CORRIGENDUM-1

Tender Enquiry No. R/5599/2017/3156V/1 dt:12/10/2017 for the Supply of Environmental Laboratory Equipment for 3x660 MW North Karanpura STPP Project site.

(1) Kindly refer the tender document of above enquiry, in which the specifications given for Package 4, Annexure-D, and Annexure-7 D for Wet & Dry Bulb Hygrometer. At line 7, 54.0 Portable ORP Monitor is not a part of tender enquiry; hence specification given for the same may please be ignored. ***Revised page*** **(Total 01 no of page)** is enclosed below.

(2) Package wise compliance sheet is enclosed as ***Annexure-IV*** **(Total 30 nos. of pages)**, bidders are requested to kindly fill, seal and sign each page of the same and submit alongwith the technical bid (Part-1) of the offer.

GSingh
17/10/2017

Gurdeep Singh
Dy. Engineer (PPX-BOI)

Shailendra Kumar, Sr. Manager (PPX-BOI)

17/10/17

7.0 WET & DRY BULB HYGROMETER Annexure-7D

Wet & dry bulb hygrometers should be on polished Zinc scale in polypropylene frame with reservoir and spare wicks.
Thermometer range 0 – 50deg. C
Thermometer graduation 0.5deg. C
It should have provision for mounting on the wall.
Two copies of psychrometric charts should be provided.

~~54.0 PORTABLE ORP MONITOR~~
~~Measurement Range : – 2000 to +2000 Mv~~
~~Resolution : 0.1 mV~~
~~Accuracy : ± 0.2 mV or ± 0.1% of reading, whichever is greater~~
~~Output : One-way, RS-232 via docking station/ 199-point memory recall~~
~~Inputs : (2) 5-pin connector~~
~~Input Impedance : >1012 Ohms~~
~~Display : Custom LCD with Backlight~~
~~Measurement Selection: pH/ORP/Temperature~~
~~Power Requirements : 4 AA batteries or 110 to 220 VAC line power through docking station.~~
~~a) Sensor/Probe Pt electrode combination electrode suitable for measurement in cooling waters, waste waters and drinking waters. Should be rugged enough to with stand normal operating conditions at coal & gas based stations. It should be easily replaceable and sensitive enough for regular operations. It should be compatible with online monitor. The operating ambient temperatures are up to 50 deg. C. Preferably sensor should be capable of measuring multiparameter such as pH, ORP, Temperature, etc~~
~~b) General The instrument should be capable for operation in cooling waters, waste waters and drinking waters. The output data should be measurable every half an hour and it should be stored in the in built memory of the instrument. Minimum of 500 measurements should be stored in the in built memory and provision should be there to transfer the data to a desktop or laptop computer through suitable software. The instrument should be provided with all necessary cables, connectors, data storage/acquisition system, suitable software, etc.~~

8.0 Hydrogen Purity Meter Annexure-8D

Function: Sensing & Measurement of Hydrogen in Air, gas holders, valves, pipelines, etc.
Range : 0 - 100 % purity
Sensor : Thermal Conductivity Detector
Readout : LCD Digital display.
Sampling Method : suction
Alarms : Audio-Visual alarm for LO, Hi ranges& Battery low
Response Time : Less than 10 seconds.
Power : rechargeable batteries + charger
Instrument shall be supplied with all required accessories.

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ANNEXURE-IV

Compliance Sheet [Package - 1]

A1 - Automatic Flash Point Apparatus

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	The equipment shall be used to determine flash points by the Pensky Martens Closed Cup Method (conforming to ASTM D-93).		
2	Entire equipment shall be housed as a single unit, separating electronic systems inside by suitable partition.		
3	The equipment should be able to determine flash points up to 400deg. C, controlling the heating rate within prescribed limits.		
4	In case of unknown and contaminated samples, the search facility should be available.		
5	Should have constant stirring arrangement for sample.		
6	Operation should be initiated by push-button, which shall proceed till the end of test.		
7	Display of sample temperature should be digital.		
7	Audible Signal at the end of test should stop the further continuation of test.		
8	Flame introduction in the sample should be after every 1deg. C up to 104deg. C and very 3 deg. C for set values above 104deg. C.		
9	It should be suitable for operation at 220 volts 50 Hz single phase AC supply.		
10	Equipment should be complete with all essential accessories and should be accompanied by operation and service manual including electrical circuit diagrams spare parts list and remedial measures for trouble shooting.		

A2 - Jar Test Apparatus

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	For floc formation tests in Water Treatment Plant, it should be designed for uniform stirring upto six samples simultaneously.		
2	A variable transformer should provide speed from 10-100 rpm with attached counter for counting the rpm.		
3	Stirrers are driven by 1/30 HP motor with gear train.		
4	Entire unit should be mounted in elongated cast aluminium housing.		
5	Stainless steel stirring paddles of about 25x75 mm are attached to rods 250 mm x 6 mm diameter with lifting knob at the top.		
6	Locking collars on stirring rods permit adjustment of paddle height.		
7	Provision should be there to disengage paddles individually without interruption of other stirrers.		
8	Varying the speed of the stirrer should be possible without interrupting the process.		
9	A spacing of about 150 mm should be there between rods to permit use of 1000 ml beakers which rest directly on bench.		
10	The bench should have a wooden base with illumination so that observation of floc formation is easy.		
11	The apparatus should come complete with On-Off switch, 3 wire cord and plug for use at 220 V AC 50 Hz supply.		

ANNEXURE-IV

A3 - Jaw Crusher

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Feed size 250 mm		
2	Product size 50 mm		
3	Capacity 0.5 to 1.0 Ton/hr		
4	Motor 415 V operated 1400 rpm, 5 to 7 HP with belt, starter and required accessories.		

A4 - Double Roll Crusher

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	DOUBLE ROLL CRUSHER: Suitable roll crusher for the preparation of coal samples should have the following specifications:		
1.1	Feed size 50 mm		
1.2	Product size 6 mm		
1.3	Capacity 0.5 Ton/hr		
1.4	Motor 415 V operated 1400 rpm, 5 HP with belt, starter and required accessories.		
2	DOUBLE ROLL CRUSHER: Suitable roll crusher for the preparation of coal samples should have the following specifications:		
2.1	Feed size 13 mm		
2.2	Product size 3 mm		
2.3	Capacity 0.25 Ton/hr		
2.4	Motor 415 V operated 1400 rpm, 2 to 5 HP with belt, starter and required accessories.		
2.5	Complete with base frames, foundation, etc.		

A5 - Muffle Furnace (for Ash Determination)

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Muffle furnace should be capable of continuous operation at temperature up to 10000C / 12000C having welded steel case with corrosion resistant paint.		
2	Complete with energy regulator, digital solid-state temperature indicator cum controller (sub divisions 5deg. C) with thermocouple.		
3	Heating element of Kanthal wire of suitable gauge.		
4	It should have built-in digital indicator cum controller for setting the desired temperature to be achieved and it should have a push button switch to check the set temperature.		
5	The furnace should be capable of attaining 650deg. C from ambient in 30 minutes and 815deg. C in another 30 to 45 minutes. Total time to reach maximum temperature should not be more than 1½ hrs.		
6	The ventilation should be provided to give about five air changes per minute.		
7	Temperature indicator - Digital		
8	Temperature accuracy - ± 3deg. C over complete range		
9	Temperature indication - 1deg. C intervals		
10	Temperature uniformity - Better than ± 5deg. C		
11	Temperature control - Automatic by ON/OFF controller and energy regulator		
12	Approx. Internal size - 100mm x 150mm x 300mm (Height x Width x Depth)		
13	Furnace Temperature range - Ambient to 10000C / 12000C		
14	This is for use at 220/230 V, 50 Hz single phase AC supply complete with cable and operation / maintenance manual with spare-parts list and circuit diagram.		

ANNEXURE-IV

A6 - Raymond Mini mill

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Raymond Mini-mill - swing hammer pulveriser should be of high speed type fitted with a continuous rated motor of 0.5 HP (Synchronous speed 3000 rpm) for small scale production of 212 micron coal fine powder from inlet size of 3.35 mm of coal of approximate HGI of 50.		
2	It shall be fabricated steel construction fitted with forged steel hammers and complete with feed hopper, integral hand operated screw type feeder, product container with lid and cloth Product Delivery Tube.		
3	It shall be complete with the pair of screens of above size (i.e. 3.35 mm and 212 micron).		
4	It should be suitable for operation on 220/230 volts single phase 50 Hz AC Supply.		
5	It should be suitable for bench mounting with replaceable fittings.		
6	SPARES		
7	1. Set of hammer - One		
8	2. Set of screen 3.35 mm & 212 micron - 6 sets		

A7 - Riffle Sampler

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Riffle Sampler should be with adjacent slots to deliver coal to opposite side and to divide it into two identical halves. Slots should be of 25 mm size and number of total slots should be 36. The sampler should be provided with legs and removable containers. The material of construction of the equipment shall be mild steel, painted with gray hammertone paint. Qty - 1 No.		
2	All details given in (1) above except the slot size shall be 12.5 mm and total number of slots shall be 24. Qty - 1 No.		

