Gas Calibration System

The calibration system for air monitoring equipment (listed above) should incorporate an automatic gas dilution calibration gas standards and a high

performance zero air generator to calibrate all of the analyzers in the system. The calibration cycle should be able to be configured through the data Acquisition System at any specific time during the 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 concentrations and minimizing the number of calibration 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 NO₂ 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 specification of the manufacturers.

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

(F) PARTICULATE MATTER (PM) MONITOR
Conforming to USEPA Automated Federal Equipment Method (FEM)
Designation

Based on the principal 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 Silicon Semiconductor Beta Detector. An internal microprocessor handles all sequences and automatically calculates the concentration of SPM.

01. Principal : Continuous measurement of PM (to be supplied with PM_{2.5} and PM₁₀ heads)
02. Particle Size Cut Off : 0-10 Microns(PM₁₀, PM_{2.5})
03. Measuring Range : 0 to 2000 µg/m³
04. Resolution : 1% of concentration
05. Minimum Detectable Limit : 2 µg/m³
06. Detector : Silicon Semiconductor Beta Detector
07. Air flow Rate : At-least 16.7 LPM
08. Filter Material : Glass Fiber Filter
09. Display : LED/LCD
10. Sampling Head : Suitable heated sampling head for measurement of PM₁₀ with adjustable temperature 20-70°C
11. Calibration : Separate calibration standards must be provided with the instrument.
12. Printer : Built Printer
13. Roll Length : Approximately 30 meters
14. Measurement Result : 1 hr average or shorter
15. Consumables and spares : Recommended requirements of 3 years of continuous operation

(G) 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 Mast 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 a wide operating range in adverse environmental conditions.

Specifications are as follows:

Accuracy	$\pm 2\%$
Wind Direction	0 to 360
Starting Threshold	0.5 m/s
Temperature Operating	0° to 60° C
Material	Anodized Aluminum

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

Maximum Operating	: 0-50 m/s
Temperature Range	: 0° to 60° C
Accuracy	: 0.2 m/s or 1%, whichever is greater
Material	: Anodized Aluminum

c) Vertical Wind Speed

The anemometer specifications are as follows:

Maximum Operating Range	: 0-30 m/s
Starting threshold	: 0.2 m/s
material	: Anodized Aluminum

d) Ambient Temperature

Temperature measurement system specifications are as follows:

Calibrated Temperature	: 0° C to 60° C
Response	: 10 seconds in still air

Linearity : $\pm 0.1^{\circ} \text{C}$

Accuracy : 0.15°C

e) Relative Humidity

Specification are as follows:

Measuring Range : 0 to 100% RH

Accuracy : $\pm 1.0\%$ (5-95% RH)

Response Time : < 2 minutes for RH 10% to 90%

<5 minutes for RH 40-90%

Typically 20 seconds

Linearity : Better than $\pm 2\%$

Reproducibility : 0.5%

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:

Sensitivity : 80 micro amps per 1000 W m^2

Temperature dependence : 0.15% per $^{\circ} \text{C}$ Max

Response Time : 10 microseconds

Linearity : 1% from 0 to 3000 watts m^2

Orientation : No effect on instrument

Performance

Calibration : Calibrated against an Eppley

Precision Spectral Pyranometer

(PSP) under natural day light

conditions.

g) Barometric Pressure

Specifications are as follows:

Operating range : 800 to 1100 Bar

Proof pressure : 2 Bar

Operating temperature : 0°C to 60°C

Compensated Temp. Range : -10°C to 60°C

Non linearity and hysteresis : 0.1% FS

Repeatability : 0.2% FS

Temperature shift : 0.3% FS / 10° C

Response Time : 1 m/sec

Long term stability : 0.1 % FS

h) Telescoping Crank – up Meteorological Mast

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

Specification are as follows:

Extended Height : 10 meters

Retracted Height : 2 meters

Wind load Limit : 0.7896 sq.m (8.5 sq. ft) at 50 mph

Number of sections : 4

Construction material : Galvanised steel or aluminum

h) SPECIFICATIONS OF STATION COMPUTER (MINIMUM CONFIGURATION)

