SURAT SMART CITY DEVELOPMENT LIMITED/SURAT MUNICIPAL CORPORATION.

SURAT

EMPLOYER'S REQUIREMENT & TECHNICAL SPECIFICATION

SIGNATURE OF THE CONTRACTOR.

NAME AND ADDRESS :-

GENERAL MANAGER / ADDITIONAL CITY ENGINEER(CIVIL)
SURAT SMART CITY DEVELOPMENT LIMITED/SURAT MUNICIPAL CORPORATION

1. INTRODUCTION

ABOUT SURAT

Surat is one of the cleanest cities of India and is also known by several other names like "THE SILK CITY", "THE DIAMOND CITY", "THE GREEN CITY", etc. Surat, the city of diamonds and textile may have earned the distinction of being one of the cleanest cities in the country, but it lags behind when it comes to keeping a check on industrial and Vehicular pollution. Industrial development in Surat district is attributed to the presence of a large number of diamond processing, textiles and chemical & petrochemical industries. There are over 41,300 small and medium industries functioning in the district. Some of the main industries are textiles, chemicals, dying & printing, diamond processing, zari (silver) making, and; engineering and related activities (including manufacturing machines & equipments). Maximum number of (nearly 24,000 units) in small and medium enterprises is related to textile industry in the district followed by repairing & service industry with more than 11,000 units.

In terms of providing the quality of the life to the citizens of Surat, Surat Municipal Corporation has decided to implement the Ambient Air Quality Monitoring System (AAQMS), weather monitoring and water quality monitoring. The main objectives of implementation of this will be to provide:

- To determine the current status and trends of ambient air quality weather and water quality.
- To indicate the levels of air quality, weather parameters and water quality necessary with an adequate margin of safety to protect the public health, vegetation and property.
- To assist in establishing priorities for reduction and control of pollutant level;
- To examine if the prescribed ambient air quality standards are maintained or not
- To gain knowledge and an insight required for developing preventive and corrective measures
- To understand the natural cleansing process undergoing in the environment through various processes such as pollution dilution, dispersion, wind based movement, dry deposition, precipitation and chemical transformation of the pollutants released.

2. INTENT OF SPECIFICATION

1.1 This specification covers the CONTINUOUS AMBIENT AIR QUALITY MONITORING

SYSTEM (CAAQMS), METEOROLOGICAL MONITORING SYSTEM (MMS) & WATER QUALITY MONITORING SYSTEM as specified herein for Surat smart city development limited/Surat Municipal Corporation.

1.2 It covers the design, engineering, and manufacture, supply of AAQMS, MMS & Water Quality Monitoring equipment with its installation hardware, packing for shipment and delivery at site, construction of shelter for housing of AAQMS analyzers / equipment, and testing and commissioning of the same. It also covers unloading the material received at site, storing at VEDNOR's area, unpacking and delivery from VEDNOR's area and transportation to erection Site.

3. CODES AND STANDARDS

All analyzers shall confirm to USEPA automated reference or equivalent method as specified for the analyzers.

Offered analyzers and the analysis method should be acceptable to Central Pollution Control Board.

4. SYSTEM DESCRIPTION AND LAYOUT

4.1 AAQMS SYSTEM

- The AAQMS are equipped with analysers of CO, CO2, SO2, NOx, PM2.5 and PM10. Analyzers shall be maintained to strict QA/QC procedures to ensure reliable results. Data shall be continuously transferred to Central Computer and also stored in Station computer. Monthly brief reports are prepared & sent to the management.
- Vendor to submit the System configuration and layout as part of their offers for the proposed system.

4.2 WEATHER MONITORING SYSTEM

Standard meteorological sensors shall include wind direction sensor, wind speed sensor, ambient temperature sensor, rain gauge, solar radiation, ambient pressure etc.

The meteorological sensor shall be interfaced directly with the data acquisition system.

MMS shall allow monitoring, logging of parameter values, archiving and report generation for environmental monitoring authorities and municipal management personnel. For the data relating to the following meteorological measurements:

a. Wind Speed & Direction
b. Wind Rose
c. Air Pressure & Relative humidity
d. Solar Radiation
e. Rainfall
f. Ambient temperature

4.3 WATER QUALITY MONITORING SYSTEM

The Water Quality measurement for the ABD area of 8 sq.km shall include the measurement of the following parameters:

- Total Coliforms
- pH
- Total organic carbon (TOC)
- Dissolved Oxygen (DO)
- Biological Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Conductivity
- Sodium absorption
- Total Suspended Solid (TSS)
- Turbidity
- Total Suspended solid
- Ammonical nitrogen
- Distilled water
- Disinfection
- Phosphate, Nitrogen, etc
- VSS, MLSS, MLVSS

The field measurement of the Water quality shall include the following parameters.

- pH
- Turbidity
- Conductivity
- Dissolved Oxygen
- Total organic carbon

The offline measurement/ lab measuring parameter of the water quality shall include the following parameters.