A8 - Sieve Shakers and Sieves

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	**Automatic Sieve Shaker**		
1.1	The equipment should be a heavy duty motorized automatic sieve shaker which operates with both vertical and horizontal sieving action for better particle size distribution analysis in the measuring range of 63 um to 63 mm.		
1.2	It should have suitable clamping device for holding up to 7 sieves of 8" (200 mm) dia with sieving pan and sieve cover and a total sample weight of 6 Kg.		
1.3	It should have an automatic timer with a variable time setting from 5 to 60 minutes.		
1.4	The instrument should be supplied with sieve cover, receiving pan and sieving aids of Vulkollan cubes (100 cubes). Complete with all necessary spares, accessories and O&M manual for use at 220 V 50 Hz single phase AC supply.		
2	**Wet Sieve Shaker, Yoder Type**		
2.1	The equipment shall be driven by 1/2 HP motor suitable for 220 Volts, 50 Hz single phase A/C power supply.		
2.2	It shall achieve thirty (30) tapping per minute by a system of worm and gear.		
2.3	The upward motion 30 mm, with sieve holder 200 mm dia sieve and one water tank 305 mm dia. Complete with motor, water tank and all essential accessories for ready use of equipment, along with cord, three pin plug, Operation & Maintenance Manual, spare-part		
3	**Test Sieves (Conforming to Indian Standard Specification)**		
3.1	The frame shall be of 200 mm diameter and made out of Spun Brass and without any joint in it, a clean rigid design of minimum weight and free from corners where the material could be lodged.		

3.2	Uniform fabrication of sieves shall permit easy and smooth nesting on each others and also with lid and receiver.		
3.3	Imported 18/8 stainless steel quality standard sieve cloth shall be used for better performance and nesting.		
3.4	The mesh shall be flat, taut and uniform and with permanent tension round the whole circumference.		
3.5	S.No. Sieve Number Size Quantity		
	1. 6 3.35 mm Two No.		
	2. 8 2.36 mm Two Nos.		
	3. 12 1.70 mm Two No.		
	4. 16 1.18 mm Two Nos.		
	5. 20 850 µm Two No.		
	6. 30 600 µm Two Nos.		
	7. 40 425 µm Two No.		
	8. 50 300 µm Six Nos.		
	9. 70 212 µm Six Nos.		
	10. 100 150 µm Six Nos.		
	11. 200 75 µm Six No.		
	12. 325 45 µm Two No.		
	Lid and Receiver of above Sieves (set) Two Nos.		

ANNEXURE-IV

Compliance Sheet [Package - 2]

B1 - Automatic Karl Fischer Titrator

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	This should be digital, direct reading instrument for the determination of water content of liquid or solid samples by completely automatic titration.		
2	It shall give the water content in mg, ppm or %.		
3	It should be able to detect water from 1 ppm to 5%. It should generate Karl Fischer Reagent by Coulometric release of iodine to titrate water.		
4	Coulometric end point detection circuit should employ a dual platinum electrode sensor.		
5	Results should be indicated on a digital register reading directly in microgram of water.		
6	It should have precision <0.3% at 1 mg or better.		
7	It should completely avoid the use of burettes and elaborate glassware.		
8	The magnetic stirrer should be built up in the control unit.		
9	Iodine generator should be refillable, glass-walled cartridge with diaphragm and sensing electrodes.		
10	Filling shall be automatic with inbuilt pumping system to fill and empty the unit.		
11	Titrator should be supplied complete with titration vessel, dual platinum sensing electrode, generator assembly, and magnetic stirrer bar, 1 ml glass syringe, 10 ml plastic, syringe for solution.		
12	6 charges of pyridine free Karl – Fisher reagent kit for titration, water standards and standard consumable spares for the instrument for 3 years trouble free operation.		
13	Operation and maintenance manual with circuit diagrams and trouble shooting guidelines		
14	The instrument is for use at 220 V 50 Hz Single Phase AC supply.		

B2 - Balance (Top Loading)

Sl. No.	Techanical Requirement		Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	A top loading electronic balance with digital display, it should have arrangement for levelling the base and protection for excessive weight.			
2	It should have in-built auto calibration facility.			
3	Weighing range	Upto 2000 g		
4	Standard Deviation or Precision	0.05 g		
5	Readability	0.1 g or better		
6	Facility for continuous taring			
7	The balance must be for use at 220 V, 50 Hz, single phase AC supply and should be accompanied by Instruction Manual containing fault finding procedure.			
8	It should be supplied with in-use plastic cover, and spare fuses.			

B3 - B.O.D. Analyzer System

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	The BOD analysis equipment should use pressure sensor technology.		
2	The equipment should do the mercury free respirometric BOD measurement using pressure sensor technology with a range of 0 – 3000 ppm BOD as O2.		
3	The sensor should measure the oxygen depletion with LCD display and should have features like automatic initiation of the measurement, five days data storage memory and battery operation.		

4	The equipment should consist of complete unit containing electro manometer and inductive stirring unit and six sensors and standard accessories like magnetic stirring rod, gasket, over flow measuring flasks, etc. and required thermostatically controlled cabinet for the incubation of the measurement samples. With standard spares and accessories along with operation and maintenance manual including detailed theory		
5	All electrically operated parts should be usable at 230 V, 50 Hz single phase AC supply.		

B4 - Centrifuge Machine

Sl. No.	Techanical Requirement			Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Laboratory centrifuge consisting of electronic speed control for 500 to 4000 rpm and direct reading tachometer with ± 5% accuracy.				
2	It should have electric timer of 30 minutes / 60 minutes and a safety latch to prevent opening of cover until centrifuge has stopped.				
3	The motor should be flameproof to permit its use with flammable liquids such as crude oil, furnace and lubricating oil.				
4	It should have full width control panel at front of base.				
5	Provision should be made to vibration isolators for extra-quiet operation.				
6	**Technical data for horizontal head**				
6.1	No. of tubes - 4				
6.2	Tube size - 100 ml				
6.3	Maximum rpm - 2400 (approx.)				
6.4	Maximum RCF - 1100				
7	It should be supplied with all the necessary accessories for its general-purpose use.				
8	**SPARES**				
8.1	Oil tubes made of pyrex / corning glass for water				
8.2	and sediments in crude mineral oil - 36 Nos.				
8.3	Long form for ASTM D 96 & D 91				
8.4	Size 37 mm (OD) x 200 mm (L)				
8.5	Capacity 100 ml				
8.6	Graduations should be as under:				
8.7	Range ml.	Subdivision ml.	Volume tolerence ml.		
	0 – 0.1	0.05	±0.02		
	>0.1 – 0.3	0.05	±0.03		
	>0.3 – 0.5	0.05	±0.05		
	>0.5 – 1.0	0.1	±0.05		
	>1.0 – 2.0	0.1	±0.10		
	>2.0 – 3.0	0.2	±0.10		
	>3.0 – 5.0	0.5	±0.02		
	>5.0 – 10	1	±0.50		
	>10 – 25	5	±1.00		
	>25 – 100	25	±1.00		
9	The centrifuge should be accompanied by spare-parts for 2 year trouble-free operation and				
10	Operation and Maintenance manual. For use at 220V, 50Hz, AC single phase.				

B5 - Comparators

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	It should be Lovibond Comparator or equivalent for routine chemical analysis by direct reading of results using standard discs complete with pair of 13.5 mm & 40 mm cells along with each comparator.		
2	The comparator shall have the provision for two cells, one for the sample and other behind the disc to contain same depth of samples without indicator for comparison.		

3	It should have provision of compensation for turbid samples as well as daylight bench-top illumination system.				
4	**Accessories**				
4.1	a. Nessler attachment for determining the difference between pale colours : 2Nos.				
4.2	b. Nessler Tube (Pair) of 113 mm for the above nesseleriser attachment : 2 doz.				
4.3	c. -do- of 250 mm for the above nesseleriser attachment : 2 doz.				
4.4	d. Special Glass Cylinders AF 315 : 1 doz.				
4.5	e. Tablets:				
4.5.1	i) DPD tablets (bottles of 100 tab) : 12 Nos.				
4.5.2	ii) Indigo-Carmine tablets (bottles of 100 tab) : 3 Nos.				
5	**Comparator Discs**				
5.1	All the discs shall have standard 9 or 10 permanent unfading guaranteed colour standards pre-calibrated against original laboratory standards mounted permanently in durable plastic wheels.				
5.2	The discs shall be interchangeable and should be used in the above Comparator.				
5.3	Technical method sheets describing complete chemical data shall be supplied along with every individual				

5.4	Sl.No. Test	Disc No	Range Covered	Quantity required	
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	1. Ammonia	NAA	0.02 to 0.16 ppm	Two Nos.	
		NAB	0.2 to 0.52 ppm	Two Nos.	
		NAC	0.56 to 1.2 ppm	Two Nos.	
	2. Chlorine (in Water) by Palin Method using DPD tablets)	3/40 A NDPB	0.1 to 1 ppm 0.05 to 0.5 ppm	Two Nos. Two Nos.	
	3. Oxygen	NOE	0 to 0.12 ml/litre	Two Nos.	