01 Make : IBM compatible HP

02	Intel Core 2 Dual Processor	
03	RAM	: 8 GB
04	Hard disk	: 500 GB
05	DVD WRITER	: with latest configuration.
06	Monitor	: 19" LCD colour monitor
07	Port	: 2 serial, 1 parallel & 4 USB standard LAN card.
08	Keyboard	: Multimedia keyboard
09	Mouse	: Roll & Scroll Mouse + Pad (optical)
10	Software	: Window XP (Licensed Version) or latest with Antivirus (Licensed Version) or latest software like Norton /Mc Affe with online continuous up-gradation.

i) SPECIFICATION OF LASER PRINTER

01.	Make HP Colour Laser jet printer	1200 x 600 dpi
02.	Main tray Capacity	: At least 250 sheet
03.	Interface	: Parallel & USB
04.	Power supply	: 230V AC, $\pm 10V$ AC, 50 Hz, $\pm 3\%$

J) 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” RS232 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 dives for location-specific or in the event of fault or incase of data limitation error.
- Data storage space for minimum 180 days or more of 5 minute historical data
- Captures minimum, maximum, average values and standard deviations.
- Lighting & surge protection facilities.
- Full control over calibration cycle periods.
- Password Protection.
- DAS should be designed for unattended use.
- Simultaneous display of data at the remote data display board through a modem.

k) ANALYTICAL SOFTWARE

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

- Windows XP or latest compatible.
- File format conversation.
- Statistical analysis of data for maximum, minimum, average and standard deviation for various time intervals using the monitored data.
- Tabular and graphical format for report production.
- Wind rose graphs.
- File export facility.
- Windows based printer support.

- All the latest data retrieval and data processing software in original to be supplied

1) CENTRAL STATION COMPUTER SPECIFICATIONS

Make	: IBM compatible HP SERVER Quad Core Core 2 Duo processor
RAM	: 8 GB
Hard disk	: 520 GB
DVD Writer	: as per latest configuration
Monitor	: 40" LCD panel
Port	: 2 Serial, 1 parallel & 4 USB with LAN
Keyboard	Multimedia
Mouse	: optical Mouse + Pad
Software	: Windows XP / latest version compatible with DAS

m) SPECIFICATIONS OF COLOUR LASER NETWORK PRINTER FOR STATION

Colour Laser Jet Printer make HP (1200 x1200 dpi)

8.0 SPECIFICATIONS OF DAY LIGHT & NIGHT VISIBLE DATA DISPLAY SYSTEM

8.1	Size of display System	: 6' x 12'
8.2	Visibility range	: 200 Meters (Day Time)
8.3	Nos. of display line	: 4
8.4	Display of colour elements	: Multi Colour (Red, Green and Yellow)
8.5	Minimum life span of the system	: 10 Years