- Biological Oxygen Demand

- Sodium absorption ratio
- Total Suspended solid
- Total Coliforms
- Suspended solids
- Ammonical nitrogen
- Distilled water
- Chemical oxygen demand
- Disinfection
- Phosphate, Nitrogen, etc
- VSS, MLSS, MLVSS

The parameters such as Dissolved Oxygen, pH, Electrical Conductivity, Total Organic Carbon, Turbidity, Colour, Odour shall be measured at the site itself so these parameters are considered as 'Field determinations' parameters and the data can be sent online. The instrument for measuring these parameter shall be installed in a mobile van. The Locations of the sample collection for the measurement of various parameters shall be as per the CPCB guidelines and will be in the scope of the bidder.

5. SCOPE OF SUPPLY & SERVICES

5.1 It is not the intent to specify completely herein, all details of design and construction of the System equipment. However, the System equipment shall conform in all respects to high standards of engineering design and workmanship and be capable of performing in continuous commercial operation in a manner acceptable to the PURCHASER, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance therewith. Lump sum price shall include the following:

a. Design & Engineering charges
b. Supply value
c. Erection including construction of analyzers shelter, testing and commissioning charges

5.2 All necessary co-ordination with regard to sub-contracted equipment shall be carried out by the BIDDER.

5.3 Any conflict between this specification and its references shall be brought to the attention of the contract for resolution prior to any further action by the BIDDER.

5.4 In addition to the scope of supply specified in other section of this Specification, BIDDER shall furnish the services and equipment, including all necessary features, components, accessories for the safe, efficient and reliable erection, operation and maintenance whether mentioned in this Specification or not.

5.5 Furnishing all data, information, drawings and documents including instruction manuals for installation, site test/commissioning operation and maintenance. All data, information, drawings and documents including instruction manuals for installation, site test/commissioning, operation and maintenance shall be submitted with electronic source files.

5.6 Bidder to provide the system configuration diagram along with the offer.

5.7 Bidder to list out the bill of materials for AAQMS and MMS along with the offer.

5.8 Test equipment for supervision and site test/commissioning by use and return basis.

5.9 Spare parts and consumables for commissioning and testing.

5.10 Spare parts and consumables for five (5) years operation.

5.11 Special tools for maintenance and services

5.12 Supervision for installation, commissioning and site test at site, guarantee and warranteye for all equipment supplied.

5.13 Project management, Project kick-off meeting, Progress review meetings.

6. TERMINAL POINTS AND EXCLUSIONS

6.1 All instrument and power cables within the battery limit of the scope shall be under vendor's scope of supply.

6.2 JB's, cable trays and erection hardware (if required) within the battery limit shall be vendor's scope of supply.

6.3 In case the Bidder's proposal has any deviations from the specification, the Bidder in his proposal shall indicate clearly such deviations item wise. Price implications for such deviations shall also be indicated item wise in the Deviation Sheet. In the absence of such deviation sheets, it will be presumed that the offer is strictly as per the specification. Also, in the absence of any price implication against any item(s) for which deviation has been taken by the Bidder, it will be taken for granted that such deviations will have no reflection in the quoted price.

7. SYSTEM DESIGN BASIS

7.1 SYSTEM DESIGN BASIS FOR AAQMS SYSTEM

7.1.1 The AAQMS shall include continuous monitoring of the following:

1. Sulphur Dioxide(SO2)
2. Oxides of Nitrogen (NOX)

3. Carbon Monoxide (CO)
4. Carbon dioxide(CO_2)
5. Suspended Particulate Matter (PM10)
6. Suspended Particulate Matter (PM 2.5)

The above listed measurements shall be provided at seven (7) locations. Therefore, AAQMS system shall include seven (7) AAQMS stations and a Centralized AAQMS Data Acquisition System (PC based). All instruments related to a particular AAQMS station shall be connected to a data acquisition unit placed in its individual room. Hourly Data transfer between the seven (7) AAQMS stations and the central evaluation AAQMS CMS (PC based)- (located in central control room) and GPCB/CPCB servers shall be performed through GPRS/GSM modems/TCP-IP which shall be appropriately licensed.

Vendor would provide GPRS SIM card along with data connectivity. The SIM management and monthly bill payment of these SIM cards including the subscription charge would be in the Vendor scope. These parameters shall also be displayed on the large display board which will be installed at the 5 location mainly near the railway junction, industrial area, populated residential area, high traffic region. However, the location shall be finalized by the bidder based on the prior discussion with the engineer-in charge of the surat smart city development limited/Surat Municipal Corporation..

7.1.2 The AAQMS equipment shall be housed in a weather proof air conditioned room. AAQMS for each location shall be a fixed type, self contained station. Total seven (7) nos such stations will be provided. The CMS shall be data logger designed to acquire, transmit, and hook data in the format required, process and store data.

Table showing the location for the CAAQMS station:

Zone office	**Location**
West Zone	Vahivati Bhavan, Bala Saheb Devrash Road, New Rander Road, Tadwadi, Surat
Central Zone	Vahivati Bhavan, GordhanCMS Chokhawala Marg, Muglisara, Surat-395003
North Zone	Vahivati Bhavan, Behind Gajera school, B/s Ramjikrupa Raw-House, Katargam,

	Surat
East Zone	Vahivati Bhavan, Nr. Saifee Society, Opp. Panchwati Wadi, Lambe Hanuman Road, Surat
South Zone	Vahivati Bhavan, Udhana Main Road, Opp. Satya Nagar, Udhan, Surat
South West Zone	Vahivati Bhavan, Municipal Shopping Center, Near Aadarsh Nagar Society, Athwalines, Surat.
South East Zone	Bh. Vatika Township, Bh. Model Township, Dumbhal, Surat

7.1.3 The Central AAQMS DAS system shall perform following functions:

- To collect all the data from the individual AAQMS Stations at prescribed time or on request.
- Ability to manage multiple remote AAQMS Stations.
- Monitoring, analyze, report generation and archiving of data.

