

Pre-Qualification Requirements (PQR)

1. The bidder should have an average annual turnover (T.O.) of minimum Rs. 150 Lakhs/year in last 03 (Three) years. Supporting documents "e.g. Last 3 financial years "Profit & Loss account/Balance Sheet/ GST returns/Any other acceptable document certified by CA" should be submitted in support of above.
2. Bidder should have supplied "Minimum 20 Nos. of different Chemical Laboratory Equipment" to "NTPC/ Reputed power plants. Proof of supply and end user details should be attached for the same.
3. Bidder must have experience for chemical lab establishment in reputed Power project/Industry. Certificate for the same should be attached.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

Purpose:

Intent of the specification is to supply and commission chemical laboratory equipment at Satge-I & II of Yadadri Power Project Site. Supplier will establish 02 number chemical laboratories at site for routine chemical analysis in power project. Chemical Laboratory would include following sub labs:

- A. Water Analysis Laboratory;
- B. Fuel Oil & Flue Gas Analysis Laboratory;
- C. Coal Analysis Laboratory;
- D. Environmental Laboratory
- E. General Laboratory

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

| S/N | Item Description | Qty (No) Stage-I | Qty (No) Stage-II | Specification |
|---------------------------------------|-----------------------------------------------|---------------------|----------------------|---------------|
| Water Analysis | | | | |
| 1 | Conductivity Meter | 2 | 2 | Annexure -1 |
| 2 | Conductivity Meter (portable) | 1 | 1 | Annexure -2 |
| 3 | pH meter | 2 | 2 | Annexure -3 |
| 4 | pH meter (Portable) | 1 | 1 | Annexure -4 |
| 5 | Turbidity meter | 1 | 1 | Annexure -5 |
| 6 | Flame Photometer | 1 | 1 | Annexure -6 |
| 7 | Jar Test Apparatus | 1 | 1 | Annexure -7 |
| 8 | Analytical balance | 1 | 1 | Annexure -8 |
| 9 | Dissolved Oxygen meter (PPB Level) | 1 | 1 | Annexure-9 |
| 10 | Dissolved Oxygen meter (PPM Level) | 1 | 1 | Annexure-10 |
| 11 | UV-VIS Spectrophotometer | 1 | 1 | Annexure-11 |
| Fuel Oil and Flue Gas Analysis | | | | |
| 12 | Apparatus for oxidation stability test | 1 | 1 | Annexure -12 |
| 13 | Redwood viscometer for oil analysis | 1 | 1 | Annexure -13 |
| 14 | Interfacial tension apparatus | 1 | 1 | Annexure -14 |
| 15 | Automatic Flash Point Apparatus | 1 | 1 | Annexure -15 |
| 16 | Penetrometer for grease testing | 1 | 1 | Annexure -16 |
| 17 | Dean & stark moisture determination apparatus | 2 | 2 | Annexure -17 |
| 18 | Explosimeter | 1 | 1 | Annexure -18 |
| 19 | Centrifuge | 1 | 1 | Annexure -19 |
| 20 | Automatic K-F (Karl- Fisher) Titrimeter | 1 | 1 | Annexure -20 |
| 21 | Orsat apparatus | 1 | 1 | Annexure -21 |
| 22 | Hydrogen Purity apparatus | 1 | 1 | Annexure -22 |
| 23 | Gas Chromatograph | 1 | 1 | Annexure -23 |

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT**TECHNICAL SPECIFICATIONS****PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)**

| S/N | Item Description | Qty (No) Stage-I | Qty (No) Stage-II | Specification |
|-------------------------------------------------------------------|----------------------------------------------|---------------------|----------------------|---------------|
| Coal Analysis | | | | |
| 24 | Muffle Furnace | 1 | 1 | Annexure -24 |
| 25 | Oven | 1 | 1 | Annexure -25 |
| 26 | Lab Pulveriser | 1 | 1 | Annexure -26 |
| 27 | Sieve Shaker | 1 | 1 | Annexure -27 |
| 28 | Jaw Crusher | 1 | 1 | Annexure -28 |
| 29 | Roll Crusher | 1 | 1 | Annexure -29 |
| 30 | Humidity Oven | 1 | 1 | Annexure -30 |
| 31 | Coal Sample Riffler | 1 | 1 | Annexure -31 |
| 32 | Furnace for determination of Volatile Matter | 1 | 1 | Annexure -32 |
| 33 | Abrasive/Erosive index machine | 1 | 1 | Annexure -33 |
| 34 | Laboratory plate mill | 1 | 1 | Annexure -34 |
| 35 | Laboratory mini mill | 1 | 1 | Annexure -35 |
| 36 | Analytical balance | 1 | 1 | Annexure -36 |
| 37 | Ordinary balance | 1 | 1 | Annexure -37 |
| Environmental & Pollution Control Laboratory Equipment | | | | |
| 38 | Weather Monitoring System | 1 | 1 | Annexure -38 |
| 39 | Autoclave | 1 | 1 | Annexure -39 |
| 40 | BOD incubator | 1 | 1 | Annexure -40 |
| 41 | COD reactor | 1 | 1 | Annexure -41 |
| 42 | Inoculation chamber | 1 | 1 | Annexure -42 |
| 43 | Dew Point Meter | 1 | 1 | Annexure -43 |
| 44 | Dial type barometer | 1 | 1 | Annexure -44 |
| 45 | Maximum & Minimum Thermometer | 2 | 2 | Annexure -45 |
| 46 | Dry & Wet Bulb Thermometer | 2 | 2 | Annexure -46 |
| 47 | Stack Monitoring Kit | 1 | 1 | Annexure -47 |
| 48 | Portable Water Quality analyzer | 1 | 1 | Annexure -48 |
| Other Equipment | | | | |
| 49 | Flue gas analyzer | 1 | 1 | Annexure -49 |
| 50 | Oil Content Analyzer | 1 | 1 | Annexure -50 |

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| S/N | Item Description | Qty (No) Stage-I | Qty (No) Stage-II | Specification |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------|----------------------|---------------|
| General Equipment | | | | |
| 51 | Kipps apparatus | 1 | 1 | Annexure -51 |
| 52 | Photometer | 1 | 1 | Annexure -52 |
| 53 | Potentiometric Titration Apparatus | 1 | 1 | Annexure -53 |
| 54 | Gas heating assembly | 1 | 1 | Annexure -54 |
| 55 | Stop Watch | 1 | 1 | Annexure -55 |
| 56 | Constant temperature bath | 1 | 1 | Annexure -56 |
| 57 | Water distillation assembly | 1 | 1 | Annexure -57 |
| 58 | Vacuum pressure pump | 1 | 1 | Annexure -58 |
| 59 | Heating Mantel | 1 | 1 | Annexure -59 |
| 60 | Magnetic Stirrer cum Hot plate | 1 | 1 | Annexure -60 |
| 61 | Refrigerator | 2 | 2 | Annexure -61 |
| 62 | Hot Plate | 2 | 2 | Annexure -62 |
| 63 | Magnetic Stirrer | 1 | 1 | Annexure -63 |
| Chemicals/Glassware's/Safety Equipments/ Laboratory Furniture & General Lab. Requisites | | | | |
| 64 | Chemical (As per Annex-A) | 1 Set | 1 Set | Annexure -64 |
| 65 | Glassware (As per Annex-B) | 1 Set | 1 Set | Annexure -65 |
| 66 | Safety Equipment (As per Annex-C) | 1 Set | 1 Set | Annexure -66 |
| 67 | Furniture (As per annex-D) | 1 Set | 1 Set | Annexure -67 |
| 68 | General Lab. Requisite with 4 Nos of Platinum Crucibles(As per annex-E) | 1 Set | 1 Set | Annexure -68 |

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 1

1.0 Conductivity Meter

Bench top conductivity Meter is used for determination of conductivity, TDS, salinity, resistivity and temperature.