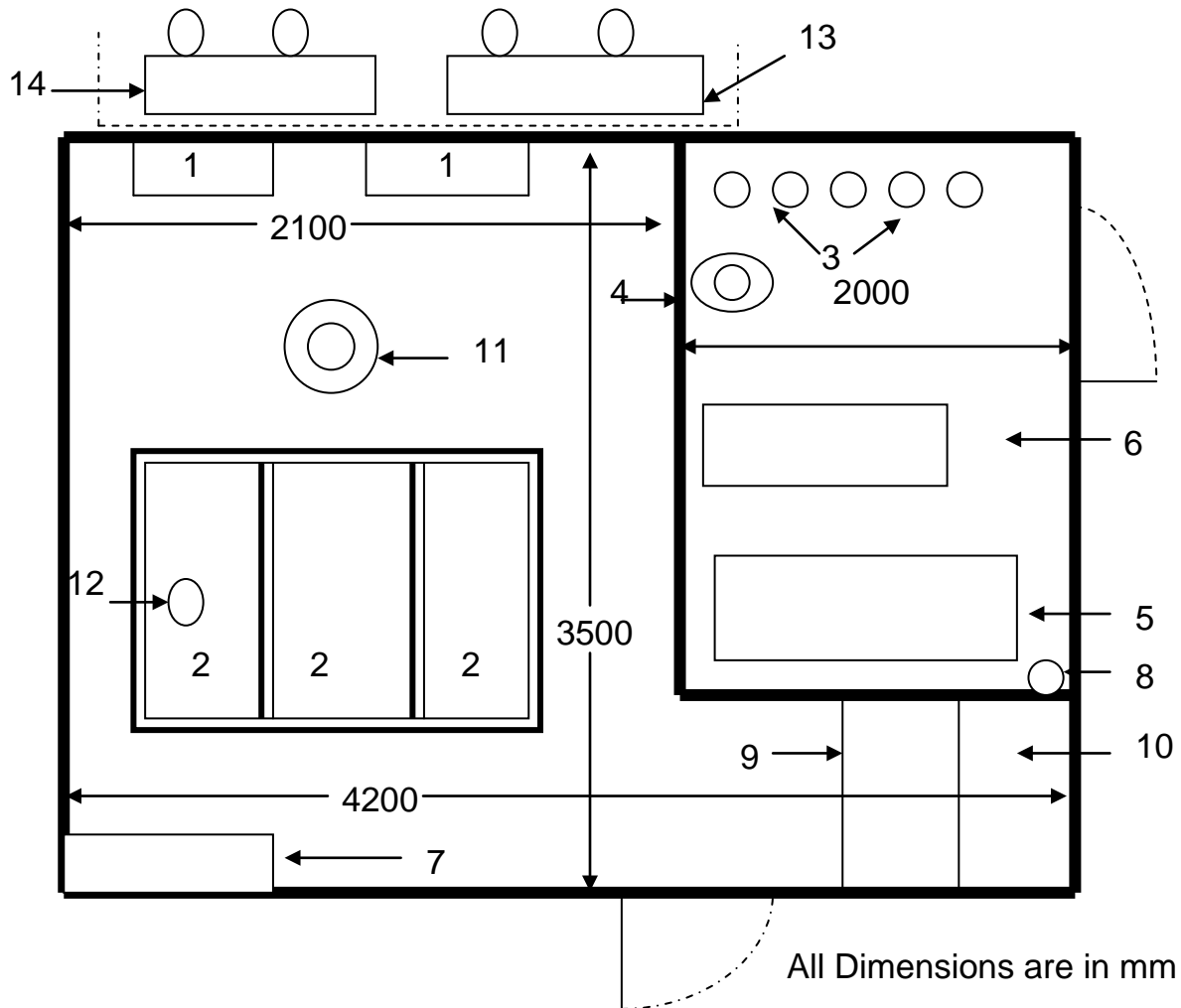
- 8.6 Smallest Character Size : 260mm x 190 mm (approx)
- 8.7 Operating and Non Operating Temperature : 0-50° C
- 8.8 Humidity Tolerance Range : 0-100%
- 8.9 Languages supported by the display : English & Hindi
- 8.10 Color Gradient : Cluster LED based or any other equivalent
- 8.11 Display Characters (example) :

S.No.	Parameters	Concentration (µg/m ³)	Standard Limit (µg/m ³)
8.11.1	RSPM	160	100
8.11.2	SO ₂	35	80
8.11.3	NO _x	79	80
8.11.4	CO	3320	2000

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

- 8.12 Input Power requirement : Cluster LED based or any other equivalent
- 8.13 Display Mounting : Weather proof casing to cope up with climate of Dhanbad
- 8.14 Computer System : Software compatible with Core 2 duo processor
- 8.15 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 and graphics should also be available.



All Dimensions are in mm

1. Roof Mounted Split AC
2. 19" Rack
3. Gas Bottles
4. Mast for Meteorological sensors
5. Battery Box for UPS
6. UPS Unit
7. Electric supply Box
8. Exhaust fan

9. Working Table
10. Racks for spare parts
11. Ambient Air Sampling System
12. Dust Sampling System
13. Sun Shed
14. Air Conditioning unit

AMBIENT AIR QUALITY MONITORING STATION
Drawing of Cup Board and Working Table