7.1.4 Analyzer for Nox shall be Electrochemical/ Chemiluminescence type capable of measuring NO, NO2 and providing separate outputs.

7.1.5 Analyzer for SO2 shall be Electrochemical /Pulsed Fluorescence type.

7.1.6 Analyzer for CO shall be Electrochemical / NDIR based

7.1.7 Analyzer for CO2 shall be IR / gas filter correlation based

7.1.8 Measurement of SPM and PM10 shall be preferably carried out by 'Beta attenuation' / light scattering method.

7.2 SYSTEM DESIGN BASIS FOR WEATHER MONITORING SYSTEM

7.2.1 Micro-Meteorological data collection & recording station shall be continuous on-line type. MMS shall allow monitoring, logging of parameter values, archiving and

report generation for environmental monitoring authorities and plant management personnel. For the data relating to the following meteorological measurements:

a. Wind Speed & Direction
b. Wind Rose
c. Air Pressure & Relative humidity
d. Solar Radiation
e. Rainfall
f. Ambient temperature

All the data related to Meteorological station shall be connected to central evaluation PC located at Command and Control Center (CCC) and also to the display board located at the ~~fixed location~~various location. Necessary software as required for the MMS shall be loaded into central evaluation PC.

The measurements shall be provided at forty (40) locations~~. Refer Annexure – II for location details.~~

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. All sensors should be NIST (National Institute for Standards and Technology, USA) traceable

7.3 SYSTEM DESIGN BASIS FOR WATER QUALITY MONITORING SYSTEM

7.3.1 The Water Quality measurement for the ABD area of 8 sq.km shall include the measurement of the following parameters:

- Total Coliforms
- pH
- TOC
- Dissolved Oxygen (DO)
- Biological Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Conductivity
- Sodium absorption
- Total Suspended Solid (TSS)

- Turbidity
- Total Suspended solid
- Ammonical nitrogen
- Distilled water
- Disinfection
- Phosphate, Nitrogen, etc
- VSS, MLSS, MLVSS

7.3.2 The field measurement of the Water quality shall include the following parameters.

- pH
- Conductivity
- Turbidity
- TOC
- Dissolved Oxygen

7.3.3 The offline measurement/ lab measuring parameter of the water quality shall include the following parameters.

- Biological Oxygen Demand
- Sodium absorption ratio
- Total Suspended solid
- Total Coliforms
- Suspended Solids
- Ammonical nitrogen
- Distilled water
- Chemical oxygen demand
- Disinfection
- Phosphate, Nitrogen, etc
- VSS, MLSS, MLVSS

The instrument for measuring these parameter shall be installed in a mobile van. The

Locations of the sample collection for the measurement of various parameters shall be as per the CPCB guidelines and will be in the scope of the bidder.

8. SYSTEM GENERAL REQUIREMENTS (AAQMS, MMS SYSTEM & WATER QUALITY MONITORING SYSTEM)

8.1 MONITORING STATION

- Suitable racks shall be installed inside the station so that the analyzers are easily accessible from front and back for calibration and maintenance.

8.1.1 ELECTRIC POWER SUPPLY

- Purchaser will provide 230 V AC supply to the bidders UPS. Further distribution of power supply shall be in Bidders scope. The termination of the same at the UPS end shall be in bidder's scope. AC power requirement including the power supply distribution boards for analyzers, air conditioning, lighting and any other requirement shall be derived by Bidder from this incomer supply.

Solar power supply

- The provision for the solar power supply shall also be provided to all the analyzer panel/ weather monitoring system and it shall be under the bidder's scope of supply and commissioning.

8.2 AIR CONDITIONING & LIGHTING

- Proper cooling arrangement shall be provided to the individual panel.
- Minimum illumination shall be provided in the individual panel so that display can be visible from the outside.

8.3 ON LINE UNINTERRUPTED POWER SUPPLY (UPS)

- Single phase UPS (2x100%) with 30 minutes battery backup should be provided for smooth operation of each station of adequate capacity during emergency.

Capacity	-	~~Bidder to indicate (?)~~1 KVA
Technology	-	PWM using IGBT/MOSFETS
Crest Factor	-	More than 3:1
Input	-	400 V AC
Voltage Range		+/-10%
Frequency		50 Hz +/- 3%
Output Voltage	-	230 V AC

Voltage Regulation		+/- 1%
Frequency		50 Hz
Frequency Regulation		+/- 0.01Hz
Waveform		Pure sine wave
Battery type	-	VRLA Battery
Distortion	-	Less than 1% on linear load
Power factor	-	0.8 to 1
Indicator	-	LED – Battery charge, over load, battery on, replace battery
Alarm	-	Audible alarm for battery backup, battery fault
Protections	-	Surge suppression meets BIS or International Standard
Overload	-	Fuse and current limited
Short Circuit	-	Fuse & current limited & cut off
Efficiency	-	More than 90%
Environment	-	Operating Temperature: 0 -50 degrees C
Operating Humidity		10% to 95% (non-condensing)
Audible Noise		Less than 45 db (at 1 meter)

8.4 GENERAL SPECIFICATIONS FOR ANALYZERS

8.4.1 The analyzers should be of rack mounting model with facilities for fixing the analyzers from front side.

8.4.2 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.