Lab Model Conductivity Meter with conductivity probe, conductivity standard 1413 $\mu\text{S}/\text{cm}$ and of following specifications should be provided.

1. Range : 0 to 1000 mS/cm with minimum low level measurement of 0.001 $\mu\text{S}/\text{cm}$
2. Accuracy : 0.5% or better
3. Temp compensation : Automatic
4. Display : Digital Display
5. Power Requirement : Mains operated (220 Volts AC \pm 10%, 50 Hz \pm 3%, single phase supply) / Battery operated.

Accessories:

- (a) Conductivity probe for low conductivity with Flow through vessel.
- (b) Electrode stand.
- (c) Conductivity standard 100 $\mu\text{S}/\text{cm}$.
- (d) 1 No spare cell

Annexure - 2

2.0 Conductivity Meter (Portable)

Portable conductivity for determination of conductivity, TDS, salinity, resistivity and temperature.

Portable Conductivity Meter with conductivity probe, conductivity standard 1413 $\mu\text{S}/\text{cm}$ and of following specifications should be provided.

1. Range : 0 to 1000 mS/cm with minimum low level measurement of 0.001 $\mu\text{S}/\text{cm}$
2. Accuracy : 0.5% or better
3. Temp compensation : Automatic
4. Display : Digital Display
5. Power Requirement : Mains operated (220 Volts AC \pm 10%, 50 Hz \pm 3%, single phase supply) and Battery operated.

Accessories:

- (a) Conductivity probe for low conductivity with Flow through vessel.
- (b) Conductivity standard 100 $\mu\text{S}/\text{cm}$.
- (c) 1 No. spare cell.

Annexure - 3

3.0 pH meter

Bench top pH meter with electrode stand, pH electrode, buffer 4,7,10.01 guide to pH measurement, operating manual and of following specifications should be provided..

1. Range pH : 0 to 14.00 pH
2. Accuracy pH : \pm 0.01 pH
3. Temp. compensation : Automatic
4. Display : Digital Display
5. Input connections : pH Combination electrode with Temperature Sensor
6. Power Requirement : Mains operated (220 Volts AC \pm 10%, 50 Hz, single phase supply) / Battery operated.

Accessories:

1. Single combination electrode with inbuilt temp.
2. One spare pH electrode.
3. Electrode Stand
4. Buffer Tablets/Solutions (4, 7 & 10.01 pH) – 1 Pack of 100 Nos. or 1.0 Litre Solution of each pH
4. Electrode filling solution
5. Dust Cover
6. Guide to pH measurement

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 4

4.0 pH meter (Portable)

Portable pH meter with built-in NTC temp probe-single combination electrode with built-in temperature probe.

The portable pH Meter should be of following specifications:

1. Range pH : -2 to 19.9
2. Accuracy pH : ± 0.01 pH
3. Temp. compensation : Automatic
4. Display : Digital Display
5. Input connections : pH Combination electrode with Temperature Sensor
6. Power Requirement : Mains operated (220 Volts AC $\pm 10\%$, 50 Hz $\pm 3\%$, single phase supply) and Battery operated

Accessories :

1. Single combination electrode with inbuilt temp. probe
2. Electrode filling solution
3. One spare pH electrode.
4. Buffer Tablets / Solutions (4, 7 & 10 pH) – 1 Pack of 100 Nos. or 1.0 Litre Solution of each pH)
5. Carrying Case
6. Batteries
7. Instruction Manual.

Annexure - 5

5.0 Turbidity meter

Turbidity meter shall be a microprocessor based instrument for measuring turbidity. Instrument shall have Auto Ranging from 0 to 1000 NTU. Instrument shall sense turbidity level of sample and automatically adjusts to the appropriate measurement. Instrument shall have a facility for Auto Alert Calibration Prompt: Automatically prompts the operator when calibration of the instrument is needed.

It shall have Simple Calibration Procedures: Calibration initiated with the push of a button ensures accurate readings.

Turbidity meter shall have infrared lamp source for colored samples measurement. Instrument shall meet international standard ISO 7027 for turbidity measurement.

Turbidity meter shall have resolution of 0.01 NTU at low turbidity readings & an extended range to 1,000 NTU.

Accessories:

- Calibration Standards (0.02, 10 and 100 NTU up to full range).
Two measuring cuvettes with light shield caps (1 Set)
Operator's manual (1 Nos.)
Plug-in power adapter (1 No.)

Annexure - 6

6.0 Flame Photometer

1. Range- 0 to 199.9 ppm.
2. Working range: Na 0.5-10 ppm, Ca 3 – 40 ppm, K 0.75-25 ppm
3. Reproducibility: 1% CV for 20 consecutive samples using 10 ppm Na set to 50 scale reading.
4. Linearity: Better than 2% when Na & K are 3 ppm, & are set to 100 scale reading.
5. Specificity: interference from Na, K equal in concentration to test of element will be < 0.5%.
6. Recorder output: nominal 1.00 V for a reading of 100.0
7. Na standard solution , K standard solution, Ca standard solution, regulator for natural gas, Air compressor 220 V shall be supplied.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 7

7.0 Jar Test Apparatus

1. This shall be suitable for continuous run in a laboratory.
2. Illuminator base shall consist of fluorescent tube mounted below translucent plastic plate to provide diffused cold light through floc samples.
3. The Jar tester shall consist of geared continuous run heavy duty 1/20 HP variable speed motor from 10 to 100 rpm with built in speed control.
4. Stainless steel stirring rods (6 nos.) shall be provided with adjustable spacers to adjust the depth of stirring paddles.
5. The stirring shaft shall be removed without disturbing other stirrers.
6. The unit shall be supplied complete with breakers.
7. Jars (6 No.), Jar Capacity: 1 liter.

Annexure - 8

8.0 Analytical balance

Analytical Balance with metal housing to protect weighing cell and electronics, compact design, brilliant backlit display.

The balances shall have automatic calibration with internal weight and it shall be possible to calibrate with external weights also.

Weighing range : 220 gms
Readability : 0.0001 g
Linearity : 0.0002 g

Annexure - 9

9.0 Dissolved Oxygen Meter (ppb level)

System shall be used for analysis of Dissolved Oxygen in ppb levels for Boiler/DM/Condensate water.

