




PRODUCT STANDARD
ELECTRICAL,C & I
BAP / BHEL / RANIPET 632 406

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TITLE : TECHNICAL SPECIFICATION FOR BOUGHT OUT ITEMS FOR ESP and
BAG FILTER

ITEM : DUST DENSITY MONITOR

PROJECT : REFER PROJECT SPECIFIC DATA SHEET

	NAME	DESIGNATION	SIGNATURE	DATE
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ISSUED BY **EDC – E, C&I**

REVISION: 03 Clause No 1.2.0, 5.1.0, 5.3.0,5.4.0, 12.1.0,18.0.0, 20.1.0,21.0.0,22.4.0 & 22.6.0 12-02-2016

REVISION: 02 Clause No 5.3.0 Make of components added. 07-05-2014

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ENGINEERING

QUALITY

PURCHASE

VENDOR

1.0.0 INTRODUCTION:

- 1.1.0 This technical specification is meant for Dust Density Monitor and its Accessories to be supplied and commissioned at the site, mentioned in Project Specific Data Sheet.
- 1.2.0 The Dust Density Monitor & its accessories offered by the bidder shall be field proven type with sufficient back-up documents and shall be reviewed & approved by BHEL / BAP / RANIPET.
- 1.3.0 The Dust Density Monitor shall be IN-SITU, visible light type. The Dust Density Monitor shall meet the requirements stipulated by US EPA / VDE standard.
- 1.3.0 The bidders shall submit all the documents required as per this specification, along with their offers for review by BHEL.
- 1.4.0 The offers without enclosing any of the required documents will be considered as non-responsive & incomplete offers. Such offers are liable for rejection.
- 1.5.0 The bidders may note that deviation if any to this technical specification is not acceptable. The offers with technical deviations, is liable for rejection.

2.0.0 SCOPE OF SUPPLY & WORKS:

- 2.1.0 The scope of supply shall include Design, manufacture, testing, inspection, packing and delivery of Dust Density Monitor, Remote control unit (if applicable) and accessories as per this technical specification.
- 2.2.0 The scope of the bidder shall also include the following.
 - a)Erection supervision of the items supplied.
 - b)Commissioning of all the items supplied by the vendor to the satisfaction of BHEL / Customer.
 - c)Supply of software if any, required for commissioning, and operation & maintenance of Dust Density Monitor and its accessories.

3.0.0 PROJECT INFORMATION:

As per Project Specific data sheet

4.0.0 SITE CONDITION & SITE DATA:

3.0.1	Ambient temp	5 to 50°C
3.0.2	Design ambient	50°C
3.0.3	Relative humidity (maximum) at 45°C	95 %
3.0.4	Location	Out door, ESP outlet duct before / after ID fan. Surrounding atmosphere is dusty, polluted and corrosive.
3.0.5	Duct width through which light passes	As per project specific data sheet
3.0.6	Duct material	Mild steel
3.0.7	Flue gas flow	Horizontal
3.0.8	Flue gas pressure	As per project specific data sheet
3.0.9	Flue gas temperature (i)Normal (ii)Exceptional	As per project specific data sheet As per project specific data sheet
3.0.10	Flue gas sulphur content	As per project specific data sheet
3.0.11	Flue gas moisture content	As per project specific data sheet
3.0.12	Dust emission (ESP design condition)	As per project specific data sheet
3.0.13	Source of dust emission	Coal fired boiler
3.0.14	Type of dust collector	ESP /Bag filter.

4.0.14 All the items supplied by the vendor shall be suitable and perform satisfactorily under the above site condition specified in the site data.

5.0.0 MAJOR COMPONENTS OF Dust Density Monitor & ITS ACCESSORIES

5.1.0 One set of Dust Density Monitor & its accessories shall consist of the following:

All the items shall be supplied thro' principal vendor only. The principal vendor shall take responsibility for satisfactory working of complete system of Dust Density Monitor.