8.4.3 The analyzers should operate at operating voltage 230V AC, 1Ø, 50 HZ. The power supply input to be protected against spikes from and to the analyzer by an LC filter. The power connection cable should be CEE (Commission for Conformity

Testing of Electrical Equipment) type complete with 15 amperes plug.

8.4.4 The analyzers must function properly in all conditions without any defect between 0 to 50 degrees C ambient temperatures, 0 – 100% relative humidity and in high ambient dust levels. The data capture rate should not be less than 90%.

8.4.5 The manufacturer of the Equipment should assure technical support for the equipment for the duration as indicated in the scope.

8.4.6 The analyzers should be complete with calibration system. The analyzer must have zero point internal calibration system. The calibration procedures are to be integrated into the software system for automatic calibration.

8.4.7 All ambient gas analyzers shall conform to the USEPA automated reference or equivalent method designation as required by the specification for individual equipment. All analyzers shall be micro processor controlled with automatic calibration. All analyzers and sensors should be fully integrated in the rack cabinet, fully calibrated and tested before supply and ready for start up at the respective sites.

8.4.8 The manufacturer shall provide ~~five (5) years~~five (5) years warranty for the entire system.

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

8.4.10 Each set of analyzers operation manuals shall be supplied with 3 hard and 3 soft copies on DVD of elaborate operation manuals comprising details in three parts.

- Part I – should comprise installation, operational and troubleshooting details
- Part II – should have details about preventive, routine and corrective maintenance; and
- Part III – should comprise details of all electrical, electronic and pneumatic circuit diagrams, details of each spare parts, catalogue No., etc. and details of each electronic card / PCBs.

8.5 SPECIFICATIONS OF AMBIENT AIR ANALYZERS

a) PM 10

- Method- Light scattering technology/ beta attenuation
- Sensing ranges- 0.001- 20mg/m3
- Accuracy- +/-2% of full scale
- Resolution- 0.001mg/m3

- Zero drift- <1% per year
- Temperature- 0-50 deg. C
- Pressure- Atmospheric

b) PM 2.5

- Method: Light scattering technology /beta attenuation
- Sensing ranges: 0.001- 20mg/m3
- Accuracy- +/-2% of full scale
- Resolution- 0.001mg/m3
- Zero drift- <1% per year
- Temperature- 0-50 deg. C
- Pressure- Atmospheric

c) NOx

- Method: Electrochemical/chemiluminescence
- Sensing ranges: 0.001- 20mg/m3
- Accuracy- +/-2% of full scale
- Resolution- 0.001mg/m3
- Zero drift- <1% per year
- Temperature- 0-50 deg. C
- Pressure- Atmospheric

d) SO2

- Method Electrochemical/UV flourescence
- Sensing ranges- 0-5000ppb
- Accuracy- +/-2% of full scale
- Resolution- 0.002mg/m3
- Zero drift- <1% per year
- Temperature- 0-50 deg. C
- Pressure- Atmospheric

e) CO

- Method -Electrochemical/ gas filter correlation
- Sensing ranges- 0-5000ppb
- Accuracy- +/-2% of full scale
- Resolution- 0.002mg/m3
- Zero drift- <1% per year
- Temperature- 0-50 deg. C
- Pressure- Atmospheric

f) CO2

- Method –IR/gas filter correlation
- Sensing ranges- 0-5000ppb
- Accuracy- +/-2% of full scale
- Resolution- 0.002mg/m3
- Zero drift- <1% per year
- Temperature- 0-50 deg. C
- Pressure- Atmospheric

8.6 CALIBRATION SYSTEM

Calibration system should provide for the calibration of the air quality analyzers, data acquisition system, and meteorological equipment. It shall be under the bidder's scope of supply

8.7 SPECIFICATIONS OF METEOROLOGICAL INSTRUMENTS

For detailed specification, refer datasheet.

8.8 SPECIFICATIONS OF WATER QUALITY MONITORING INSTRUMENTS

8.8.1 FIELD MONITORING INSTRUMENTS

a) pH Meter (portable type pH meter)

- Sensor- Electrodes (Combined pH electrode and reference electrode) with integral temperature compensator assembly.
- Measured variable- pH and temperature
- Electrode material- Glass
- Type- Insertion type

- Measuring range- -2 to 20 pH
- Ambient temperature range- 0- 55 deg.
- Ambient Humidity- 0-90%
- Type- Portable type
- Calibration Check- Automatic
- Power supply- Battery operated
- Resolution- 0.01pH
- Accuracy- +/-0.02 pH
- Significant figures after decimal- 1
- Cable length from the Sensor to the displayer- Bidder to indicate

The chemical reagent necessary for calibrating the instrument is under the scope of bidder only. The quantity must be sufficient at least till the guarantee period.