Specifications of Equipment:

Dissolved Oxygen Meter should be microprocessor-based, with the following specification :

1. Range : 1 ppb to 20 ppm
2. Accuracy : $\pm 1.5\%$ of reading or ± 0.2 ppb
3. Temperature range : 0.0 to 50.0 0C.
4. Probe : Dissolved Oxygen Probe with Cable
5. Power Requirement : Mains operated (220 Volts AC $\pm 10\%$, 50 Hz $\pm 3\%$, single phase supply and Battery operated.
6. Standard Accessories :
 1. Dissolved Oxygen probe
 2. Flow through cell
 3. Rechargeable Battery with adaptor
 4. Support stand
 5. Instruction manual.
 6. Other required accessories / standards.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 10

10.0 Dissolved Oxygen Meter (ppm level)

Dissolved Oxygen Meter should be with the following specification :

1. Dissolved oxygen meter with barometric pressure/automatic temperature compensation, salinity correction, point calibration, with digital LCD display. Battery cum mains operated.
2. Range: 0-20 mg/L with high sensitivity membrane.
3. Accuracy: $\pm 0.5\%$ of the value, Operating temp.: -5 to 50 °C, Protection waterproof.
4. Essential/Standard Accessories including DO Electrode, Output Cable, other required accessories/ standards & Instruction Manual.

Annexure - 11

11.0 UV-VIS Spectrophotometer

1.0 General: Preprogrammed UV Visible Spectrophotometer with a unique combination for fast, accurate and precise measurements of Water Quality parameters and Spectral Analysis with the following specifications:

2.0 Specifications of Equipment:

1. Wavelength Range: : 190 - 1100 nm
2. Monochromator type : Grating monochromator with step motor
3. Spectral Bandwidth : 4nm
4. Wavelength Reproducibility : ± 0.5 nm (shall be checkable, with holmium Oxide filter)
5. Lamp type : Xenon Flash lamp with approx. 10 years Lamp life.
6. Photometric measuring range : ± 3.3 A Photometric resolution: $\Delta A = 0.001$
7. Photometric linearity : $< 1\%$ for $A < 2.000$ in the range 340 to 900nm
8. Photometric Accuracy (in the range 200 to 1000nm) : 0.003 A for $A < 0.600$ 0.5% of the reading for $0.600 < A < 2.000$
9. Photometric Reproducibility (in the range 200 to 1000nm) : ± 0.002 at $A = 1.000$ Scattered Light: $< 0.1\%$ transmission at 340 and 408 nm.
10. In built Cell adaptability : Automatic cell reorganization facility.
11. Password protection for user management.
12. Methods and profiles Over 100 water analysis methods, 100 user defined methods, 20 Profiles each for kinetics and spectra.
13. Measuring modes : concentration, Absorbance, % transmission, Multi - wavelength Storage for 1000 values for spectra and kinetics approx. 4 MB, e.g.100 spectra (300-900 nm) and 400 kinetics with 150 values Updates via Internet and USB-Stick
14. Interfaces : 1 USB-A, 1 USB-B, 1 RS232 for Data transfer to PC and Printer and Data transfer from PC.
15. Analytical Quality Assurance : AQA support of standard parameters.
16. Ambient Condition : Equipment shall be suitable for operation ambient temperature from 0-50°C and relative humidity of 0-98%.
17. Spectrophotometer shall be supplied with 10, 20, 50 mm glass cells and pour through cell along with **reagents** for silica, Iron, copper, phosphate for 1000 test for each parameter.

Any other accessories/ standards / consumables not mentioned but required for I&C, demonstration & operation of the system will be part of scope of supply.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 12

12.0 Apparatus for oxidation stability test

1. Apparatus Suitable for both new and in-service many types of petroleum oils / turbine oils/ Transformer oil.
2. Standard: - Conforming to ASTM and related test method specifications.
3. Digital microprocessor based temperature control with sensor.
4. Test Capacity: Upto 8 oxidation cells
5. Temperature Range: ambient to 100°C or more.
6. Temperature Control Stability: 0.1°C
7. Bath Medium: white technical oil / Solid aluminum block bath
8. Electrical Requirements: Operation on 220-240V 50/60Hz AC
9. Equipment shall be supplied with complete required no. of oxidation tubes made of Borosil glass and flow meters for oxygen @1 lph.

Annexure - 13

13.0 Redwood viscometer for oil analysis

A standard viscometer in which the viscosity is determined by the time, in seconds, certain quantity of liquid to pass out through the orifice under given conditions; used for determining viscosities of fuel oils.

1. Electrically heated with energy regulator for temperature control.
2. Red wood viscometer should be Supplied with:
 - (a) thermometer (low range) ip 8c,
 - (b) thermometer (medium range) ip 9c,
 - (c) thermometer (high range) ip 10c
 - (d) stop watch (electronic)

Annexure - 14

14.0 Interfacial tension apparatus

1. Measurement of surface & interfacial Tension of liquids by du nouy's principal. As per IS:6104/1972 & ASTM-D-971,1590 & 1331 for oils, Detergents, Dyes, Cosmetics, Insecticides, Imulsifiers, Pharmaceuticals, Biological Fluids etc.
2. Display: LED
3. Unit of measurement: Dynes/cm or mN/m
4. Range: 1-999 Dynes/cm
5. Accuracy: ± 0.01 Dynes/cm.
6. Sample: 40ml.
7. Scope of supply: Complete apparatus with levelling screws, torsion wire, Carrying Case, Platinum Ring 6 cm and Operation manual.

Complete apparatus with levelling screws, torsion wire, Carrying Case, Platinum Ring 6 cm and Operation manual shall be supplied.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 15

15.0 Automatic Pensky Marten Flashpoint Apparatus for Oil Analysis

1. Application: automatic measurement of flash point of oil and lubricants.

The Flashpoint Apparatus is microprocessor controlled fully automatic to determine the closed cup flashpoint ensuring accurate and repeatable measurement. Automatic correction of flash point per actual barometric pressure shall have electric and gas igniters.

2. Technical specification:

2.1 Temperature range: 25°C to 400 °C

2.2 STANDARD: As per ASTM D 93 (A&B), EN ISO (A&B), IP 34 (A&B)

2.3 flash point detection: differential thermocouple/ionization.

2.4 stirring speed: 120 & 250 rpm

2.5 Temperature control: programmable, software for temperature control.

2.6 Corrections: automatic correction of flash point, as per actual barometric pressure.

2.7 Operation: microprocessor controlled, 14 pre-programmed test methods, programmable library for the user with suitable software support for easy to operate.

2.8 Encasement: encasement/cabinet of corrosion resistant stainless steel material.

2.9 power supply: 230 v, 50 hz.

2.10 data output: PC interface.

2.11 ambient condition: equipment shall be suitable for operation in ambient temperature from 0 to 50 degree Celsius and relative humidity of 0 to 98%.

Annexure - 16

16.0 Penetrometer for grease testing

1. Standard Penetrometer as per IP-50, IS-1448 (P-60) with cone, Container & weight with geared arrangement for moving the arm with geared centering device & digital timer.

2. Digital timer (0-9 secs)

3. Brass cone

4. Weight (50 & 100 gms)

5. Grease container 10cm dia & 10cm height.

Annexure - 17

17.0 Dean & stark moisture determination apparatus

Dean & stark apparatus for estimation of moisture in lubricating oils as per IP-74, ASTM D 95.