- (i) Transceiver / Measuring Head / Sender Receiver with Purge Air Adopter.
- (ii) Reflector / Retro Reflector with Purge Air Adopter
- (iii) Local Connection Unit / Local Control Unit.
- (iv) Interconnecting **special** cables/prefabricated cable.
- (v) Air Purge Blower with filters, Hose, Adapters and mounting base plates.
- (vi) Air purge hose between Blower and Transceiver / Reflector along with hose clips. (Length 2x15m).
- (vii) Alignment fasteners to align the Transceiver and Reflector.
- (viii) Fully Automatic, electrically operated Failsafe Shutters for protecting Transceiver / Reflector
- (ix) Differential Pressure Switch / Flow sensors for monitoring purge air failure at the Transceiver / Reflector.

- (x)Set of span filters for all measuring ranges (if applicable for the design).
- (xi)Remote Control Unit suitable for panel mounting if applicable as per Project Specific Data Sheet.
- (xii)Low pressure switch to monitor Air Filter Choking condition.
- (xiii)Mounting flange/Mounting tube with flange along with fasteners.
- (xiv) Weather hood for Measuring head/Sender/Receiver, Reflector,Purge air blower.
- (xv)Weather hood cover for Evaluation unit/local Control Unit as applicable/Field mounted items.
- (xvi)Field Termination box/Auxiliary Box for Fail safe shutter with Interconnection Cables/Junction Box with Interconnection cables as applicable.
- (xvii)Adaptor Flange for Solenoid operated Fail safe Shutter as applicable.

5.2.0 In addition if any other items required to make the system complete, shall be identified & supplied.

5.3.0 For NTPC projects only NTPC Approved Vendors is applicable.

5.4.0 Make of components as follows :

Supplier to furnish along with offer , the makes / model no. to be followed for the below listed equipment's along with a certificate from the principle suppliers that the make of components used is acceptable to them and they stand guarantee for the entire system.

SL.NO	DESCRIPTION	MAKE & MODEL NO.	QUANTITY/DDM Set
1	Transceiver/ Measuring Head / Sensor Receiver with Purge Air Adopter.		
2	Reflector / Retro Reflector with Purge Air Adopter.		
3	Local Connection Unit / Local Control Unit.		
4	Interconnecting Special cables/ prefabricated cable.		
5	Air Purge Blower with filters, Hose, Adapters and mounting base plates.		
6	Air purge hose between Blower and Transceiver / Reflector along with hose clips.(Length 2x15m)		
7	Alignment fasteners to align the Transceiver and Reflector.		
8	Fully Automatic, electrically operated Failsafe Shutters for protecting Transceiver / Reflector.		
9	Differential Pressure Switch /Flow sensors for monitoring purge air failure at the transceiver / Reflector.		
10	Set of span filters for all measuring ranges (if applicable for the design).		
11	Remote Control Unit suitable for panel mounting if applicable as per Project Specific Data Sheet.		

12	Low pressure switch to monitor Air Filter Choking condition.		
13	Mounting flange/ Mounting tube with flange along with fasteners.		
14	Weather hood for Measuring head/ Sender/ Receiver, Reflector, Purge Air Blower.		
15	Weather hood cover for Evaluation unit / Local Control Unit as applicable/Field mounted items		
16	Field termination box / Auxiliary Box for Fail safe shutter with Interconnection Cables/ Junction Box with Interconnection cables as applicable.		
17	Adaptor Flange for Solenoid operated Fail safe Shutter as applicable.		

5.5.0 Power supply details

(i) The Local Connection Unit / Local Control Unit / Power Supply Unit / Signal Processing Unit & Electrically operated shutter shall be suitable for the following power supply.

- a) Voltage : 110 V/240 V AC (As per Project Specific Data Sheet)
- b) Frequency : 50 HZ.
- c) Variation in Voltage : $\pm 10\%$.
- d) Variation in frequency : $\pm 5\%$.
- e) Combined Variation in Voltage & Frequency : 10%(Absolute sum).

(ii)The Blower shall be suitable for the following power supply.

- a)Voltage : 415V, AC, 3 Phase
- b)Frequency : 50 Hz.
- c)Variation in voltage : $\pm 10\%$.
- d)Variation in Frequency : $\pm 5\%$.
- e)Combined Voltage & frequency : 10% (Absolute sum).

6.0.0 Principle of operation :

6.1.0 The Dust Density Monitor is a monitoring device for the optical measurement of dust concentration. It belongs to a group of Transmissimeters, which precisely determine the energy loss focused light beam caused by dust particles in the emission

6.2.0 The energy loss is expressed in the optical measurement 'Extinction'. The quantity of Dust contained in the emission through which the light passes is proportional to the 'Extinction' value. The correlation is found by means of gravimetric measurements. (Gravimetric measurement is not in the scope of bidder / supplier).