b) Conductivity meter & Temperature

- Sensor- Electrodes (conductive sensors) with integral temperature compensator assembly.
- Measured variable- Conductivity and temperature
- Type- Dip type
- Significant figures after decimal for conductivity- 0
- Significant figures after decimal for temperature- 1
- Electrode type- Bidder to indicate
- Measuring cable length- bidder to indicate
- Temperature sensor- Thermistor/ RTD
- Measurement range- 0-2000µs/cm
- Accuracy- +/-1% of reading
- Repeatability- +/-0.3% of span
- Calibration- Five point calibration

The chemical reagent necessary for calibrating the instrument is under the scope of bidder only. The quantity must be sufficient ~~atleast~~at least till the guarantee period.

c) Dissolved oxygen meter

- Sensor – Electrochemical sensor
- Range- 0- 50 mg/l
- Resolution- 0.01 mg/l
- Accuracy- +/-1% of reading
- Calibration- Five point calibration
- Enclosure protection- IP 67
- Installation scheme- Dip type
- Significant figures after decimal - 1
- Ambient temperature range- 0- 55 deg.
- Ambient Humidity- 0-90%
- Type- portable meter
- Measurement modes- Direct DO
- Temperature compensation- required
- Power supply- inbuilt battery type

The chemical reagent necessary for calibrating the instrument is under the scope of bidder only. The quantity must be sufficient atlest till the guarantee period.

d) Turbidity meter (nephelometer)

- Sensor- optical sensor
- Measuring principle- ratio metric
- Measuring range- 0.001- 4000NTU
- Units of measurement- NTU
- Accuracy- +/- 2% of reading
- Repeatability- less than 1% of reading
- Type- portable type
- Weather proof- IP 67
- Sensor body- SS
- Significant figures after decimal – 1

- Five point calibration

The chemical reagent necessary for calibrating the instrument is under the scope of bidder only. The quantity must be sufficient at least till the guarantee period.

e) Total Organic carbon (TOC)

- Parameters- measures TOC
- Range- 0-1000mg/L C
- Range selection- Auto/manual
- Repeatability- +/- 0.5mg/LC
- Measurement method- Infrared measurement of CO2 after oxidation
- Display- High contrast display with backlit LCD
- Ambient temp- 5 -50 deg. C
- Humidity- 5 to 90%

All the related accessories required for the measurement of TOC shall be included in the bidder scope only.

8.8.2 LAB MONITORING INSTRUMENTS

The following Lab Instruments are required for improving the Lab Capabilities and measurement of listed parameter.

Sl no	Name of the Instruments	Test	Description	Suggested make
1	U.V.Visible Spectrometer	Phosphate, Nitrogen, COD etc.	UV visible range- 340nm to 950nm Cuvette length- 1cm	HACH, BIOTECHNICS INDIA, THERMOFISHER SCIENTIFIC
2	Balance	SS,VSS,MLSS, MLVSS	Digital, max capacity- 2kg Minimum capacity- 0.1 gm	HACH, BIOTECHNICS INDIA, THERMOFISHER SCIENTIFIC
3	Laminar Flow	Coliform Bacteria	All the technical parameters shall be specified by	HACH, BIOTECHNICS INDIA, THERMOFISHER SCIENTIFIC

			the bidders	
4	Auto cleave	Disinfection	Capacity 100lit.	HACH, BIOTECHNICS INDIA, THERMOFISHER SCIENTIFIC
5	Microbiological Oven	Coliform	Size- 2cm dia. X 30 cm depth Internal material- SS Temperature range- 50deg. To 130 deg.	HACH, BIOTECHNICS INDIA, THERMOFISHER SCIENTIFIC
6	COD Reactor (Double Block)	COD etc	Temperature range- 10- 150 deg.C Temperature stability- +/- 1deg.C Output –COD and TOC Power requirements- bidder to indicate No of block – 2 Number of vial wells- bidder to specify	HACH, BIOTECHNICS INDIA, THERMOFISHER SCIENTIFIC
7	B.O.D. Incubator	B.O.D	Capacity- 90lit Temperature range- 5-60deg c. Temperature uniformity- +/- 0.5deg.c Power requirement- bidder to indicate	HACH, BIOTECHNICS INDIA, THERMOFISHER SCIENTIFIC
8	Distillation Unit	Distilled water	MOC- SS	HACH, BIOTECHNICS INDIA, THERMOFISHER

			Capacity- 3-4 lit.	SCIENTIFIC
9	Muffle furnace	SS	Capacity- 20lit. Temperature- upto 600 deg.C	HACH, BIOTECHNICS INDIA, THERMOFISHER SCIENTIFIC
10	Amm.Nitrogen assembly	Amm.nitrogen	All the technical parameters shall be specified by the bidders	HACH, BIOTECHNICS INDIA, THERMOFISHER SCIENTIFIC

All the necessary accessories required with the instruments such as chemical reagents, titration flask, test tube shall be under the bidder's scope of supply.