B6 - Computer with printer and scanner

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Core I3 processor, RAM :4 GB, Hard Disk : 500 GB		
2	WIN8 Professonal 8.1 Operating System		
3	Monitor : 14" SVGA colour monitor		
4	Ports : 2 Serial & 1 Parallel		
5	Keyboard : Standard Windows Keyboard		
6	Mouse : Mouse + Pad		
7	Software : Windows based data logging/driver software with provision to averaging out data at selectable interval		
8	Black and White Laser jet printer		

B7 - Dean & Stark Apparatus

Sl. No.	Techanical Requirement		Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Made of pyrex / borosilicate glass for determination of moisture in oil, it should consist of the			
2	**Distillation Flask**			
2.1	Capacity (min.)	500 ml		
2.2	Connection	B-19/B-24 joint		
3	**Condenser**			
3.1	Jacket length	400 mm		
3.2	Ends should have	B-19/B-24 joints		
4	**Receiver tube with**	B-19/B-24 joints		

	Capacity	Sub-Divisions		
4.2	2 ml	0.05 ml		
4.3	10 ml	0.1 ml		

B8 - Density Hydrometer

Sl. No.	Techanical Requirement				Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Hydrometer should be made of glass graduated in units of Density Conforming to ASTMSpecification E-100 and calibrated at 15deg. C. Suitable for determination of density of hydrocarbons:-					
	Sl. No.	Range	Subdivisions	Quantity		
	1.	0.80 to 1.00	0.001	2 Nos.		
	2.	1.00 to 1.10	0.001	2 Nos.		
	3.	1.10 to 1.20	0.001	2 Nos.		
	4.	1.40 to 1.50	0.001	2 Nos.		

B9 - Deposition and Corrosion Meter

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Deposition & Corrosion Meter is meant for monitoring bio fouling, scaling and corrosion of cooling water systems.		
2	The test material should be SS 304, Cupronickle 90:10, Cupronickle 95:05 and brass.		
3	**Bio fouling monitor**		
3.1	Sample tube material as mentioned above.		
3.2	Water flow indicator Rotameter		
3.3	Flow control valve manual / automatic control		
3.4	Differential pressure guage Diaphragm dial type range 0-250 mm W.C		
3.5	Inlet and outlet water pressure tapping.		
3.6	By pass line of SS / copper tube for differential pressure gauges.		
3.7	Mounted on panel		
4	**Scaling Monitor**		
4.1	Sample tubes (3 no. each) – material as mentioned above		
4.2	Outside jacket tube – Acrylic		
4.3	Metal temperature sensor – 20-100deg. C; accuracy 1deg. C		
4.4	Inlet and outlet water temperature sensor and digital indicator – 10-70deg. C; accuracy – 1deg. C		
4.5	Water flow sensor digital indicator – 200 to 1000 litres accuracy 5%		
4.6	Water flow indicator – Rotameter or digital indicator		
4.7	Heater – 1000 to 1500 watts 220 ±10 V AC		
4.8	Heat input controller – Selector switch.		
4.9	Power input – 220±10 V AC		
4.10.	Heater protection relay – 50 to 100deg. C operating valve		
4.11	Heater and water flow relay – Automatic on/off switch for heater with water flow stopper.		
4.12	Display – Digital.		
4.13	Water flow regulator – valve.		
4.14	Complete with all fittings and fixtures for attachment of equipment.		
5	**Corrosion Test Racks**		
5.1	Corrosion test rack equipment – 12 no.		
5.2	Corrosion test coupons size 13 mm×76 mm×1.6 mm as per ASTM-D-2688-92 – Mild steel, SS 304, Cupronickle 90:10, Cupronickle 95:05, Brass – 100 no. each		
5.3	3. Complete with all fittings and fixtures for attachment of equipment		

ANNEXURE-IV

B10 - Electronic Analytical Balance

Sl. No.	Techanical Requirement			Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	This should be a top loading electronic analytical balance having auto calibration facility with built in weights.				
2	It should have tare facility and automatic draught shield.				
3	Stabilisation time should not be more than 15 seconds and pan size should not be less than 80mm.				
		I	II		
	i) Range/capacity :	220 gm	220 gm		
	ii) Readability :	0.1 mg	0.01 mg		
4	Complete with all accessories and O&M Manual, it should be suitable for use at 220 V, 50 Hz single phase AC supply.				

B11 - Flame photometer

Sl. No.	Techanical Requirement		Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Flame photometer is for the determination of Na, K, Ca, Li and Ba in water samples.			
2	It should preferably work on LPG. It should have inbuilt flame igniter, automatic flame control / flame failure detection and other user safety features.			
3	Sensitivity	1 ppm Na & K FSD.		
4	Range	0 – 100 ppm for all the elements.		
5	Air supply	in - built, preset regulator.		
6	Compressor	oil free, portable.		
7	Interface	RS 232		
8	Power supply	230 V, 50 Hz, Single phase AC.		
9	Standard solutions -	1ml = 1mg solution for all the five elements.		
10	The supply should be complete with all standard spares and accessories for three years trouble free operation and operation and maintenance manual.			

B12 - Heating Mantle

Sl. No.	Techanical Requirement		Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	It should be glass-cloth mantle suspended in cylindrical aluminium housing and well insulated against heat loss.			
2	Capacity	To hold 500 ml, 1000 ml round bottom flasks.		
3	Power	250 – 1000 W		
		220 V, 50 Hz AC supply		
4	It should also have thermostat, temperature regulator with ON / OFF switch.			

B13 - Hot Air Dryer

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Electrically operated and portable type hot air dryer for general drying purpose.		
2	It should comprise of electric motor and about 500 W heater enclosed in light weight, but high impact thermoplastic.		
3	It should be provided with 3-way switch (Off, Cool, Hot).		
4	Maximum air flow temperature – 70deg. C.		
5	Air delivery : 3-4 cubic feet per minute.		

6	It should be supplied with 7 feet 3 conductor cord & 3 prong plug for use at 220 V, 50 Hz AC supply.		

B14 - Hot Plate

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Rectangular hot plate should be made of cast iron top with smooth corrosion resistant finish with a maximum operating temperature of 500deg. C.		
2	It should have continuously variable thermostat control with pilot lamp & a nickle-chromium alloy heating element.		
3	The lower steel case should preferably be perforated to allow ventilation for the controls and lower section with protective rubber feet. Complete with 5 feet, 3 wire cord and 3 prong plug.		
4	Wattage-1000 Watts.		
5	Approximate Size - 30 cm x 20 cm		

B15 - Humidity Oven

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Humidity Oven should be triple walled with forced air circulation by a motorised blower.		
2	Inside walls should be of stainless steel, outside walls of mild steel and intervening walls of G.I sheets.		
3	It should have outer double metal door with one full view inner glass door.		
4	It should be fitted with a refrigeration compressor (to work at temperature lower than the room temperatures, nichrome heaters thermostat and wet contact thermometer (humidifier), with separate switches for heat and humidification.		
5	It should be provided with three shelves.		
6	**Technical data**		
6.1	Chamber dimensions (approx.) 700 x 450 x 450 mm (Height, Width & Depth)		
6.2	Temperature range 5deg. C to 70deg. C		
6.3	Temperature control accuracy ± 0.5deg. C		
6.4	Humidity range 10-95% RH		
6.5	Humidity control accuracy ± 1% RH		
6.6	Drift over 72 hours Less than 1deg. C and 2% RH		
7	It should come complete in all respects, ready for use, with indicating lamp, main switch, 3 meter 3-core cable with three prong plug for use at 220V & 50Hz single phase AC supply.		
8	Operation & Maintenance Manual with spare-parts list and circuit diagram should accompany the instrument.		

B16 - Hydrometer

Sl. No.	Techanical Requirement				Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Hydrometer set is used for the measurement of specific gravity of liquids (such as Sodium Hydroxide & Hydrochloric Acid). It should have a length of 300 mm and made of pyrex / borosilicate glass.					
2	S.No.	Range of Sp. Gravity	Division	Quantity		
2.1	1.	0.800 - 1.000	0.002	2 Nos.		
2.2	2.	1.000 - 1.100	0.002	2 Nos.		
2.3	3.	1.100 - 1.200	0.002	2 Nos.		
2.4	4.	1.400 - 1.500	0.002	2 Nos.		