- 6.3.0 The principal of operation of Dust Density Monitor shall be transmission and absorption. The unit shall operate on Auto Collimation principle.
- 6.4.0 The Dust Density Monitor and its accessories, mounted at the duct, shall be designed for weather & dust proof as per IP 55 degree of protection, as per standard.
- 6.5.0 The Dust Density Monitor shall automatically and continuously correct the measurement for variations in the following and provide out put signal not affected by the following parameters.
- a) Flue gas temperature.
 - b) Ambient temperature.
 - c) Line voltage.
 - d) Ambient illumination.
 - e) Lamp aging.
 - f) Detector drift.
 - g) Shift in components characteristics.
 - h) Moisture in flue gas
- 6.6.0 The Dust Density Monitor shall measure the dust concentration of the dust at the location of installation and produce 4 – 20mA DC (floating) instantaneous signal corresponding to dust density measurement in mg / Nm³. The Dust Density Monitor system shall provide separate isolated 4-20 mA DC signals corresponding to dust measurement in mg / Nm³ and opacity for Purchaser's use.
- 6.7.0 The Dust Density Monitor shall provide potential free 'NO' contact for high emission level alarm.
- 6.8.0 The Dust Density Monitor shall meet the following.
- a. Drift in calibration (zero & span) : 1% in 24 hours.
 - b. Response time : Within 5 sec.
 - c. Sensor type : Luminescence
 - d. Calibration error : 2% or less of full scale range.
- 6.9.0 The Dust Density Monitor shall automatically carry out on-line ZERO & SPAN calibration. However it shall also be possible to select the on line ZERO & SPAN calibration manually at the field.
- 6.10.0 It shall be possible to select measurement mode, zero calibration mode and span calibration mode at the field.
- 6.11.0 It shall also be possible to read the out put current, Dust measurement at the field.

- 6.12.0 The Dust Density Monitor shall check the contamination on the optical surfaces and output error signal .Potential free 'NO' contact shall be provided if the window contamination exceeds the set level.
- 6.13.0 One Potential Free 'NO' contact shall be provided in the Dust Density Monitor to indicate that, the Calibration process is ON. The change in status of this potential free contact shall hold until the completion of the zero & span calibration.
- 6.14.0 The bidder shall furnish in their offer, the duration of ZERO & SPAN calibration / any other check cycle.
- 6.15.0 The bidder / supplier shall feed all parameters related to this contract in the Dust Density Monitor at the works itself and not at the site. It shall also be possible to feed the path Length details in the Dust Density Monitor, at site. Details of set point shall be furnished along with test certificate
- 6.16.0 Erection, commissioning, operation & maintenance manual shall be in ENGLISH only. Accordingly any displays, instruction etc. shall be furnished in English only.
- 6.17.0 All Potential Free contacts for external used shall be rated for 240 V, AC.5A If required suitable Local Junction Box shall be supplied to convert the Potential Free Contacts to 240 V, AC rating.**
- 6.18.0 Necessary Field Termination Box shall be supplied to terminate the Flow Sensor contacts, if Flow Sensors are envisaged.

7.0.0 TRANCEIVER / TRANSMISSOMETER / MEASURING HEAD AND REFLECTOR
/ REFLECTOR:

- 7.1.0 Each set of Dust Density Monitor shall have one number each Transceiver (to be mounted on one side of the duct), and Reflector (to be mounted on the opposite side of the duct).
- 7.2.0 The Transceiver shall contain a light source, the light from which shall be modulated and shall be projected through the flue gas stream. The light reflected (Measurements beam) from the Reflector shall be compared at the Transceivers with the light transmitted (reference beam) from the Transceivers. The ratio of measurement beam to reference beam shall be used to determine the Optical density of the dust in the flue gas.
- 7.3.0 The power supply to the light source shall be regulated to ensure constant light emission.
- 7.4.0 The minimum life of the light source shall be 20, 000 hours.
- 7.5.0 The Transceivers and the Reflector shall be made up of Die Cast Aluminium / Stainless Steel.
- 7.6.0 The Transceivers shall be provided with automatic on line Span and Zero calibration function with manual over – ride facility.