Parameters	**Unit**	**Measurement methods**	**Significant figures after Decimal**
Colour	-	**Visual Method**	
odour	-	**Manual**	
Temperature	Deg. C	**Thermometer**	1
pH	-	**pH meter**	1
Electrical Conductivity	µS/cm	**Conductivity meter**	0
Dissolved Oxygen	mg/L	**DO meter**	1
Turbidity	NTU	**Nephelometer**	1
Ammonical Nitrogen	mg/L	Gravimetry	0
Nitrite + Nitrate-N	mgN/L	Colorimetry	1
Orthophosphate	mgN/L	Colorimetry	1
Biological Oxygen Demand	mg/L	DO consumption in 3 days at 27 °C	4
Chemical Oxygen Demand	mg/L	Potassium dichromate method	4
Sodium	mg/L	Flame photometry	1
Potassium	Mg/L	Flame photometry	1

Calcium	mgCaCO3/L	EDTA Titrimetric	1
Magnesium	mgCaCO3/L	EDTA Titrimetric	1
Carbonate as CaCO3	mgCaCO3/L	Titrimetric	1
Bicarbonate as CaCO3	mgCaCO3/L	Titrimetric	1
Chloride	mg/L	Argentometric titration	1
Sulphate	mg/L	Turbidimetry	1
Fluoride	mg/L	Ion meter, Colorimetry	2
Boron	mg/L	**Ion meter**, curcumin method	2
Total Coliform	No./100mL	MPN or MF method	0
Fecal Coliform	No./100mL	MPN or MF method	0
% Sodium	-	calculation	2
SAR	-	calculation	2

8.9 SPECIFICATIONS OF CENTRAL MONITORING SYSTEM (CMS)

The central Monitoring System shall be provided with hardware & software, which forms the heart of the Ambient Air Quality Monitoring & Weather monitoring System and is therefore a vital component of the system.

In general CMS should be industrial grade PC running latest windows OS and compatible software. It should be able to work unattended i.e. it captures analyzer values and sensor values automatically. If a user wishes to perform zero span checks or simply wishes to view the data, he should be able to login to the CMS through a valid username-password. In other words, the user can be located anywhere and not necessarily to close to the CMS. Data recorded in the CMS should also be accessible by remote computer and Smart Phone users for analysis & report viewing.

a. It should comprise of an Industrial PC running Windows latest version OS and compatible software.

b. The Data logging with central Monitoring System will be through GPRS/TCP-IP from all the AAQMS and MMS system and should have an ability to program and log channels at different intervals and should have a capability of averaging and displaying real time data and averaged data over a period of 1 min, 10 min, ½ hr, 1 hr, 4 hr, 8, hr, 24 hr.
c. Real time or averaged data can be viewed quickly and easily through a remote CLIENT interface on the central computer.
d. The System should be able to perform nested calculations vector averaging and rolling averages.
e. It should have a feature for viewing instantaneous and historical data in the form of tables and graphs either locally or from a remote client.
f. Data retrieval from CMS via USB and DVD should be possible.
g. Generation of reports for pollution load, wind rose etc
h. Alarm annunciation of analyzer/sensor in abnormal conditions

The CMS should be able to collect and store meteorological data and air quality data from all instruments listed above. The CMS should be data logger designed to acquire, transmit, process and store data.

8.10 SPECIFICATION OF COMPUTER (MINIMUM CONFIGURATION)

8.10.1 The Bidder shall provide one no. of systems with the following specified minimum hardware and the applicable software:

Make	-	DELL / Compaq / HP
Processor	-	Intel Core2 Duo, Minimum 3.6 GHz processor or better
RAM	-	8GB RAM
Hard Disk	-	1TB
Other features:	-	DVD R/W Drive DVD-RW used for installation of software and backing up of data/configuration files Modem 9600 baud or greater Data averaging periods up to 4 independent data sets. Selected between 1 minute and 7 days. Calibration control Automatic span and zero

		control. Calibration data is stored separately. Mouse port USB port
Monitor	-	22 " TFT color monitor
Port	-	2 serial, 1 parallel & 4 USB with LAN
Keyboard	-	104 keys keyboard Microsoft
Mouse	-	Optical Mouse + Pad
Operating system	-	Windows latest
Display	-	better than 800 x 600+ Display driver supporting up to 2048 x 1536 dual screen
Data storage	-	IDE Hard disk drive 1 TB Data Storage format Data stored in ASCII format
Modem Port	-	1 x RS232 DB9M

8.11 SPECIFICATION OF LASER PRINTER

8.11.1 The Bidder shall provide one no. of printer.

Speed(pages per minute	-	At least 12
Resolution	-	1200 x 1200 dpi
RAM	-	8 MB expandable to 32 MB
Main tray capacity	-	At least 250 sheets
Interface	-	Parallel& USB
Operating System	-	Windows latest
Power Supply	-	230V AC, Single phase, 50 Hz

8.12 SPECIFICATION OF ANALYTICAL SOFTWARE

Windows latest version OS software for data acquisition from the CMS and for statistical analysis and reporting of the monitored parameters mentioned above. Analysis and reporting software should possess following minimum features:

(i) Windows (latest version) compatible

(ii) File format conversion

(iii) Statistical analysis of data for maximum, minimum, average and standard deviation for various time intervals using the monitored data

(iv) Tabular and graphical format for report production

(v) Wind rose graphs

(vi) File export facility

(vii)Windows based printer support.