3	These should be supplied with a thermometer (0 to 50OC x 0.1OC) in a leather case.		

B17 - Incubator

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	The Incubator should be for general purpose incubation and BOD tests with auto as well as manual control and interior illumination.		
2	It should have full view inner glass door to allow inspection of samples without disturbing the temperature of Working Chamber.		
3	Compressor should be hermetically sealed and permanently lubricated.		
4	Door gasket should be impregnated with magnets to provide positive seal.		
5	It should be supplied with a voltage regulator.		
6	Plastic drip pan and dial thermometer range 0 to 100deg. C. It should be complete with 3-pin plug and cord for 220 V/50 Hz, single phase AC supply.		
7	**Other Specifications**		
7.1	Temp. range 5 to 50deg. C.		
7.2	No. of shelves 2		
7.3	Storage capacity 6-7 cubft (0.16-019 M3)		
7.4	Storage area. 0.7 M2 (approx.)		
7.5	Control accuracy + 0.5deg. C		
8	It should be supplied with instruction manual (including maintenance).		

B18 - Magnetic Stirrer Cum Hot Plate

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	It should be a hot plate & magnetic stirrer combination which permits stirring of samples at identical speeds under similar and differing temperature conditions.		
2	**Technical data**		
2.1	Speed Up to 1500 rpm variable.		
2.2	Top plate size Circular 16 cm diameter.		
2.3	Heater Wattage 1000 W		
2.4	Hot plate control Thermostatic		
2.5	The unit should have ON/OFF switch, a pilot indicator lamp, speed and heat control separate for hot plate and magnetic stirrer.		
2.6	For use at 220 V AC 50 Hz single phase. It should be supplied with 3 meter 3 core chord & 3 prong plug.		

B19 - Membrane Filter Holder Assembly

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	**Stainless Steel Filter Holder**		
1.1	This assembly should have stainless steel barrel, base, filter support screen, top cap and tubing adapter with anodized aluminium locking ring, PTFE “O” rings and silicon stopper.		
1.2	It should come with 9.5 mm inlet hose connecter for applied air or gas pressure.		
1.3	Capacity 100 ml		
1.4	Filter dia 47 mm		
1.5	Dimensions (approx.) 70 mm dia., 292 mm height.		
2	**Stainless Steel Filter Holder**		
2.1	This assembly should have stainless steel funnel, base and filter support screen with anodized aluminium locking ring, nylon lock wheels, PTFE gaskets and silicon stopper and suitable 1 litre borosilicate glass filtering flask.		
2.2	Capacity 650 ml.		

2.3	Filter dia. 47 mm		
2.4	Dimensions (approximately) 114 mm dia., 229 mm height.		
3	**Glass Filter Holder:**		
3.1	These are for the analysis of suspended solids in water. Consisting of borosilicate glass funnel and base, anodized aluminium spring clamp, coarse frit glass filter support and silicon stopper; for mounting on standard 1litre filtering flask.		
3.2	Capacity 300 ml.		
3.3	Filter dia 47 mm		
3.4	Dimensions (appxtly.) 76 mm dia., 229 mm height.		
3.5	It should come complete with 1 litre borosilicate filtration flask.		

B20 - Oven

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	It should be electrically heated and made of double wall construction with stainless steel inner chamber of approximately the following dimensions:		
1.1	48 cm x 45cm x 38cm.		
1.2	63cm x50cm x49cm.		
2	The chamber should be well insulated to minimize heat losses. It should be provided with 2 removable perforated stainless steel shelves and runner type support for the shelves.		
3	The heater element should be made of superior quality nichrome wire and should be easily accessible.		
4	i) Temperature Range Ambient to 300deg. C		
5	ii) Temperature control ± 0.5deg. C		
6	iii) Temperature control Electrically operated thermostat / Digital energy regulator controller		
7	iv) Temperature uniformity + 2deg. C maximum		
8	Front panel control should include pilot lamp, temperature control knob, (calibrated in deg.C) heater switch and booster heater switch.		
9	It should be equipped with an adjustable vent and thermometer holder at the top and efficient arrangement for good circulation of air inside the chamber.		
10	The equipment should be accompanied by instruction manual incorporating circuit diagram.		
11	For use at 220 V, 50 Hz single phase AC supply.		
12	**Spares**		
12.1	1. Thermometers 4 Nos.		
12.2	2. Heating Element 1 Set		
12.3	3. Indicating Bulbs 12 Nos.		

B21 - Refrigerator

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	This should be double door, frost free refrigerator of Capacity minimum 300 lit., complete with voltage stabilizer and suitable stand.		

B22 - Sample Cooler

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Sample cooler should be efficient counter–flow heat exchanger designed for the cooling of high temperature, high pressure fluid samples, e.g. Boiler Water, Steam Feed Water, etc. for tests at atmospheric pressures and temperatures.		
2	The pressure rating on the coil should be 420 kg/cm2 at 400deg. C.		
3	Rugged, coil within shell construction should ensure trouble-free service.		

4	Inner coil should be of Inconel seamless tubing and outer shell of Type 304 SS seamless tubing.		
5	Internal cooler baffling should be arranged for maximum rate of heat transfer and low coolant pressure loss.		
6	The cooler should be conveniently attachable with any piping system.		
7	Mounting is to be facilitated by clamp type brackets, but the unit should be suitable for mounting “in the piping”.		
8	Terminal connections should be clearly marked, showing cooling water and sample inlets and outlets.		
9	Coolant connections should be 1/2" NPT.		
10	A metal name plate showing flow should be permanently attached.		
1	The sample cooler should be suitable for sampling Boiler Water, Steam having initial conditions corresponding to all present power stations, maximum conditions, providing the cooling water is flowing.		
12	Each unit should be hydrostatically tested at room temperature to 630 kg/cm2 on the inner coil and 26 kg/cm2 on the outer shell.		
13	Max. operating pressure 420 kg/cm2		
14	Max. operating temperature 400deg. C.		
15	Sample connections 1/2" NPT		
16	Net weight Approx. 3.5 kgs.		
17	Shell maximum W.P. –		
18	Pressure Drop Shell : 0.2 kg/cm2 at 700 litres per hour (water flow)		
19	Coil 3.88 kg/cm2 at 115 kg/hr (waterflow)		

B23 - Saybolt Viscometer

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Saybolt viscometer should have two test limits with universal & furol tips.		
2	It should consist of a composite bath and cup assembly permitting two saybolt tests to be carried out up to 100deg. C.		
3	The bath should be electrically heated by a 3 heat switch & a contact thermometer & relay for accurate temperature control.		
4	The bath should have provision for a cooling coil and suitable connections for water supply.		
5	Complete with two saybolt universal and furol tip viscometers.		
6	Two oil receiving flasks, two thermometers holders.		
7	This is for use at 220 V AC 50 Hz single phase supply.		
8	The instrument must be supplied with operation and maintenance manual & necessary accessories and spares for 2 years trouble free operation.		

B24 - Specific Gravity Bottle

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	These are Specific Gravity Bottles with capillary bore made of boroslilcate glass with interchangeable stopper.		

2	Sl.No. Capacity (in ml) Capacity Tolerance (in mm) Dia x Ht (in ml.) Stopper size Quantity (in No.)		

2.1	10 1 24 x 46 10/5 1		
2.2	25 2 38 x 56 10/5 1		

ANNEXURE-IV

B25 - Stop Watch

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	It should be a digital hand-held stopwatch with stop, start and reset facilities.		
2	It should indicate hour, minute, seconds and microseconds. It should be supplied complete with battery and leather carrying case.		

B26 - Thermometers

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Thermometers used for general laboratory purpose should have etched stem with permanent filler and partial immersion.		
2	The stem should have 6-7 mm OD.		
3	The thermometers should be nitrogen filled above mercury.		
4	It should be provided with top suspension ring.		

5	S.No. / Range (deg C) / Division in deg.C. / Length in mm / Quantity in Nos.		

5.1	1. / 0 to 50 / 0.5 / 300 / 2		
5.2	2. / 0 to 100 / 1.0 / 300 / 2		
5.3	3. / 0 to 250 / 1.0 / 350 / 2		
5.4	4. / 0 to 350 / 1.0 / 450 / 2		

B27 - Thermostat Bath

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	This should be a combination of water bath & circulating water at controlled temperature.		
2	It should have a pump cum stirrer for circulation by pressure.		
3	Stirrer should be removable from the drive.		
4	It should be provided with a cooling coil for better control of temperature at near ambient conditions.		
5	It should be made of stainless steel inner chambers & outer chamber painted in stove enamel.		
6	Complete with contact and central thermometers, pilot indicating lamp, manual control valve and drain valve, inlet and outlet nozzles to permit closed circulation of thermostatic water to other source.		
7	The rate of increase and decrease of temperature should be within a specified time.		
8	Pumping Capacity 20 litres/minutes		
9	Temperature Range Ambient to 90deg. C (with water)		
10	Temperature Control Jumo relay		
11	Temperature control accuracy + 0.05deg. C		
12	Approximate size (working) 30 cm x 22.5 cm x 30 cm		
13	Overall wattage of heaters 2 KW		
14	Water capacity 20 litres.		
15	For use at 220 V AC 50 Hz.		