- 7.7.0 For the visual observation of the system alignment (Alignment Indicators), suitable provision shall be made available in the Transceivers.
- 7.8.0 The Reflector shall be suitable for the duct dimension indicated in Project Specific Data sheet.
- 7.9.0 **EXTINCTION RANGES:**
- 7.9.1 The measurement range in mg/Nm³ for various extinction ranges shall be furnished.
- 7.9.2 The instrument can be designed for a particular duct width (zero reference paths) as per purchase enquiry / purchase order, for a particular extinction range, considering 200mg/NM3 having dust particle size 3 micron .
- 7.9.3 The vendor shall supply span / check filter for all measurement ranges for all Dust Density Monitors.
- 7.9.4 In case during calibration check cycle, if the span filter needs to be changed for different extinction ranges, the same should be possible and replaceable at site easily.
- 7.9.5 Adjustment at site, for working in different extinction range, shall be possible and the same shall be confirmed in the offer.
- 7.9.6 Minimum 5 different MEASUREMENT RANGES shall be provided in the Dust Density Monitors.
- 7.9.7 If any other design is offered which does not require changing of SPAN / CHECK FILTER for various measurement ranges, the same shall be explicitly brought in the offer along with details.
- 8.0.0 **LOCAL CONNECTION UNIT / LOCAL CONTROL UNIT / POWER SUPPLY UNIT / SIGNAL PROCESSING UNIT,**
- 8.1.0 The vendor shall supply Local unit .
- 8.2.0 In addition any Control Unit for Fail Safe Shutter is required, the same shall also be supplied.
- 9.0.0 **FULLY AUTOMATIC ELECTRICALLY OPERATED FAIL SAFE SHUTTERS :**
- 9.1.0 Each set of Dust Density Monitors shall be supplied along with 2 nos. independent Fully Automatic Fail Safe Shutters, to prevent dust laden flue gas from entering and contaminating the Optical surfaces of the Transceivers and Reflector .

- 9.2.0 These failsafe shutters shall automatically open when, the following conditions are satisfied.
- a) Power supply is available
 - b) Purge air is available at the Transceiver & Reflector.
- 9.3.0 The failsafe shutters shall close automatically when minimum one of the following conditions is satisfied.
- a) Power supply is not available
 - b) Purge air is not available at the Transceiver or Reflector.
- 9.4.0 The failsafe safe shutter requiring manual intervention for its Open / Close operation, is not acceptable.
- 9.5.0 The part of failsafe shutter, which is exposed to the measuring light beam shall not be of polished surface/ white colored surface.
- 9.6.0 The Fail Safe Shutter shall be operated using Electrical supply only and not based on Air operation or Air cum spring operation or Counter Weight.**
- 9.7.0 The Operation of the failsafe shutter shall not be based on Battery. Battery charging mechanism is not acceptable.
- 9.8.0 Counter weight cum air operated fail-safe shutter is not acceptable.
- 9.9.0 The failsafe shutter shall be field proven type and BHEL / Ranipet approved model.
- 9.10.0 The shutter shall move away from the exposed portion of the flange such that moving mechanism will not be affected by dust deposit, if any.
- 9.11.0 The bidder shall submit along with the offer, the General Arrangement drawing along with Operational write – up of the Failsafe shutters for BHEL review & acceptance, if the shutters are not meeting the above requirement.
- 9.12.0 Each failsafe shutter shall be provided with one number potential free contact, which shall close, when the shutter is closed and shall open when the shutter is open. This contact is required for the use of Purchaser.
- 9.13.0 The Fail Safe Shutter shall perform satisfactorily with the dust having highly abrasive characteristics.
- 10.0.0 MOUNTING FLANGE WITH TUBE**
- 10.1.0 Two sets of Mounting Flange with Tube assembly shall be supplied, one each for Transceiver and Reflector.
- 10.2.0 The mounting flange with tube shall be integral. Supply of separate flange and tube from supplier's works is not acceptable.

10.3.0 The flange tube shall be suitable to mount Transceiver and Reflector along with the Fail Safe Shutters.

10.4.0 The length of tube shall be minimum 225mm.

10.5.0 To mount failsafe shutter with the equipment, additional adopter / accessories if any are required, the same shall be supplied along with the mounting flange.