8.13 REPORT PREPARATION AND DATA VALIDATION SOFTWARE

A typical online air quality monitoring station produces thousands of data values every month. The report preparation software is a vital aid to analyze the data recorded by the CMS. The software will be used to download data from the various field stations to a central location for analysis, long-term storage and dissemination of information. The software will be used to tabulate the data, export it to popular formats such as MS Excel or perform scientific analysis in the form of graphs/charts. For routine daily operation the user should be able to perform auto generation of suitable tables/graphs via templates configured as per need. Mandatory features of Report Preparation software are listed as below.

a. It should support communication to the CMS via a variety of mediums such as Ethernet, TCP/IP, GPRS, PSTN lines etc.
b. It should feature automatic data validation complete with data capture percentage
c. It should be able to manage more remote air quality monitoring stations in addition to the specified requirement.
d. It should be able to automatically collect data from various CMS at prescribed time interval i.e. it should allow programmable data download from the CMS
e. It should be able to display/tabulate online data of multiple stations
f. Should have the facilities for calculation of Arithmetic mean values, average, 30 min, 1 hr,2,hr, 3hr, 4 hr, 8 hr, 12 hr, 24 hr, weekly, monthly and yearly. Calculation for minimum, medium, percentile, maximum standard deviation frequency analysis and cumulative frequency analysis.
g. Capability to generate automatically wind roses, polar plots, Exceedance Curves, Histograms, Bar Charts etc.
h. Automatic reports preparation in the form of graphs/tables for a user defined period .User should be able to schedule time for the report to be generated
i. Auto mailing of the prepared report to a user-defined email id.
j. Features to export data to a variety of standard formats including standard image format, MS excel, HTML and ASCII text files.

k. It should allow setting up of alarm levels and provide automatic alerts of unexpected data and calibration levels via email to the system administrator.

l. Different users (or clients) should be able to customize the way they wish to interpret download values

Data evaluation and reporting software should be upgraded to a multi-user version that can store data in a MS SQL server 7 databases.

8.14 AAQMS HOUSING & METEROLOGICAL SENSORS SETUP

- The AAQMS equipment shall be housed in a weather proof air conditioned. Bidder shall furnish the details of space requirements, foundation details for locating at field (required Civil works by purchaser) of each ~~room~~station.
- Standing Poll of Telescopic type of 10 Meter height for the installation of meteorological sensors shall be considered. Necessary hangers and holders along with electrical grounding set shall be provided for installation of sensors. Material of construction of Substation/ Standing Poll shall be metallic and robust. All the civil works required for this shall be in the scope of the bidder.

8.15 SPECIFICATION OF LARGE ELECTRONIC DISPLAY UNIT

- Electronic Display system /super bright red LED panel for displaying information of pollution parameters and their values.
- The system should hold & display the value of a parameter for 10 seconds before going on display the value of next parameter.
- Size of character 9” x 7 “.
- Sequence of display on the board shall be as follows

Name of the company:

Location of the Station: Box

Consent No: Box

Date: (Box) **Day :** (Box)

Emission From Station: SO2 (Box) **TPD , Nox** (Box) **ppm , CO, CO2**

Ambient Air Quality Parameters

(1st Box) (2nd Box) (3rd Box) (4th Box)

Meteorological Parameter

(1st Box) (2nd Box) (3rd Box) (4th Box)

The size of the board shall be adjusted according to the above requirement.

The Supplier should give details of connectivity by cabling or through wireless or both. All the civil works required for the foundation of the Digital display shall be in the scope of the Contractor. However the contractor shall also coordinate with the ICT contractors /Sub contractor regarding the data synchronization.

9. TECHNICAL DATASHEET/ PARTICULARS

MICRO-METEOROLOGICAL STATION DATA SHEET			
1.	**WIND SPEED AND DIRECTION – SINGLE UNIT**	**2.**	**AIR TEMPERATURE AND RELATIVE HUMIDITY SENSOR – SINGLE UNIT**
	1. **WIND SPEED**		SENSING ELEMENT : Solid State Capacity type sensor
	RANGE : (0 – 65 m/s)		RANGE : 0 – 100% RELATIVE HUMIDITY
	STARTING THRESHOLD : 0.3 m/s		TEMPERATURE RANGE : -20˚C TO 60 ˚C
	ACCURACY : ± 2% FSD		RESPONSE TIME : LESS THAN 15 SECONDS AT 20˚ C OF FINAL (WITH FILTER)
			ACCURACY : ± 3% of FS
			TEMPERATURE COEFFICIENT : 0.04% RH /˚C
	2. **WIND DIRECTION**		OUTPUT : 0 -1 VDC STANDARD
	RANGE : MECHANICAL 0 – 360 ˚ ELECTRICAL 0 – 356 ˚		INPUT POWER : 4 mA AT 12V DC BATTERY
	STARTING THRESHOLD : Better than 0.5m/s	**3.**	**RAINFALL**
	ACCURACY : ± 3 degrees		FUNNEL DIAMETER : Bidder to specify
	DAMPING RATIO : 0.25		STANDARD CALIBRATION : 0.01”
	RESOLUTION : <0.5 DEGREE OUTPUT:0-5 k Ohms		OPERATING TEMPERATURE : '-4˚C to +50˚C
	3. OTHER SPECIFICATIONS		ACCURACY AT better than (±)5%
	TEMPERATURE RANGE : -30 ˚ to + 70 ˚C		SWITCH : TYPE REED
	OUTPUT SIGNAL: WIND SPEED : NON CONTACT PHOTO CHOPPER WIND DIRECTION : POTENTIOMETER OUTPUT (0-10K OHMS)		RATING : 10 mA, 28 V DC
	MOUNTING : ADAPTER TO A VERTICAL 1” TUBING OR PIPE(1.05” OD)		HEIGHT : 20.5” (52 cm)