16	It should be supplied with Instruction Manual incorporating the necessary circuit diagrams and spares for three years trouble free operation including heater, stirrer and temperature		

B28 - Vacuum Pump

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	These are of pressure cum vacuum rotary type for general laboratory purpose.		
2	**Technical data**		
2.1	Free air displacement 20 liters / minute		
2.2	Ultimate pressure 30 psig.		
2.3	Pumping speed 2000 rpm		
2.4	Ultimate vacuum 0.1 micron of mercury		
2.5	Motor Horse Power 1/4 HP		
2.6	Approximate oil capacity 200 ml		
2.7	The motor should have safety cut off to avoid over loading. Pump body and end plates should be made of cast iron.		
2.8	Complete with intake oil/filter, exhaust muffler, vacuum and pressure gauges with regulator, rubber feet, and moisture trap.		
2.9	This is for use at 220 V AC 50 Hz single phase.		
2.10	It should be supplied with 5 meter 3 core cord & 3 prong plug.		
3	**SPARES**		
3.1	Oil for vacuum pump 1 litre		

B29 - Viscometer (Kinematic)

Sl. No.	Techanical Requirement			Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	These are U-tube, Calibrated, Kinematic Viscometers made of pyrex / corning glass with engraved constant, for the measurement of viscosity of transparent/opaque samples.				
2	The viscometers should be supplied with calibration certificates.				

3	Viscosity Range in cst	Nominal constant	Quantity in No. each for Transparent & Opaque Samples		

3.1	1.6 - 8.0	0.008	2		
3.2	6 - 30	0.03	4		
3.3	20 - 100	0.1	4		
3.4	60 - 300	0.3	2		
3.5	200 - 1000	1.0	2		
3.6	600 - 3000	3.0	2		

4	**Suspension Mounting - 5 Nos.**				
4.1	There should be suitable suspension mounting for above viscometers to suspend them in thermostatic bath.				
4.2	The mounting should be such that, it protects the viscometer against breakage and are interchangeable.				
5	**Viscosity Bath - 2 Nos.**				
5.1	The bath tank should be made of stainless steel with double glass windows fitted at the front and rear.				
5.2	The heat resistant armoured glass inner windows should be sealed with silicone rubber gaskets and the outer plate glass windows secured by clips to allow easy removal for cleaning.				

5.3	The bath should be equipped with a thermistor bridge temperature control unit, a temperature selection dial calibrated 10deg. C to 120deg. C, coarse and fine controls for precise temperature adjustment with reference to a thermometer in the bath, controls for selecting manual or automatic operation of the boost heater and setting the required degree of permanent heating and for setting the temperature at which the safety cut-out operates.			
5.4	All electrical components including the heaters and stirrer should be removable without emptying the bath.			
6	**Specifications & Accessories**			
6.1	External Dimensions, mm (approx.)	650x325x600 high		
6.2	Height to top of tank, mm (approx.)	475		
6.3	Working space, mm (approx.)	400x250x400 deep		
6.4	Window opening, mm (approx.)	375x340		
6.5	Volume of tank,	40-45 litre		
6.6	Temperature range.	Max 120deg. C ; Minimum (without coolant) 10deg. C above ambient, 10deg. C below ambient.		
6.7	Temperature Control	Better than + 0.01deg. C throughout the range		
6.8	Refrigeration Unit	A low powered, small size, unit suitable for maintaining a bath of 35 to 45 litres at 5 to10deg. C below ambient. Complete with a flat, vertical evaporator coil of (approx.) 175x75x25 mm. For operation on 220V,50Hz AC supply..		
6.9	Metal lid.	With 8 holes & levelling rings for visco-meter holder.		
6.10	Sindanye Discs.	With bakalite handle. ; Set of 8.		
6.11	Circular spirit level	Accurate to 5 min of area.		
6.12	Per bunan rubber cap	To seal gap between viscometer limbs and holder.		
6.13	Stand, with oil draining tray	To accommodate 6 inverted viscometers and six viscometers in holders.		
6.14	Fluorescent lighting attachment.			
6.15	The bath should be useable at 220V, 50Hz single phase AC supply and accompanied by operation and maintenance manual.			

B30 - Viscometer (Kinematic)

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Water bath should be of rectangular shape made of Stainless steel with 8 openings of 3" diameter.		
2	Openings fitted with concentric rings central cover with handle.		
3	It should have constant level device (overflow drain) and a stopcock for draining purpose.		
4	Thermostatic temperature control with digital display of temperature.		
5	The heater capacity should be 1.5 KW.		
6	Approximate dimensions: 16” x 12” x 4”.		
7	For use at 220 V 50 Hz single phase AC supply.		

B31 - Digital Camera(6 MP)

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Camera should be of Sony, Canon or any other equivalent reputed make		

ANNEXURE-IV

B32 - Portable ORP Monitor

Sl. No.	Techanical Requirement		Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Measurement Range	2000 to +2000 Mv		
2	Resolution	0.1 mV		
3	Accuracy	± 0.2 mV or ± 0.1% of reading, whichever is greater		
4	Output	One-way, RS-232 via docking station/ 199-point memory recall		
5	Inputs	(2) 5-pin connector		
6	Input Impedance	>1012 Ohms		
7	Display	Custom LCD with Backlight		
8	Measurement Selection:	pH/ORP/Temperature		
9	Power Requirements	4 AA batteries or 110 to 220 VAC line power through docking station.		
10	**Sensor/Probe**	Pt electrode combination electrode suitable for measurement in cooling waters, waste waters and drinking waters. Should be rugged enough to with stand normal operating conditions at coal & gas based stations. It should be easily replaceable and sensitive enough for regular operations. It should be compatible with online monitor. The operating ambient temperatures are up to 50 deg. C. Preferably sensor should be capable of measuring multiparameter such as pH, ORP, Temperature, etc		
11	**b) General**	The instrument should be capable for operation in cooling waters, waste waters and drinking waters. The output data should be measurable every half an hour and it should be stored in the in built memory of the instrument. Minimum of 500 measurements should be stored in the in built memory and provision should be there to transfer the data to a desktop or laptop computer through suitable software. The instrument should be provided with all necessary cables, connectors, data storage/acquisition system, suitable software, etc		

ANNEXURE-IV

Compliance Sheet [Package - 3]

C1 - Conductivity Meter (Bench top)

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	This should be direct reading microprocessor controlled conductivity meter for the measurement of specific conductance in micro Siemen/cm and for measurement of resistance in Ohms.Siemen/cm with a provision for measurement of resistance in Ohms.		
2	It should have provision for automatic temperature compensation, auto ranging, adjustable temperature coefficients, reference temperature and to use both two and four electrode cells.		
3	The instrument should incorporate the following features:		
3.1	Range 1 micro Siemen/cm f.s.d. to 0.1 Siemen/cm f.s.d in 12 ranges		
3.2	Accuracy ± 1% of full scale		
3.3	Minimum measurement limit 0.1 micro Siemen/cm		
3.4	Temperature compensation 0 deg.C - 60deg.C (auto)		
3.5	Range of cell constant adjustment 0.01 to 1.2		
3.6	Temperature Co-efficient From 1.4% to 2.7% per deg.C		
4	The instrument will be operated at 220 V AC 50 Hz. The instrument should be supplied with 3-pin plug and 3 meter long cable.		
5	Must be supplied with instruction Manual containing circuit diagram, operation and maintenance instruction and procedure for fault rectification along with list of spare parts.		
6	**SPARES**		
6.1	Dip / Cup type, 4 and 2 electrode conductivity cells made of acrylic body and having the following cell constants:		
6.1.i	0.01 cm-1 2 Nos.		
6.1.ii	0.1 cm-1 2 Nos.		
6.1.iii	0.5 cm-1 2 Nos.		
6.2	b) Flow type conductivity cells of 0.1 cm-1 2 Nos.		