10.6.0 Suitable sealing gaskets shall be supplied along with the Flange with Tube, so as to prevent dust and water entry through the Flange-to-Flange connection.

11.0.0 ALIGNMENT FASTNERS AND MOUNTING FASTENERS

11.1.0 To mount and align the Transceiver & Reflector on the flange tube along with the Fail Safe Shutters, suitable mounting cum aligning fasteners shall be supplied. The length of the fasteners shall be sufficient enough to mount the Transceiver / Reflector on the Flange Tube along with the Fail Safe Shutters

11.2.0 All mounting hardware (bolt, nut & washers or any other items not specified but required for the system) for fixing all applicable equipment / accessories shall be supplied by the vendor. The bolts shall have adequate length for fixing the equipment / accessories.

12.0.0 BLOWER

12.1.0 For each set of Dust Density Monitor, Blowers along with accessories shall be supplied. The Blower shall be of field proven & BHEL approved make.
Number of Blowers shall be as per Project Specific Data Sheet.

12.2.0 The Blower motor suitable for power supply other than that mentioned above will be not be accepted and the same will be rejected.

12.3.0 The Blower shall be supplied along with the mounting base, so that the blower can be mounted on the flue gas duct wall itself.

12.4.0 Each Blower shall be supplied along with air purge hose (**length as per Project Specific Data Sheet**) to convey the purge air from the Blower to the Transceiver and Reflector

12.5.0 The Blower shall be provided with removable cartridge dust filter at the suction side to filter
5 micron & above dust particle from the intake air.

12.6.0 The Blower and its associated components, filter etc, shall be suitable for an ambient temperature of +50°C

12.7.0 Necessary hose clips, screws etc, shall be supplied for the installation of the hose, between Blower, Transceiver and Reflector.

- 12.8.0 The KW rating & full load current of Blower to be furnished in the offer.
- 12.9.0 The Blower shall be provided with electrical motor of adequate capacity & justification for the capacity selected shall be submitted.
- 12.10.0 The motor shall be minimum Class-B insulated. The temperature rise for the motor shall be 70 deg. C by resistance method.
- 12.11.0 The noise level and vibration level of the motor shall be limited within the limits prescribed in relevant IEC / IS standard. The motor shall withstand the vibrations produced by the driven equipment.
- 12.12.0 The maximum continuous rating of the motor shall be at least 10% above design point or equal to the maximum load demand of the driven equipment, under entire operating range including voltage and frequency variations.
- 12.13.0 The starters (Switch gear) for Blower will be provided by BHEL and excluded from the scope of supply of Dust Density Monitor.
- 12.14.0 The Blower shall deliver the purge air at the required pressure and volume to prevent the dust laden flue gas from reaching the Optical Surfaces of the Transceiver thereby avoiding contamination of the Optical Surfaces and condensation of flue gas moisture in the Dust Density Monitor.
- 12.15.0 The air purge hose shall be suitable for 120 deg.C continuous operation
- 12.16.0 Providing Compressor for Air Purging is not acceptable.
- 13.0.0 **DIFFERENTIAL PRESSURE (DP) SWITCH / FLOW SENSOR:**
- 13.1.0 For each set of Dust Density Monitors, two numbers Differential Pressure Switch shall be supplied.
- 13.2.0 The differential pressure switch shall be provided with potential free 'NO' contact, to sense the purge air flow at the Transceivers / Reflectors. These 'NO' contacts shall be suitable for 240 V, AC .
- 13.3.0 Alternatively, if the design of the bidder calls for Flow Sensors, then, 2 numbers Flow Sensors per Dust Density Monitors shall be supplied , to sense the air flow at the Transceiver / Reflector.
- 13.4.0 On sensing the purge air failure at the Transceivers / Reflectors, the DP Switch / Flow Sensor shall close the Fail Safe Shutters automatically to prevent the optical surfaces of Transceivers / Reflectors from the dust deposit. When the purge air is resumed at Transceivers/ Reflectors, the Fail Safe Shutter shall open automatically.