The apparatus shall consist of receiver 10ml graduated, with 19/26 outer joint and 24/29 inner joint, round bottom flask 1000ml with 24/29 outer joint and liebig condenser 200 mm with 19/26 joint.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

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Annexure - 18

18.0 Explosimeter

An explosimeter is a device which is used to measure the amount of combustible gases present in a sample. When a percentage of the lower explosive limit (LEL) of an atmosphere is exceeded, an alarm signal on the instrument is activated.

The device, also called a combustible gas detector, operates on the principle of resistance proportional to heat—a wire is heated, and a sample of the gas is introduced to the hot wire. Combustible gases burn in the presence of the hot wire, thus increasing the resistance and disturbing a Wheatstone bridge, which gives the reading. All standard accessories required for proper operation shall be supplied along with the instrument.

Specifications:

1. Gas to Be Detected: All Explosive Gases
2. Range: 0 to 100% LEL
3. Detection Principle: Catalytic Pellister
4. Display: LCD
5. Battery: Rechargeable Battery
6. Temperature: -5 to 50 Deg C
7. Alarm: Audible & Visual

Annexure - 19

19.0 Centrifuge for Oil Analysis

The driving motor and the centrifuge chamber have been specially designed to suit the hazardous requirements of oil centrifuge application.

These units are equipped with a Stepless speed regulator, Safety Lid interlock to prevent cover opening during centrifugation, Digital speed meter and 0-60 minutes digital countdown timer, Dynamic break for quick deceleration, Imbalance detector with cut off.

Max. Speed: rpm: 5250,

No. of tubes: 4. each graduated tube shall have a capacity of 100 ml and shall be of glass.

Annexure - 20

20.0 Automatic K-F (Karl- Fisher) Titrimeter

Coulometric Karl Fischer Titrator for measuring moisture content in Transformer oil, lube oil in ppm range.

1. Principle of measurement: Coulometric method
2. Type: Microprocessor Based Digital Automatic Karl Fischer Titration Apparatus (Coulometric)
3. Measuring range: 5 ppm to 5%
4. Accuracy: 0.3 % at 1 mg water
5. Display Format: Liquid Crystal Display in ppm (mg/Kg)
6. Printer: Printer Port provided to connect printer
7. Power Supply: 230V AC, 50Hz
8. The instrument should be supplied with Titration cell with all necessary small parts for mounting and putting into operation like tubes, septum, gasket etc. double platinum pin electrode, Magnetic stirring bar, Magnetic stirrer motor, Brown glass bottle 1 L molecular sieve, Pump unit, Drying tube with cover, Syringe with injection needle, Operation instructions.
9. 01 liter of reagent suitable for operation should be supplied along with instrument.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

21

21.0 Orsat apparatus

For measurement of carbon dioxide, carbon monoxide & oxygen in furnace flue gases; the apparatus shall include:-

- (a) Three test gas manifold & rubber bellow - 1Nos
- (b) 03 Absorption pipette with fitted glass tubes shall be having total filling cap 250ml (appr.) & have fine glass tubes for CO₂ & O₂ absorption pipette whereas for CO tubes shall have copper wire with glass tubes
- (c) Gas burette complete with outer water jacket, capacity 100ml with bulb at top-1 No
- (d) Leveling bottle cap. - 250 ml-1Nos

The above items shall be fitted in Good quality wooden cabinet with front & rear sliding doors with lifting handle-1No.

Accessories:

- (a) Three test manifold & rubber bellow - 3 Nos
- (b) Absorption pipette - 3 Nos
- (c) Gas burette - 3 Nos
- (d) Leveling bottle cap. 250 ml - 3 Nos

Annexure - 22

22.0 Hydrogen Purity apparatus

Function: Sensing & Measurement of Hydrogen in Air, gas holders, valves, pipelines, etc.

Range : 0 - 100 % purity

Resolution: 0.1%,

Accuracy : $\pm 0.2\%$ of Full Scale.

Sensor : Thermal Conductivity Detector

Readout : LCD Digital display.

Sampling Method : suction

Alarms : Audio-Visual alarm for Low, High ranges & Battery low

Response Time : Less than 10 seconds.

Power : rechargeable batteries + charger

Ambient Condition : Equipment shall be suitable for operation in ambient temperature from 0 to 50 degree Celsius and relative humidity of 0 to 98%

Annexure - 23

23.0 Gas Chromatograph

1.0 General:

Complete Gas chromatography (GC) system for measuring dissolved gases in transformer oil. GC shall consist of Oven, FID, TCD detectors, gas extraction system, methanizer and other accessories required for dissolved gas analysis i.e. Hydrocarbons, Hydrogen, Carbon Monoxide, Carbon Dioxide etc.

2.0 Specifications of Equipment:

1. GC Controller: Microprocessor Based Gas Chromatograph with Data Processor, Digital Pressure and flow control for carrier gas, along with auto leak check facility in the digital measurement through hardware complete with necessary standard accessories.

Column Oven:

2. Temperature Range: Ambient - 400°C

3. Oven Capacity: 12 - 25 litres

4. Temperature Deviation: 2°C maximum

5. Temperature program steps: 5 to 7 (cooling program possible)

6. Linear heating rate: 30°C/min upto 150°C; 20°C/min upto 250°C,
15°C/min upto 325°C; 10°C/min upto 400°C

7. Cooling Rate: 250°C or 300°C to 50°C in 5 to 7 mins

8. Columns: Capillary columns: 2; Packed columns: 2

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Sample Injection Unit:

9. Temperature Range: Up to 400°C
10. Heating Settings: 1°C step
11. Number of units that can be installed: Up to Three (03) simultaneously
12. Unit Type: Dual packed, single capillary injection- Split/splitless
(Compatibility to complete range of capillary columns)

Carrier Gas flow Controller:

13. Range: 0-100 ml/min

Thermal Conductivity Detector (TCD) and Flame Ionization Detector (FID) System:

14. Temperature Range : 400°C.
15. Gas Purification Panel For Three Gases With Tubing's And Complete Fitment (1 No.)
16. Required Gas Cylinders With brackets & Double Stage Regulators For H₂, N₂ / Ar and Zero Air (99.9% pure, 7 cu.m.) (1 Set)- Filling of gas cylinders as per specification requirement would be done at the time of I&C of equipment. Cost towards the same would be indicated separately.
17. Computer & Printer : Latest Windows based compatible computer (Minimum configuration- i7 processor, Min. 4 GB RAM, 500 GB SSD), 19" Monitor, UPS for computer, Mouse Pad, Key Board, B/W A4 laser Printer with speed 25 PPM or better.
18. License version of Chromatography software to control complete system, data acquisition, processing & reporting, etc. The software will be able to provide full automatic control of the process of analyzing samples.
19. Voltage Stabilizer : Min 5 KVA or better as per system requirement.
20. Required standrad CRMs / Gas Standard Mixture to be supplied along with system.
21. Any other accessories / standards / consumables required for demonstration & operation of the system will be part of scope of supply.

Annexure - 24

24.0 Muffle Furnace

Heating elements shall be of KANTHAL wire in coil form wrapped on the muffle, embedded in high grade refractory cement & backed by High Density Ceramic Fibre Blanket, which avoids loss of heat.

Max. Temp. : 1200 °C.