C2 - Conductivity Meter (Portable)

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	It should be direct reading microprocessor controlled conductivity meter for measurement of specific conductance in micro Siemen /cm, Battery operated with provision for using with mains.		
2	Automatic Temperature compensation in 0-60oC range with selectable reference temperature 20deg.C - 25deg.C.		
3	Range : 0-2, 0-20, 0-200, 0-2000 and 0-20,000 µ Siemens/cm		
4	Accuracy : ± 1% of full scale		
5	Smallest Scale Division : 0.01 micro Siemens/cm on lowest range		
6	Complete with cell holder, temperature probe, batteries, leather carrying case and instruction manual.		
7	**Accessories**		
7.1	Conductivity cells - 2 No. (Cell constant 0.1 cm -1)		
7.2	Conductivity Cell - 2 No. (Cell constant 0.5 cm -1)		
7.3	Battery - 1 charge		

ANNEXURE-IV

C3 - pH Meter (Bench Top)

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Digital pH meter should have following specifications:		
1.1	Range 0-14.00 pH ± 1999 mV		
1.2	Accuracy ± 0.01 pH + 1 mV		
1.3	Repeatability + 0.01 pH + 1 mV		
1.4	Drift rate < 0.01 pH in 24 hrs.		
1.5	Temperature 0-60deg.C. Compensation Automatic giving pH at 25deg.C		
1.6	Display 4 digit LED		
2	The instruments should be suitable for use at 220 V, 50 Hz Single phase AC supply.		
3	It should be supplied with Operation & Maintenance Manual complete with circuit diagram and fault finding procedure, Electrode Holders and stand.		
4	**Spares & Accessories**		
4.1	Combination Electrode with filling solution 8 Nos.		
4.2	Temp. probe 2 Nos.		

C4 - pH Meter (Portable)

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	It should be handy, lightweight, batteries operated with a provision for operating at 220 V AC, 50 Hz single phase power supply.		
2	Range i) 0 – 14 pH		
	ii) -100 to +700 mV		
	iii) +100 to -700 mV		
3	Accuracy i) pH ± 0.1		
	ii) mV + 10		
4	It should be a single combination pH electrode with appropriate end correction and automatic temperature compensation covering the entire pH range, have provision for temperature compensation in 0-100deg.C. Complete with electrodes, electrode holder, batteries, etc. & instruction manual.		
5	**Spares**		
5.1	Combination Electrodes with filling solution. 4 Nos.		
5.2	Batteries 1 Set		

C5 - Turbidity Meter (Nephelometric)

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Direct reading instrument for the measurement of low level of turbidity using nephelometric principle.		
2	Range 0-1000 NTU in five ranges viz. 0 – 0.2, 0 -1, 0 -10, 0 -100 & 0-1000		
3	Accuracy ± 2% of FSD or better		
4	Calibration Formazin Standard		
5	Reproducibility + 2% of full scale or better		
6	**Spares**		
6.1	Sample cuvettes 2 Dozens		

6.2	Source lamps	4 Nos.		
6.3	Fuses	6 Nos.		
7	Calibration standards in the following ranges should be provided with the instrument: 1.0, 10, 100 and 1000 NTU (Two sets in each range).			
8	The instrument must be accompanied by Operation and Maintenance Manual incorporating circuit diagram and trouble shooting guidelines for use at 220 V 50 Hz single phase AC.			

C6 - UV-VIS Spectrophotometer

Sl. No.	Techanical Requirement		Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	**SINGLE BEAM**			
1.1	This should be microprocessor controlled single beam UV-Vis spectrophotometer with large LCD display and touch button keyboard.			
1.2	The microprocessor should be able to store multipoint calibration curves and should give absorbance, transmittance as well as concentration readings.			
1.3	Wavelength scan function with the identification of the most sensitive wavelengths should be available in the instrument.			
1.4	Operating Wavelength Range	200-1000 nm		
1.5	Wavelength presentation	Digital counter in 0.2 nm increments		
1.6	Wavelength accuracy	Better than ± 1.0 nm		
1.7	Wavelength repeatability	Better than 0.3 nm		
1.8	Stray light	Less than 0.3% T at 220 nm		
1.9	Photometric readout	Digital display for linear transmittance (T)		
1.10	Spectral band width	≤ 5.0 nm		
1.11	Photometric accuracy	± 0.003 Abs (at 0.5 Abs)		
1.12	Photometric noise	0.002A peak to peak		
1.13	Path Length	Variable with suitable pyrex / silica glass cuvettes and holders for use with cuvettes up to 100 mm path length		
2	**DOUBLE BEAM**			
2.1	Double beam UV-visible spectrophotometer should be microprocessor controlled with dual source assembly for UV & visible region, monochromator, digital readout of absorbance/transmittance and concentration.			
2.2	i) Operating Wavelength Range	200-1000 nm		
2.3	ii) Wavelength presentation	Digital counter in 0.2 nm increments		
2.4	iii) Wavelength accuracy	Better than ± 0.5 nm		
2.5	iv) Wavelength repeatability	Better than 0.25 nm		
2.6	v) Stray light	Less than 0.3% T at 220 nm		
2.7	vi) Photometric readout	Digital display for linear transmittance (T)		
2.8	vii) Spectral band width	Variable (0.1 to 7.5 nm stepwise)		
2.9	vii) Photometric accuracy	'A' to 'C' conversion 0.5% of value or better		

2.10	viii) Photometric noise	0.001A near OA 0.002A near 1.0A 0.004A near 1.5A		
2.11	ix) Photometric stability	0.2% T/day		
2.12	x) Resolution	Better than 0.2 nm through out the entire range.		
2.13	xi) Slit	Both manually adjustable and programmed.		
3	The instrument should have the facility for storage of spectra with facilities for multi wavelength mode, baseline correction, peak area and other statistical calculations along with in - built printer and Interface for PC.			
4	**ACCESSORIES**			
4.1	Matched pair of rectangular cells of following path length for use in 200-1000 nm range made of pyrex / silica glass.			
4.2	a) 10 mm : 4 pairs			
4.3	b) 20 mm : 2 pairs			
4.4	c) 50 mm : 4 pairs			
4.5	d) 100 mm : 1 pair			
4.6	2. Cell holder for use with 20 mm & 50 mm & 100 mm path length cells.			
4.7	3. Voltage stabilizer suitable for use with the main instrument.			
5	Both the Spectrometers are for use at 220 V AC 50 Hz, single phase power supply.			
6	The instruments must be accompanied by O&M Manuals which should be complete with circuit diagram, performance testing, and fault finding procedures.			
7	The equipments should be supplied along with two years' requirement of spare-parts for smooth use particularly source lamp and fuses.			

ANNEXURE-IV

Compliance Sheet [Package - 4]

D1 - Assmann Psychrometer

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	This should be senior model with long stem and battery driven or mechanical driven fan, dry & wet bulb thermometer, having range of –30deg. C to 50deg. C with a least count of 0.05deg.		
2	It should be provided with psychrometric chart, O&M manual and leather carrying case.		
3	The instrument is for use at 220 V 50 Hz Single Phase AC supply.		

D2 - Dew Point Apparatus

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	This is for measuring the dew point of hydrogen gas in the generator casing.		
2	The instrument should be intrinsically safe from hazardous areas and should be able to measure dew point in the range of +20deg. C to –60deg. C.		
3	It should have auto calibration / calibration check facility and should comply with ASTM D 2029.		
4	The working principle should be either (a) Automatic Chilled mirror (Peltier cooling) principle or (b) Capacitance method.		
5	**Automatic Chilled Mirror**		
5.1	Consisting of internal cooling, temperature sensing, photo-source and photo-detector systems for the determination of dew point by measuring the moisture on the mirror.		
5.2	It should be complete with necessary electronics to give digital display of the dew point temperature and ambient temperature in deg. C and moisture in % and ppm.		
5.3	It should avoid elaborate piping within the instrument so that the time taken for attaining equilibrium is minimized.		
5.4	Complete with necessary connections, valves and tubing, operation and maintenance manual.		
5.5	Should operate at 230 V, 50 Hz single phase AC supply.		
6	**Capacitance method**		
6.1	Capable of measuring various levels of moisture content in test gases using aluminium oxide or silicon oxide sensor - which change capacitance in proportion to the amount of moisture absorbed.		
6.2	Isolation package housing the sensor should allow for the introduction of the test gases maintaining the test gas integrity.		
6.3	Should have the necessary microprocessor capable of computation and digital display of the dew point and ambient temperature in deg. C and moisture in ppm and percentage.		
6.4	Battery operated, complete with necessary connections and tubing accompanied by operation		

D3 - Fortin's Barometer

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Fortin's Barometer is for general laboratory use, graduated in inches & mm.		
2	Mercury column should be calibrated from 20-31 inches, with readability by vernier to 0.01 inch and from 508 to 790 mm to 0.1 mm.		
3	Fortin type cistern should permit precise adjustment of zero point.		
4	It should include thermometer 0-50deg. C recessed in protective channel.		
5	The unit should be completely encased in a polished wooden case with white plastic reflectors and provision for mounting on the wall.		
6	Assembling of the barometer should be preferably carried out by the supplier at the site.		