14.0.0 WEATHER HOODS:

- 14.1.0 Weather hoods shall be provided for all field mounted equipment & for all instruments including Transceiver, Reflector, Local Connection Unit/ Local Control Unit, Purge Air Blowers, Local Junction Box / Field Termination Box etc.
- 14.2.0 These weather hoods shall be provided for all field mounted equipment / instrument, even if they are meeting weather and dust protection to prevent direct fall of sunlight or rain or dust on the equipment / instruments.
- 14.3.0 The weather hoods shall fully cover the respective equipment / instrument except at the bottom (for heat dissipation.)
- 14.4.0 The weather hood shall be made of Mild Sheet Steel.
- 14.5.0 The weather hood drawing shall be submitted to BHEL for approval, on placement of order.

15.0.0 INTERCONNECTING CABLES:

- 15.1.0 Prefabricated Inter connecting **special** cables of sufficient length from Transceiver / Reflector/ Fail Safe Shutter / DP Switch / Flow Sensors to Local Termination box / Local Evaluation Unit / Power Supply Unit / Signal Processing Unit/ Control Unit for Fail Safe Shutter shall be supplied for each Dust Density Monitor.
- 15.2.0 Fabrication of cables at site is not acceptable.
- 15.3.0 If pre fabricated cables are not required, the same shall be clearly indicated in the offer.
- 15.4.0 The type of cable, type of termination, limitation in length if any etc. shall be clearly indicated in the offer.
- 15.5.0 The bidder shall furnish detailed interconnection drawings between various equipment / instrument on placement of order.
- 15.6.0 Inter connecting cable between Transceiver and Reflector if applicable shall be supplied at the rate of 15 meter per Dust Density Monitor.

16.0.0 REMOTE CONTROL UNIT (RCU):(If applicable as per PROJECT SPECIFIC DATA SHEET)

16.1.0 The automatic calibration interval shall be selectable from the Remote Control Unit (Herein after called as RCU).

16.2.0 The RCU shall be suitable for Panel mounting located at a distance of 500 m away from the location where the Transreceiver / Measuring Head is installed.

16.3.0 The RCU shall provide two separate isolated 4-20 mA DC (floating) outputs corresponding to dust density measurement in mg / Nm³ & 0 to 100 % Opacity.

16.4.0 The RCU shall be provided with the following features:

- (i) Dust density indication (in mg / Nm³.)
- (ii) Measurement range selection (min. 10 ranges)
- (iii) Remote automatic transceiver/ Measuring head calibration interval control (1 to 24 hours)
- (iv) Status indication of in-situ equipments such as lamp, Air filters, Fail safe shutters, Optical surfaces (Transceiver and Reflector) and Over range operation etc.
- (v) Two independent high level alarm (potential free NO contact) with adjustable time delays.
- (vi) Potential free contact (NO) output for indicating that the Dust Density Monitor is under calibration mode.
- (vii) Potential free contact (NO) output for indicating that the Dust Density Monitor is malfunctioning.

17.0.0 DOCUMENTS/DETAILS TO BE SUBMITTED ALONG WITH THE OFFERS:

- a) Schedule A (Schedule of technical confirmations)
- b) Schedule B (Schedule of technical deviations)
- c) Schedule C (Bill of materials including special tools if any)
- d) Schedule D (Scope of work)
- e) General arrangement drawing & operational write-up on Fail Safe Shutters
- f) Block / Schematic diagrams identifying various items quoted / required and also indicating the scope of supply.
- g) The duration of Zero & Span calibration / any other check cycle.
- h) The measurement range in mg/Nm³ for various extinction ranges.
- i) The KW rating, full load current & flow of Blower is to be furnished in the offer.

- j) The type of cable, type of termination, limitation in length if any etc. shall be clearly indicated in the offer

18.0.0 THE FOLLOWING DOCUMENTS SHALL BE SUBMITTED TO BHEL IN THE EVENT OF AN ORDER ON THE BIDDER.

Following documents / drawings shall be submitted to BHEL (For Approval) within 2 weeks from the date of purchase order.