Approx. Internal size : 20 x 20 x 30 cm Approx.

Accessories:

- (a) Two (2) numbers each of stainless steel tongs of sizes 15 & 24 inch
- (b) One (1) spare heating element

Annexure - 25

25.0 Oven for Coal Analysis

1. Electrically operated outer chamber made of mild steel & inner chamber made of mild steel/ stainless steel/aluminum for drying.
2. Oven should be equipped with digital display of temperature and electronic controller.
3. Temp. Range: 30 °C to 250 °C Max. temp.
4. Accuracy: +/- 2 °C
5. Size: 60X60X90 cm

Accessories:

- (a) Two (2) mercury thermometer, range 40 to 250 °C
- (b) Twelve (12) silica crucible of 50ml capacity, with lid
- (c) Temp. Sensor
- (d) Spare Heating element

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 26

26.0 Lab Pulveriser

1. Lab pulverizer Which can be mounted and securely bolted on steel stand with main drive pulley, feed hopper, shifter pulley & belt with metal guards.
2. Screened drum with 212 micron screen, motor pulley, v-belt.
3. Motor Capacity : 3 HP or more
4. Six(6) extra screens of 212 microns.

Annexure - 27

27.0 Sieve Shaker

1. Electrically operated Ro-Tap sieve shaker will be furnished to accommodate seven 50 mm high X 200 mm diameter standard test sieves.
2. The shaker will produce both circular and tapping motion to provide uniform mechanical action ensuring accurate and dependable test result.
3. The shaker will be provided with a timer switch so that the test is automatically terminated after the present time.
4. Standard sieve will be of brass/steel frame 200mm diameter and 50mm high above the wire cloth and drawn from one piece without a seam.

Accessories:

- (a) Two (2) polished brass lid and pan for the above sieves of 200mm diameter
- (b) Sieves: 850microns, 710microns, 600microns, 500microns, 425 microns, 355 microns, 250 microns and 212 microns.

Annexure - 28

28.0 Jaw Crusher

Jaw size: 100X150mm
Maximum feed size: upto 50 mm
Product size: 5 to 15 mm
Capacity: 100 to 200 kg/Hr
Motor : Min 3 HP or better with triple V belt, starter and required accessories.
AWS Strokes : Forward & Downward strokes with rocking action

Annexure - 29

29.0 Roll Crusher

The machine is to be provided with hopper of suitable size fabricated from mild steel sheet.
Maximum feed size: 8 mm
Product size: 1mm to 2 mm
Motor : 2 HP or better with starter.

Annexure - 30

30.0 Humidity Oven

1. Temperature range: + 5 °C to 60 °C
2. Accuracy: ± 1 °C
3. Temperature and humidity controlled by digital temperature controller cum indicator- LED (dual display) from 40% to 90% with sensitivity of $\pm 3\%$.
4. Humidity Oven should be provided with Hygrometer (Humidity Indicator), with humidity range of 0-100%.
5. Preferable dimension: Width (W)- 455 to 460 mm
Depth (D)- 455 to 460 mm
Height (H)- 710 to 715 mm

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 31

31.0 Coal Sample Riffler

1. Riffle Sampler should be with adjacent slots to deliver coal to opposite side and to divide it into two identical halves.
2. 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.
3. The material of construction of the equipment shall be mild steel, painted with gray hammertone paint.
4. All details given in (1) above except the slot size shall be 12.5 mm and total number of slots shall be 24.
5. Ambient Condition: Equipment shall be suitable for operation in ambient temperature from 0-50 degree C and relative humidity of 0-98 %.

Annexure - 32

32.0 Furnace for determination of Volatile Matter (VM)

- Maximum operating Temperature -1000°C
Temperature sensor required - Thermocouple Type N mineral insulated
Over temperature protection sensor-Required
Temperature to be controlled automatic by cut out system digital temperature controller cum indicator.
Furnace shall be equipped with siliminite base high temperature refractory muffle & Kanthal heating elements for max temperature upto 1000°C.
Equipment to be supplied complete with contractor, thermocouple with compensating load wire, fuse plug.
Approx Internal Size: 10" x 5" x 5"

Annexure - 33

33.0 Abrasive/Erosive index machine

1. Main Equipment: The main equipment should comply with IS 9949-1986 Re affirmed 1994, "Methods of Test for Abrasive Properties of Coal and Associated Minerals.
2. The equipment should be able to handle high ash coal (upto 45% ash)
3. Mill Pot: Mill pot or Motor should be of Steel.
4. Blade Assembly: Blade assembly should consist of four number of carbon steel blades.
5. Driver unit: Driver unit to be fitted with 2.5 to 3 HP, three phase motor to run at 1450 RPM.
6. Gauges: Gauges for checking the gap between the edges of the blade & internal wall bottom of mill pot to be supplied.
7. Accessories: Sieves having nominal aperture / perforated plate having size of 6.3 mm, 12.5 mm conforming to IS 460 (Part i) -1978 along with brush to clean the sieve to be provided.
8. Painting: The machine shall be painted with two coats of red oxide primer & two coats of light gray paint.
9. Power Supply: 220 volts A.C 3 phase, 50Hz
10. Ambient Conditions: Equipment shall be suitable for operation in ambient temperature 0 to 50 °C and relative humidity of 0 to 98%.

Annexure - 34

34.0 Laboratory Plate Mill

1. Mini Mill: Should be swing type pulveriser designed to powder laboratory samples to 60- 72 mesh (212- 250 microns).
2. Powdering Device: Should have swing hammer type pulveriser design. The hammer to be fitted to a rotating shaft.
3. Size Reduction: The mini mill should be able to reduce the size 60- 72 mesh size.
4. Motor Capacity: 0.5 HP, Triple V-belt pulley drive I direct coupled & mounting.
5. Power Supply: 3 phase, 50 Cycles, 440 Volt, AC supply.
6. Ambient Condition: Equipment shall be suitable for operation in ambient temperature from 0- 50 degree C and relative humidity of 0-98 %.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 35

35.0 Laboratory Mini Mill

1. Plate Mill: Disc type grinder to grind coal sample to produce about 600 microns (25 mesh) in one operation.
2. Disc: Should have rotating disc having planetary motion in the vertical plane. The disc should be hardened/heat treated of about 100 mm dia.
3. Size Reduction: 10-25 mesh. Plate should reduce 450-500 gm sample of coal to 25 mesh in 10-15 min.
4. Motor Capacity: 1 HP, Triple V-belt pulley drive and proper mounting
5. Power Supply: 3 phase, 50 Cycles, 440 Volt, AC supply
6. Feed Size: 5.0 mm
7. Ambient Condition: Equipment shall be suitable for operation in ambient temperature from 0- 50 °C and relative humidity of 0-98 %.

Annexure - 36

36.0 Analytical balance

- Capacity: 200 gm
Accuracy: 0.1 mg
Type of display: Digital display
Operating Temperature: 10-45 °C

Annexure - 37

37.0 Ordinary balance

- Capacity: 4000 gm
Accuracy: 0.1 gm
Type of display: Digital display
Operating Temperature: 10-45°C

Annexure - 38

38.0 Weather Monitoring System

1.0 Application: Measurement of meteorological parameters in ambient atmosphere at Pre-defined intervals, storage and display of meteorological data.