7	The instruction manual should contain tables for temperature and gravity corrections.		

D4 - Hygrometer

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
	Air hygrometer should come with silver metal scale 0 to 100 x 1% RH.		
	It should be accurate to + 3% RH in the range of 30-90% at temperatures upto 45OC.		
	The assembly should be enclosed in a chromium plated case of about 125 mm dia.		
	It should have provision for hanging on the wall.		

D5 - Hygrometer

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	The thermometer shall register both maximum and minimum temperature. Range: -40°C to +50 °C		

D6 - Orsat Gas Analyzer

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Portable Orsat gas analyser for the determination of CO2, CO, & O2 in flue gas samples should consist of the following parts, made of borosilicate glass:		
1.1	Two absorption pipettes filled with thin walled glass tubing and one with copper spirals, and three rubber expansion bags.		
1.2	Manifold made of 2-3 mm I.D. and length approximately 35 mm, capillary tubing, with four stop-cocks: one three – way horizontal and three vertical and a U-tube drying facility at I/L to the manifold.		
1.3	100 ml measuring burette Class A, with water jacket. The lower portion of burette should be graduated in 0.1 ml, up to 30 ml and the remaining 70 ml in 5 ml divisions.		
1.4	Leveling bottle 250 ml capacity.		
2	The assembly should be neatly fitted with supports, clamps in a portable polished wooden case with removable front and back covers.		
3	**SPARES**		
3.1	Absorption pipettes with 2-3 mm I.D. capillary tube - 12 Nos.		
3.2	Absorption pipettes copper spirals - 6 Nos.		
3.3	Measuring burette with water jacket - 6 Nos.		
3.4	Leveling bottle - 6 Nos.		
3.5	Manifold - 12 Nos.		

D7 - Wet and Dry Bulb Hygrometer

Sl. No.	Techanical Requirement		Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Wet & dry bulb hygrometers should be on polished Zinc scale in polypropylene frame with reservoir and spare wicks.			
2	Thermometer range	0 – 50deg. C		
3	Thermometer graduation	0.5deg. C		
4	It should have provision for mounting on the wall.			
5	Two copies of psychrometric charts should be provided.			

D8 - Wet and Dry Bulb Hygrometer

Sl. No.	Techanical Requirement		Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Function: Sensing & Measurement of Hydrogen in Air, gas holders, valves, pipelines, etc.			
2	Range	0 - 100 % purity		
3	Sensor	Thermal Conductivity Detector		
4	Readout	LCD Digital display.		
5	Sampling Method	suction		
6	Alarms	Audio-Visual alarm for LO, Hi ranges& Battery low		
7	Response Time	Less than 10 seconds.		
8	Power	rechargeable batteries + charger		
9	Instrument shall be supplied with all required accessories.			

ANNEXURE-IV

Compliance Sheet [Package - 5]

E1 - Atomic Absorption Spectrophotometer

Sl. No.	Techanical Requirement		Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	This is double beam Atomic Absorption Spectrophotometer with full multi-element capability controlled by data workstation running under windows and having manual override with local controls.			
2	It should be easily usable with all applications like flame absorption / emission, graphite furnace, hydride vapour or mercury cold vapour absorption modes and should have automatic background correction.			
3	Having digital display of linear absorbance & concentration, it should preferably have parallel mounting of both flame and flameless (graphite furnace) assemblies.			
4	**Flame**			
4.1	This part should consist of air cooled burners with good flame stability and low carbon buildup for acetylene / hydrogen, acetylene / nitrous oxide flames and standard 100 mm burner for air / acetylene flame.			
4.2	It should have provision for automatic ignition and extinction of flame with a safety in-lock features to prevent flashback by pressure monitoring and safe gas handling in case the flame goes out.			
4.3	The system should do safe automatic shutdown in case of power failure or in case the pressure of any gas falls below the safe limit.			
4.4	Vertical, horizontal and rotational adjustments of the burner head should be possible.			
4.5	It should be provided with rotameter flow control valves and pressure gauges and a pressure control valve incorporated for both of fuel and support gases.			
4.6	All controls should be achievable through software commands.			
5	**Graphite furnace**			
5.1	Flameless water-cooled graphite furnace assembly should come with pyrolytic graphite coated furnace tube as well as boats.			
5.2	It should be circulating water-cooled complete with water reservoir tank, pump and necessary tube and valve connections.			
5.3	Data station controlled with provision of local controls.			
6	**Auto sampler / hydride generator**			
6.1	Furnace and flame auto sampler should be equipped with automatic sampling, standard presentation and preparation facilities.			
6.2	Intelligent dilution (for furnace) / in line dilution (for flame) should be available for over range samples.			
6.3	Computer controlled continuous flow vapour system for the measurement of hydride of metals and mercury.			
7	**Hollow cathode lamps**			
7.1	Instrument should have a minimum of 4 lamp connections with two lamps on at a time.			
7.2	The lamp alignment and energy optimization should be computer controlled.			
7.3	Lamps compatible with the instrument for the following elements should be supplied. Al, As, B, Ba, Ca, Cd, Co, Cr, Cu, Fe, Ga, Hg, K, Li, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Si, Sn, Sr, Ti, V, W and Zn.			
8	**Monochromator**			
8.1	Echelle/ Ebert or Czerny – Turner monochromator employing a grating of 1800 lines / mm.			
9	**Computer and Software**			
9.1	The system should be recent standard Pentium and using WINDOWS based operating system. Configuration of the system shall be as follows (or the latest as available):			
9.2	Hard Disc	1 TB or more		
9.3	Processor	Pentium P IV with >1.5 GHz		
9.4	Monitor	SVGA 17" colour or larger		

9.5	RAM	Min. 4 GB or better		
9.6	DVD/CD			
9.7	CD ROM	52x CD ROM		
9.8	PRINTER WITH SCANNER	LASER / INKJET PRINTER WITH SCANNER		
9.9	Window based software for the system function including control of major accessories with single or multi element capacity for flame / furnace with the required inter locking for safe operation.			
10	**Technical data**			
10.1	Wavelength Range	190nm - 900nm		
10.2	Digital meter	4 - digit LED		
10.3	Slit width	0.2, 0.5 & 1.0 nm		
10.4	Wavelength display	3 digit digital counter.		
11	**Accessories**			
11.1	Air compressor, oil free, capable of continuous operation providing the required quantity of air at the prescribed, constant pressure.			
11.2	Suction hood with exhaust fan of required capacity to maintain a stable flame.			
11.3	Pressure Regulators for use with the gases such as Acetylene, hydrogen & nitrous oxide, and for gases used in the graphite furnace. 2 Nos. each.			
11.4	Voltage Stabilizer (For use at 220 V AC 50 Hz single phase supply). - 1 no.			
12	**Reference Standards**			
12.1	Certified reference standard solutions (1 ml = 1 mg) for all the elements mentioned in (4.) should be provided with the equipment.			
12.2	Complete with all essential accessories for the tests of all metals in ppm as well as in ppb level, along with Operation and Maintenance			
12.3	Manual, Methods of determination of metals by Atomic Absorption Spectroscopy, electrical circuit diagrams and trouble shooting guide.			
12.4	The equipment should be procured along with Mandatory spare parts for three years' trouble free operation and after sales services in India.			

E2 - Gas Chromatograph

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	**Brief Description of the Instrument/System**		
1.1	This should be microprocessor controlled data work station based, computer compatible gas chromatography system for capillary and 530 micron mega bore columns.		
1.2	The main unit should consist of the injectors, oven, detectors, flow system and the related electronics.		
1.3	It should comply with ASTM – D 3612 for analysis of dissolved gases in oil and ASTM – D 1945 for the analysis of natural gas samples.		
2	**Operational Requirements**		
2.1	The system should be capable of operating with capillary column as well as 530 micron megabore columns, possess two injection ports or equivalent injector system, provision for mounting two columns and at least two detectors.		
2.2	It should preferably have stripper column attachment containing high surface area beads for the extraction of dissolved gases in oil (say, transformer oil) using the carrier gas. Should include functional key board with alphanumeric print out and signal analog output, should have provision for column compensation, power fail memory protection, control of four heated zones (injector, oven, detectors) and built in diagnostics and comprehensive self		
2.3	It should operate on 220 ±10 volts, 50 Hz AC power supply.		
3	**Technical Specification**		
3.1	**Injector**		
3.1.1	The injector system should be dedicated for both, capillary columns (all types and all sizes of capillary columns) as well as 530 micron mega bore columns.		