	4.PYRANOMETER – SOLAR RADIATION	**5.**	**BAROMETRIC PRESSURE**
	SPECTRAL RESPONSE : NANOMETERS : 400 -1100 MICRONS : 0.4 – 1.1 Pyrometer solar radiation output- 0 to 1 V proportional to 0 to 1200 W/sq. mtr.		PROOF PRESSURE : 2 bar
	CALIBRATION : AGAINST EPPLEY B&W UNDER NATURAL DAY LIGHT		OPERATING TEMPERATURE : 0 to 50 degree C
	SENSITIVITY : 8 mV / kwatt meter 2 with 100 ohm LOAD, approx.		COMPENSATE TEMP. RANGE : (-)10 - 60˚C
	IMPEDANCE : 100 ohms LOAD (DEPENDENT UPON SENSOR SENSITIVITY)		NON LINEARITY & HYSTERISIS : 0.1% OF FULL SCALE
	TEMPERATURE DEPEND : ± 15% / ˚C MAX		RESPONSE TIME : 1 ms
	LINEARITY : ±1% FROM 0 – 3000 WATTS METER2		REPEATABILITY : 0.2% OF FULL SCALE
	RESPONSE TIME : 10µS (10 – 90%)		LONG TERM STABILITY : 0.1% OF FULL SCALE
	COSINE RESPONSE : CORRECTED UPTO 82˚ INCIDENT ANGLE & AZIMUTH ERROR LESS THAN 1% OVER 360˚ AT 45 ˚ ELEVATION		TEMP. SHIFT : 0.3% OF FULL SCALE/ 10˚C
6.	**TELESCOPIC CRANK-UP METEOROLOGICAL TOWER (REFER NOTE 1)**		
	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 - 6		
	CONSTRUCTION MATERIAL : GALVANISED STEEL OR ALUMINIUM		

NOTES:

1. THE WIND DIRECTION, WIND SPEED, VERTICAL ANEMOMETER AND TEMPERATURE SENSORS ARE TO BE MOUNTED ON THE METEOROLOGICAL TOWER. THE TOWER IS TO BE FREE STANDING FOUR SECTIONS TELESCOPIC TOWER PROVIDED WITH A HAND CRANK OR FOOT PUMP TO RAISE AND LOWER INSTRUMENTS MOUNTED ON THE TOP SECTION.

10. PERFORMANCE GUARANTEES

The bidder shall provide a guarantee in respect of the equipment to be furnished by him the following:

(i) All equipment and materials shall be new and in accordance with the specification, all equipment shall be free from any defect due to faulty design, materials and/or workmanship.

(ii) Performance Guarantee: Bidder shall guarantee the successful and satisfactory operation of all the equipment supplied under this specification and shall meet the ratings and requirements with stipulated accuracy class.

The period of the Guarantee shall be called the "Guarantee period". During this period, the successful bidder's liability shall be replacement of any defective parts that may develop in the equipment. All such replacements of defective parts mentioned above shall be made free of cost at site by the bidder. The service shall be free of cost during Guarantee period.

11. TESTING & INSPECTION

- Owner will take over the system from the bidder after final acceptance test, which is defined as the satisfactory performance of the analyzers and station and successful uninterrupted operation for 10 days. Any malfunctioning of the system shall be replaced / repaired as required by the purchaser. Commissioning is deemed to be completed only after successful completion of FAT.

12. QUALITY REQUIREMENT

- 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 Bidder shall plan the necessary audits to evaluate the effectiveness of the Quality System applied to the work under contract. In particular, the internal quality audits shall be carried out following an appropriate documented procedure and on the basis of a suitable plan setting out the items and activities which are to be audited. The audits shall be conducted by qualified personnel not directly involved in the activities under examination. Audit results shall be reported in a suitable document which may be examined by the EPC Contractor (Audit Report). Copies of Audit Reports (along with any finding) shall be forwarded to the EPC Contractor for review to determine if there are any significant conditions adversely impacting quality.

- The Bidder shall have a system, in line with this specification, which assures the control of the issue, updating, distribution and filing of the required documentation. This system shall include the issue of appropriate procedures for at least the following aspects:
- Issue, check and approval of documentation;
- Carrying out modifications in a controlled and documented manner;
- Method of filing and distribution
- The bidder 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

13. Training requirements

- Intensive maintenance training to minimum three of purchaser's personnel shall be given at bidder's facility for a period of 1 month. Operation and maintenance training at site shall also be given.

14. Drawings and documents

- Two sets of Operation and Service manuals with Part Numbers should be provided in bound volumes and also in soft copies as CD/DVD.
- The bidder shall also provide approval certificates, calibration and material certificates, if required, from the competent authority for all types of equipments supplied.

Signature

SIGNATURE OF THE CONTRACTOR.

NAME AND ADDRESS :-

GENERAL MANAGER / ADDITIONAL CITY ENGINEER(CIVIL)
SURAT SMART CITY DEVELOPMENT LIMITED/SURAT MUNICIPAL CORPORATION