2.0 Technical Specification: Weather monitoring station comprising of following:

2.1 WIND SPEED SENSOR:

- 2.1.1 Measuring Range : 0-50 m/s
- 2.1.2 Resolution: 0.1 m/s

2.2 WIND DIRECTION SENSOR:

- 2.2.1 Measuring Range : 0 to 360 degree angle
- 2.2.2 Resolution: 2 degree

2.3 AMBIENT TEMPERATURE SENSOR:

- 2.3.1 Measuring Range : -20 to 70 degree centigrade
- 2.3.2 Resolution: 0.5 degree centigrade

2.4 RELATIVE HUMIDITY SENSOR :

- 2.4.1 Measuring Range : 0 - 100% RH
- 2.4.2 Resolution : 1%

2.5 RAINFALL SENSOR :

- 2.5.1 Sensor: Tripping bucket Rain gauge sensor
- 2.5.2 Measuring Range : 0-999.9 mm.
- 2.5.3 Resolution : 1 mm

2.6 SOLAR RADIATION (SUNSHINE RECORDER):

- 2.6.1 Measuring Range : 0 to 1300 W/m²
- 2.6.2 Resolution : 1 W/m²

2.7 Data Logger : Data logger having 8 sensor channels and 8 digital channels, upto 256 KB memory capacity with buffer battery power supply through built in 12V/6.5 Ah. Real time clock with calendar and liquid Crystal Display for instantaneous values of wind speed, direction, RH, Soalr radiation and temperature, data readout through memory card and RS232 interface.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

2.8 A PC should be supplied along with the automatic weather station to store, analysis and printing of data.

PC should have Minimum configuration as mentioned below:-

- ☑ i7, Windows 10
- ☑ RAM : 8 GB or better
- ☑ Hard disk : 1 TB or better
- ☑ Monitor : 17" colour monitor
- ☑ Ports : 2 serial & 1 parallel
- ☑ Keyboard : Standard Windows
- ☑ Mouse
- ☑ Software : Windows based data logging / driver software
- ☑ Black & White printer

2.9 Software: Suitable software package for data transfer to computer, measured value acquisition, graphical presentation system for metrological data including preparation of wind roses.

2.10 Mounting Accessories: Tripod stand with provision of mounting all sensors with fittings and connecting cable of approximately 10 meter length from sensors to data logger.

2.11 Constant Voltage Transformer : Suitable Constant Voltage Transformer for stabilized voltage (230 V AC, 50 Hz) to the Weather station.

2.12 Compass: Standard magnetic compass for setting direction of Wind direction sensor.

2.13 Ambient Condition : Equipment shall be suitable for operation in ambient temperature from 0 to 50 degree Celsius and relative humidity of 0 to 98%.

2.14 Quality Assurance: Calibration and Test certificate should be supplied along with the Equipment.

Annexure - 39

39.0 Autoclave

1.0 General: autoclave is required for sterilization & preparation of Culture media for microbiological tests.

2.0 Specifications of Equipment:

1. The Autoclave should be double wall construction with boiler made of stainless steel 16 gauge sheets.
2. The Autoclave should be 50 liters' capacity approximately.
3. There should be mineral wool/glass wool insulation between Boiler and outer shell.
4. Lid should be made of thick stainless steel plate and tightened all – around by radial locking / wing nut arrangement.

5. There should be joint less gaskets made of neoprene rubber.

6. This sterilizer should be hydraulically tested upto 40 psi.

7. Sterilizer should be fitted with arrangement to indicate water level inside the boiler.

8. Pressure gauge, air/Steam release cock and double safety valves should be provided.

There should be Immersion type heating element of adequate wattage to achieve desired temperature and pressure. Stainless Steel basket should be provided.

Annexure - 40

40.0 BOD incubator

Specifications of Equipment:

1. Temperature range: 5 °C to 50 °C

2. Temp Stability: ±2 °C

3. Dual LCD Display.

4. Thermostatically Controlled BOD Incubator of Volume 230 Ltrs.(approx.)

5. It shall be provided with a double walled clear see-through door for visual inspection of the samples without opening the door.

6. To achieve uniformity of temperature in the inner chamber it should be fitted with 2 nos. circulating fans.

7. Power: 230 V, 50 Hz, and 2.5 Amps.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 41

41.0 COD Reactor

Specifications of Equipment:

1. COD reactor/digester to be used to for the sample digestion for the measurement of COD and all other thermal digestion processes.
2. Reactor shall be dry temperature control device with safety cover and Cell shafts 12 cell shafts for reaction cells 16 ± 0.2 mm.
3. Reaction time setting 20 min, 30 min, 60 min, 120 min (via fixed programs)
4. Temperature setting 100 °C, 120 °C, 148 °C and 150 °C via fixed programs
5. Controlling accuracy ± 1 °C ± 1 Digit
6. Temperature stability ± 0.5 K
7. Over temperature protection 190 °C ± 5 °C
8. Heating time (with empty thermo block) from
 - ☑ 25 °C to 100 °C approx. 5 min
 - ☑ 120 °C approx. 7 min
 - ☑ 148 °C approx. 10 min
9. Digestion unit shall come along with the following accessories and reagents:
 - ☑ cuvettes Pk/25 empty digestion vessels.
10. 250 tests reagents for up to 1500 ppm COD.

Annexure - 42

42.0 Inoculation chamber

1.0 General: autoclave is required for sterilization & preparation of Culture media for microbiological tests.

2.0 Specifications of Equipment:

1. The Inoculation chamber should be Vertical laminar flow cabinet with 100% exhaust system, suitable for exhaust duct upto 6 ft. to throw the contaminated air from the work area into the atmosphere outside the room.
2. The size (working size) of the Inoculation chamber should be approx. 3 x 2 x 2 ft.
3. A plenum should be provided under the S.S. perforated working table, with exhaust system which should work in coordination with the main air flow system.
4. The side panels should be made of thick transparent plexi glass duly framed.
5. The unit should be fitted pre-filter and HEPA filter so that air is drawn through pre-filter and is made to pass through highly effective HEPA filter, thus retaining all air-borne particles of size 0.3 micron and larger.
6. The air should flow down vertically from top towards the work table.
7. HEPA filter and virus burn out should also be provided at the exhaust.
8. The unit should be fitted with duly balanced, direct drive motor blower units sized to provide adequate air flow volume over the entire surface of HEPA filter. It should be fitted with reputed make motor which should operate with minimum noise level.
9. The unit should be complete with S.S. Table Top, Transparent front door (5 mm), Static Pressure Inclined Manometer, Built in U.V. Germicidal Light and cock for gas.
10. The work area should be properly illuminated by diffused, glare free fluorescent light fitted to the unit.
11. The number, location, rating and make of motor / motors being used in the equipment should be indicated in the offer.
12. The equipment should work on 230 Volts AC, 50 Hz single phase supply.
13. The following spare accessories should be quoted:
 - Pre Filter
 - HEPA Filter

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 43

43.0 Dew Point Meter

1.0 DESCRIPTION: Portable Dew Point Meter.

1.1 TECHNICAL SPECIFICATIONS :

- ☑ Range : (-) 60° to 0°C
- ☑ Resolution : ± 0.1°C
- ☑ Maximum Operating Pressure : 1 bar
- ☑ Accuracy : ± 2 deg C Dew point
- ☑ Indication : Digital
- ☑ Sensor Connection : Internal Sensor Connection required with the Dew point meter
- ☑ Calibration : Calibration will be manual
- ☑ Sensor : Capacitance thin film Polymer Sensor
- ☑ Power supply : 230 V AC
- ☑ Cabinet : Table mount with carrying case

Annexure - 44

44.0 Dial type barometer

Specifications of Equipment:

1. Dial Diameter: 100 mm

Annexure -45

45.0 Maximum & Minimum Thermometer

Specifications of Equipment:

Thermometer shall register both maximum and minimum temperature.