3.1.2	The design should provide temperature programmable split-splitless and direct injection.		
3.1.3	The injector should be with heater, auto sample injection system (optional), temperature sensor, protection from overheating and septum purge.		
3.1.4	The adjustments of the split flow and the septum purge should not affect the column flow, and the purge time should also be adjustable.		
3.1.5	The range of temperature should be at least 400deg. C, with a provision of 1deg. C increment in the entire operating range.		
3.1.6	Facility shall be available for solvent rejection and back flush.		
3.2	**Columns**		
3.2.1	The columns should be useful for the analysis of dissolved gases in transformer oil such as CH4, C2H2, C2H6, CO, CO2, N2, etc., as well as natural gas samples and if separate columns are needed for both the analysis, facility for switch over should be provided in the hardware without changing the column ends from detector side in the oven.		
3.2.2	The columns should be packed with molecular sieve/ silica gel / diisodecyl phthalate / chromosorb / carbosieve / seperocarb: all or as many as required for the partition as well as adsorption of component gases in both the applications.		
3.3	**Column Oven**		
3.3.1	High performance and sufficiently large capacity oven which can accommodate both, capillary columns (up to 100 meter length) and 530 micron mega bore columns with their respective mounting supports.		
3.3.2	The temperature range should cover upto at least 400deg. C.		
3.3.3	It should be with temperature sensor and overheat protector.		
3.3.4	It should provide an accuracy of + 1deg. C for the entire temperature range, and a temperature stability of 0.01deg. C for 1o C ambient change.		
3.3.5	It should have provision for multi-linear programming (at least 4 ramps and 5 plateaus), with a rate of at least 0.1 to 45o C per minute and at least 650 minutes run time.		
3.3.6	Should have provision of set point entry of upto 1o C for temperatures and upto 0.1o C for program rates.		
3.3.7	Re-calibration of the oven should be possible up to + 0.01o C.		
3.3.8	The cooling and restablization of the oven temperature should be in automatic sequence and fast through a microprocessor controlled vent at the rear of the column oven.		
3.3.9	Oven should also be capable of adopting two detectors (similar or different).		
3.4	**Flow System**		
3.4.1	It should be dual flow, dual column system.		
3.4.2	Inlet pressure and flow rate of the carrier gas should be controlled by electro pneumatic control/manually as well as through data processor with digital and screen display of the pressure and the flow rates.		
3.5	**Detectors**		
3.5.1	The detectors should be of modular type for their quick interchangeability, and should be dedicated for accepting effluent from both, the capillary columns (all types and all sizes) as well as 530 micron mega bore columns.		
3.5.2	The operating temperature range should cover upto at least 400deg. C.		
3.5.3	It should be with make up gas and automatic zeroing facility.		
3.5.4	Each detector should be supplied in a self contained module with heater, temperature sensor and overheat protector.		
3.5.5	**(a) Flame Ionization Detector**		
3.5.5.1	It should be of an appropriate design for the operator's safety. The ignition facility should be an easily replaceable auto igniter involving push button ignition. Should provide a detection limit of less than 5 picogram carbon/sec or equivalent with S/N=2 and nitrogen as carrier gas, and a linear dynamic range of up to at least 10.		
3.5.5.2	The departure from linearity should be less than + 1% for the entire range.		
3.5.6	**(b) Thermal Conductivity Detector (TCD)**		

3.5.6.1	The constant current system maintains a stable bridge current even when the detector temperature is changed, thus requiring no additional intervention.			
3.5.6.2	Excessive current flow in the bridge circuit or stoppage of the carrier gas stream will activate the filament protection circuit which will turn off the bridge current to protect the filaments and indicate such action on the display & by alarm buzzer.			
3.5.6.3	The rhenium-tungsten filaments, which have a resistance of 100 each, provide excellent stability and high reliability.			
3.5.6.4	Make-up gas flow of a few milliliters to a few tens of milliliters per minute provides sharper peaks in capillary column GC.			
3.6	**Data Station**			
3.6.1	It should have basic program facility and capable of providing accurate and reproducible integration, reintegration/repot and multilevel calibration, base line correction, area calculation, data subtraction and report formats. Should have, ingrained provision for statistical analysis, printer-plotter function, and battery back up for memory protection.			
3.6.2	It should also have provision for CV and specific gravity calculation of Natural gas in the gas analysis software.			
3.6.3	It should be able to operate on 220 ± 10 volts, 50 Hz AC power supply.			
3.7	**Computer and Software**			
3.7.1	The system should be recent Pentium based PC using latest WINDOWS Operating System environment.			
3.7.2	Configuration of the system shall be as follows:			
3.7.3	Hard Disc	1 TB or more		
3.7.4	Processor	Pentium P IV with >1.5 GHz speed		
3.7.5	Monitor	SVGA 17" colour or bigger		
3.7.6	RAM	4 GB or better		
3.7.7	DVD/CD			
3.7.8	CD ROM	52x CD ROM		
3.7.9	Printer	Inkjet / Laser Printer		
3.7.10	Software performing the following functions should be provided:			
	a) Gas analysis (Natural/Naphtha).			
	b) Water and environmental analysis for priority organics including pesticides, poly aromatic hydrocarbons (PAH), poly chloro benzene (PCBs), penta chloro phenolos (PCPs).			
	c) Dissolved gas analysis of transformer oils			
	d) Quality control protocols			
	e) Data display, Data import/export, Data handling and reporting			
4	**Additional Items to be supplied as Accessories:**			
4.1	Operation and maintenance manual as well as service manual; application notes for the analysis of pesticides, PAH compounds, PCBs, PCPs etc. in environmental samples;			
4.2	Two stage gas regulators for nitrogen, hydrogen and air with necessary tubing and connectors;			
4.3	High capacity gas purifier for hydrogen, air and carrier gas;			
4.4	And two sets each calibration gas cylinders for natural gas and dissolved gases in transformer oil analysis with all necessary spares and consumables for at least three year trouble free operation.			
4.5	In case if the instrument does not contain the stripper column for the in-situ extraction of dissolved gases in transformer oil, separate extraction kit complying with ASTM D-3612 should be provided with the instrument.			

ANNEXURE-IV

E3 - Thermo Gravimetric Analyzer

Sl. No.	Techanical Requirement	Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	Thermo gravimetric analyzer is for the proximate analysis of coal.		
2	It should meet the requirements of ASTM D – 5142.		
3	It should have the capability to analyse 15 – 20 samples simultaneously with no limit on the minimum number of samples to be loaded.		
4	The system should automatically monitor and calculate weight loss for moisture, volatile matter, ash, loss on ignition (LOI) or fixed carbon in the range exceeding 0% to a total weight loss of 100%.		
5	Balance should be in – built, top loading with auto calibration facility and a sensitivity of ±0.0001 gm.		
6	The weight range should be adequate to cover the analytical applications.		
7	Sample size 1 to 5 gm.		
8	Maximum furnace temperature 1000oC		
9	Temperature stability ±5oC		
10	Instrument precision 0.001gm		
11	Gas requirement Oxygen, 99.5% pure, 35 psi regulated Nitrogen, 99.5% pure, 35 psi regulated Compressed air, oil and water free, 35 psi.		
12	Sample weight 1 gm.		
13	Calibration sample 50 gm.		
14	Power requirement 220±10 V, 50 Hz, Single phase A/C.		
15	LCD display and printer with built-in operational program to perform all calculations as well as control heating temperature, atmosphere, duration and heating rate should be available with the instrument.		
16	Programmable memory for the storage of analytical methods and results should be provided with built in PC interface.		
17	It should be complete with compressor and regulators for the gases, all spares and consumables for a period of minimum 3 years trouble free operation and accompanied by operation and maintenance manual.		

ANNEXURE-IV

Compliance Sheet [Package - 6]

F1 - Atomic Absorption Spectrophotometer

Sl. No.	Techanical Requirement		Offered Specification (Bidder to Specify against each Particulars)	Document attached in Support of Offered Specification (Catalogue / Confirmation by OEM)
1	The equipment should be complete set of automatic (Isoperibol) bomb calorimeter with all essentials/ accessories for estimation of calorific value of coal and oil.			
2	It should be microprocessor controlled, with touch panel keyboard for data entry and operation control, Menu driven programmed operating system, RS 232 port, etc. and should comply with ASTM – D 5865.			
3	Range	3000 – 6000 cal / gm sample.		
4	Temperature measurement resolution	Better than 0.001deg. C		
5	Room temperature	15deg. C – 35deg. C		
6	Gas	Oxygen 99.9% pure (30 Kg/cm2)		
7	Panel display	Digital display		
8	Electrical power requirement	230 ±10 V AC, 50 Hz, Single phase.		
9	Certified calibration sample	50 grams, benzoic acid.		
10	The equipment should come complete with all accessories / essentials required for at least three years trouble free operation along with the calibration certificate for pyrometer/thermometer and test certificate for the bomb.			
11	The package should also be accompanied by operation and maintenance manual.			