- 18.1.0 Detailed Bill of material (as per purchase order including special tools if any) indicating item description, part no. rating, quantity make etc.
- 18.2.0 Details of dimension and weight for various loose items.
- 18.3.0 Mounting arrangement drawing including clearance required.
- 18.4.0 Electrical interconnection diagram indicating terminal /pin details of various items.
- 18.5.0 Internal wiring diagram of the Local Junction Box / Field Termination Box.
- 18.6.0 Termination details of various items.
- 18.7.0 Power & Control Scheme drawings of motor & instruments
- 18.8.0 Technical Data sheet for Blower and its motor
- 18.9.0 General arrangement and mounting arrangement drawings for Blower and its motor.
- 18.10.0 General arrangement drawing of weather hoods
- 18.11.0 General arrangement and operational write up of Fail Safe Shutters
- 18.12.0 Block / Schematic diagrams & wiring diagrams identifying various items quoted / required and also indicating the scope of supply.
- 18.13.0 The bidder shall furnish, the duration of Zero & Span calibration / any other check cycle.
- 18.14.0 The measurement range in mg/Nm^3 for various extinction ranges shall be furnished.
- 18.15.0 The KW rating, full load current of Blower is to be furnished along with justification for capacity selection.
- 18.16.0 The type of cable, type of termination, limitation in length if any etc.
- 18.17.0 The bidder shall furnish detailed interconnection between various equipment / instrument.
- 18.18.0 Erection instruction.
- 18.19.0 Pre commissioning checks.
- 18.20.0 Commissioning procedure.

19.0.0 O & M INSTRUCTION MANUAL :

- 19.1.0 Hard copies of operation & maintenance instruction manual shall be supplied along with the Dust Density Monitor, RCU (if applicable) and all its accessories. The number of copies shall be as per Enquiry / Purchase order.
- 19.2.0 In addition, the O & M manual shall also be submitted in CD.
- 19.3.0 The O & M instruction manual shall include all the items supplied by the bidder / vendor.
- 19.4.0 The O&M manual shall include the following:
- 19.5.0 Detailed technical write up on working principal, technical data & specification for various items.
- 19.6.0 Detailed erection procedures
- 19.7.0 Detailed commissioning procedure, trouble shooting, maintenance schedule etc.
- 19.8.0 Various parameters to be set during commissioning along with their tolerance.
- 19.9.0 Detailed operating instructions
- 19.10.0 Detailed maintenance instructions
- 19.11.0 List of spare parts along with ordering details
- 19.12.0 All inter connection drawings including terminal / pin details
- 19.13.0 DO's & DON'Ts

20.0.0 PACKING:

- 20.1.0 The Dust Density Monitors and its accessories shall be covered with polythene and packed with completely enclosed wooden boxes / Equivalent strength card board pallets. Lining with plastic sheet shall be provided inside the packing to avoid water entry during transit / storage.

21.0.0 INSPECTION.

- 21.1.1 Vendor shall submit their Manufacturing Quality Plan along with test procedure for our review and approval.
The test procedure shall cover Measuring head, Local control Unit, Remote control unit (if applicable), Purge Air blower along with fail safe shutter and Field Junction box(flow controllers).
The make of components shall be part of MQP.
- 21.1.2 The Dust Density Monitors and its accessories shall be inspected based on the following documents.
 - a) BHEL Purchase Order.
 - b) BHEL Technical Specification.
 - c) BHEL / CUSTOMER Approved Vendor Drawing.
 - d) BHEL approved Quality plan along with Test procedures

22.0.0 COMMISSIONING :

- 22.1.0 The vendor shall furnish necessary documents to BHEL for erecting all the Dust Density Monitor, Remote Control Unit (if applicable) and its associated items supplied by the vendor.
- 22.2.0 The vendor shall commission all the Dust Density Monitor, RCU (if applicable) and its associated items supplied by the vendor to the satisfaction of BHEL/ Customer.
- 22.3.0 The supplier shall carry out Zero Reference Path Calibration, for each Dust Density Monitor at site.
- 22.4.0 The list of tools and tackles etc. required for the commissioning / maintenance of Dust Density Monitor by BHEL / Customer.(Eg. Optical alignment telescope shall be clearly mentioned in the offer).
- 22.5.0 The instruments, tools, spares etc. required for the commissioning shall be arranged by the vendor.
- 22.6.0 List of recommended spares to be quoted along with the offer. The spares list shall include the following :
- a.All the PCBs of the opacity monitor
 - b.One blower
 - c.RCU
 - d.Light source
 - e.Light detector
 - f.Power supply module
 - g.Fail safe shutter
- 22.7.0 Separate unit prices shall be mentioned in the offer for 22.4.0 & 22.6.0 for BHEL reference.