Range: -40°C to +50 °C

Annexure - 46

46.0 Dry & Wet Bulb Thermometer

Specifications of Equipment:

1. This is shall be mercury filled wet and dry Bulb thermometers mounted on scales with amended graduations in 2 Deg. C intervals.
2. Nominal range 10 Deg. C to 50 Deg. C.
3. Hand blown glass cistern.
4. Overall dimensions 108 mm width x 225 mm high, with holes for wall mounting along with wick and booklet of relative humidity tables.

Annexure - 47

47.0 Stack Monitoring Kit

1.0 General: Equipment is required to measure concentration of Stack emissions.

Stack monitoring Kit as per IS 11255, consisting of :

1. Instrument Panel with fibre cover consisting of thermocouple, inclined cum vertical manometer, stop watch, rotameters, Cold Box Assembly.
2. Vacuum Pump Assembly
3. Probe Set consisting of probe pipe, pitot tube, thermocouple, filter holder, interconnecting hose pipes, nozzles .etc.
4. Dry Gas Meter.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

2.0 Technical Specifications:

1. Stack Temperature Range: Ambient to 600 Deg C.
2. Stack Velocity Range: 0-50 m/sec
3. Particulate sampling: 10– 60 lpm
4. Gaseous sampling: 1-2 lpm in a of Borosilicate glass impingers.
5. Digital Temperature Indicator : 0-600 deg. C
6. Thermocouple : Thermocouple sensor in SS casing, Length of insertion 1 m with 2m long cable
7. Pitot Tube : S-type pitot tube fabricated from SS, 1.5 m in length
8. Rotameter: Rotameter with 2% FSD accuracy, 0-60 lpm for Particulates and 0.6-5 lpm for gases
9. Differential Density Manometer Assembly
10. Extension Vacuum Hose Pipe, 10 m long
11. Sampling Probes: Made from SS, 1.5m length
12. Filter Holder: Fabricated from SS suitable to hold either cellulose filtration thimble (size-28mm ID & 100mm long) or glass micro fibre, thimble (Size-19mmID, 90 mm long)
13. Whatman Cellulose Thimble (size-28mm ID & 100mm long) – 1 pkt. with kit
14. Nozzles: A set of 3 SS nozzles (1/4, 3/8,1/2 inch)
15. Digital Clock: 0-60 minutes,1 second, readout with start and stop watches.
16. Sampling Train:5 borosilicate glass impingers of 250 ml cap., accommodated in cold box .
17. Vacuum Pump:100 lpm approx free flow capacity.
18. Dry Gas Meter: To measure dry gas volume.

Annexure - 48

48.0 Portable Water Quality Analyzer

Portable water quality analyzer for measuring pH, ORP, ION, conductivity, TDS, salinity, dissolved oxygen, Turbidity and temperature in water and waste water samples.

It shall have large backlit Liquid crystal display.

Instrument shall have below technical requirement

- 1.pH Range : 0.00 ... 14.00,
Accuracy : ± 0.1 pH
2. ORP Range : 1000 to +1000 mV,
Accuracy : ± 1 mV
3. Dissolved oxygen Range : 0.00 to 20.00 mg/L,
Accuracy: ± 0.1 mg/L
4. Saturation measuring range : 0.0 to 200 %,
Accuracy: $\pm 1\%$
5. Conductivity measuring range : 0 $\mu\text{s/cm}$ to 200 ms/cm,
Accuracy : $\pm 1\%$ full scale
6. TDS Range : 0 to 20 ppt
7. Turbidity : 0 to 1000 NTU
Accuracy : <5% of the Full scale NTU.

Instrument shall be supplied with pH/ORP probe, Conductivity probe, and Dissolved oxygen probe, Turbidity measuring devise, short instruction manual, standard solutions and carry case.

Any other accessories/ standards / consumables not mentioned but required for I&C, demonstration & operation of the system will be part of scope of supply.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 49

49.0 Flue gas analyzer

General: Flue Gas Analyser suitable for Industrial applications viz. Thermal Power Stations, Diesel Generator Sets and Heat Treatment Furnaces etc.

The following parameters would be monitored:

Continuous Analysis of :

Applicable to various fuel types: Coal, Natural Gas, Heavy Fuel Oil, Light Oil.

Flue gas & Air Temperature Measurement: Temperature Sensor

- 1.1 O₂ : 0 - 25%
- 1.2 CO : 0-8000/20000 ppm
- 1.3 NO : 0-4000 ppm
- 1.4 NO₂ : 0-1000 ppm
- 1.5 SO₂ : 0-4000ppm
- 1.6 CO₂ : 0-20% (NDIR)
- 1.7 Flue gas temperature up to 999.90C
- 1.8 1 m long sampling probe with 3 m hose
- 1.9 Fresh Air Purging
- 2.0 Excess Air
- 2.1 Combustion Efficiency
- 2.2 Battery Charger
- 2.3 Computer Interface
- 2.4. Printer Inbuilt with printer rolls
- 2.5. Data logging
- 2.6. Calibration Certificate
- 2.7. Carrying bag
- 2.8. Dust filter elements (pack of 10 elements)
- 2.9. Moisture free elements (pack of 5 elements)
- 2.10. Printer paper roll (pack of 5)
- 2.11. Printer cartridge
- 2.12. Efficiency: 1 to 99.9%
- 2.13. Sample Gas Flow Rate Approx.: 1.1 L/min
- 2.14. Display measured value in LCD screen.
- 2.15. Flue gas analyser shall have internal memory and facility to transfer the data to PC
Instrument shall be supplied with all required accessories as a ready to use analyser.

Annexure - 50

50.0 Oil Content Analyzer

Oil content analyzer with following specification shall be supplied:

1. Display: LCD
2. Measurement Method Solvent Extraction
3. Accuracy Better than 2% of Full Scale
4. Repeatability Better than 2% of Full Scale
5. Linear Range: 0 –200/1000 ppm most crudes or dilute sample for higher range Sensitivity: 1 ppm
6. Calibration: Single-point and blank
7. Response Time: 5 Seconds
8. Measures: Diesel, Lube Oil, Fuel Oil, Crude Oil and Gas condensates
9. Applications: Produced water, Industrial Waste Water, Oil Spill Response.
10. Minimum Detection Limit: <1 ppm for most oils
11. Instrument shall supplied with sample cuvettes, 2 liter extraction solvent and calibration standard.
12. Any other accessories/ standards / consumables not mentioned but required for I&C, demonstration & operation of the system will be part of scope of supply.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 51

51.0 Kipps apparatus

1.0 General: Kipp's apparatus, also called Kipp's generator, is an apparatus designed for preparation of small volumes of gases.

3.0 Specifications of Equipment:

1. The apparatus is made of three vertically stacked cylinders.
2. The solid material is placed into the middle cylinder; the acid is put into the top cylinder.
3. A tube extends from the top cylinder into the bottom cylinder.
4. The middle cylinder has a tube with a stopcock attached, which is used to draw off the evolved gas. When the stopcock is closed, the pressure of the gas in the middle cylinder rises and expels the acid back into the top cylinder, until it is not in contact with the solid material anymore, and the chemical reaction stops.
5. Capacity: 1000 ml.

Annexure - 52

52.0 Photometer

Specifications of Equipment:

1. Colorimeter shall have pre-programmed methods for common water and boiler water parameters like iron, Silica, Phosphate, Hydrazine, Copper and Iron etc.
2. Colorimeter shall be used for both field as well as laboratory testing.
3. Colorimeter shall be supplied with following:
 - Eight sample cells
 - Silica Reagent set for 500 tests
 - Iron Reagent set for 500 sets
 - Hydrazine reagent set for 500 tests
 - Copper reagent set for 500 tests
 - Phosphate Reagent set for 500 tests
 - Micro pipette with tips
 - Carry case
 - Instructions Manual

Annexure - 53

53.0 Potentiometric Titration Apparatus

Specifications of Equipment:

1. Potentiometric titration is a technique similar to direct titration of a redox reaction. No indicator is used; instead the voltage across the analyte, typically an electrolyte solution is measured. To do this, two electrodes are used, a neutral electrode and a standard reference electrode. The voltage is recorded at intervals as the titrant is added.
2. Technical Specification:
 - pH range: 0 -14 pH
 - Resolution: 0.01 pH.
 - Automatic and Manual Temperature Compensation.
 - Ambient conditions Ambient temperature + 10 ...+ 40 °C for operation
 - Potentiometric Titration Apparatus with Stirrer System
3. Electrode for Redox titration shall be supplied with the Potentiometric Titration Apparatus.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Annexure - 54

54.0 Gas heating assembly

Specifications of Equipment:

1. The Gas Heating Assembly (Gas Stove) should conform to IS: 4246.
2. It should be a Double Burner Cooking Gas Stove without cover and with Non-Automatic Ignition System.
3. Size – Approx. Dimensions (when packed) 690 x 370 x 110 mm.
4. It should be sleek, streamlined, high efficiency with stainless steel body.
5. It should have brass burner tops and stainless steel drip-trays.
6. It should have one small burner and one big burner.
7. Detailed printed leaflet be supplied along with quotation.

Annexure - 55

55.0 Stop Watch

Specifications:

1. Stop Watch 1/100th of second, Digital with date, time and one lap function from Reputed indigenous make

Annexure - 56

56.0 Constant temperature bath

Specifications:

1. This shall be used to maintain the temperature of the water in the temperature range 5°C above ambient to 100°C. Accuracy of temperature control shall be $\pm 0.01^\circ\text{C}$.
2. The tank shall be of stainless steel with stainless steel (or) aluminum housing and a glass view panel. An electric heater with digital temperature indicator cum controller shall be provided. Suitable capacity pump / stirrer shall be provided for the circulation/ agitation of the tank media.
3. Capacity of the tank shall be minimum 25 liters.
4. This temperature bath shall be supplied with necessary accessories.

Annexure - 57

57.0 Water distillation assembly

Specifications :

1. The double distillation unit shall consist of suitable capacity electrical heaters.
2. Body shall be glass.
3. Capacity of the plant shall be 2.0 lph and a storage tank of capacity 10 ltrs shall also be supplied to store the distilled water.

Annexure - 58

58.0 Vacuum pressure pump

Specifications:

1. Teflon diaphragm based oil-free, portable AC powered vacuum pump for Lab use operating on 230V / 50 Hz.

2. Accessories:

- (a) Cellulose nitrate membrane filter dia 47mm, pore size 0.45 μm Qty- 4 Packets (each packet having 100 filters)
- (b) All glass filter holders-47mm borosilicate glass filter holder for vacuum filtering of aqueous liquids with clamp, all parts contacting liquid are borosilicate glass with ground glass sealing surface Qty- 2 set.

Annexure - 59

59.0 Heating Mantel

1.0 Specifications of Equipment:

1. Heating mantel for oil analysis which can withstand high temperature up to 350°C with energy regulator and can hold flask size of 2 liters.

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

| | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| | Annexure - 60 |
| 60.0 Magnetic Stirrer cum Hot plate Specifications of Equipment: 1. Magnetic stirrer shall be provided with a stainless steel hot plate. The heating energy shall be controlled by stepless speed and energy regulator. 2. Max speed: 1200 RPM, Stirring Capacity 2 liters. | |
| | Annexure - 61 |
| 61.0 Refrigerator Specifications: 1. Type : Electrically operated with freezer, chill trays, crispators and provided with magnetic door latch, pilot bulb, thermostat temperature control, automatic voltage stabilizer, leads, plugs , Double door with auto defrosting etc. 2. Capacity : 230 litres 3. Voltage : 230V AC nominal with input voltage range. | |
| | Annexure - 62 |
| 62.0 Hot Plate Specifications: Hot Plate for continuous heating up to 350 °C with cast iron top. Size: 200 mm x 300 mm x 150 mm. | |
| | Annexure - 63 |
| 63.0 Magnetic Stirrer Specifications: 1. A magnetic stirrer or magnetic mixer is a laboratory device that employs a rotating magnetic field to cause a stir bar immersed in a liquid to spin very quickly, thus stirring it. 2. Magnetic Stirrer should be electrically operated. 3. It should be fitted with a speed regulator with maximum speed of 1200 RPM. 4. Top plate should be made of stainless steel. 5. Capacity – 2 Litres 6. The magnetic stirrer should be supplied with Teflon coated stirring bar. 7. The magnetic stirrer is required without hot plate. | |
| | Annexure - 64 |
| 64.0 Chemical (As per Annex-A) Chemical specification(As per Annex-A) | |
| | Annexure - 65 |
| 65.0 Glassware (As per Annex-B) Glassware specification(As per Annex-B) | |
| | Annexure - 66 |
| 66.0 Safety Equipment (As per Annex-C) Safety Equipment specification (As per Annex-C) | |
| | Annexure - 67 |
| 67.0 Furniture (As per annex-D) Furniture specification (As per annex-D) | |
| | Annexure - 68 |
| 68.0 General Lab. Requisite (As per annex-E) General Lab. Requisite specification (As per annex-E) | |

| CHEMICALS FOR YADADRI PROJECT | | |
|--------------------------------------|---------------------------------------------|-----------------|
| List of Chemicals | | (AR Grade) |
| S.N. | Chemical's Name | Quantity |
| 1.0 | Acid Acetic | 4 X 500 ml. |
| 2.0 | Acid Benzoic | 2 X 500 gms |
| 3.0 | Acid Hydrochloric A.R. | 4 X 2.5 lits. |
| 4.0 | Acid Hydrofluoric | 1 X 500 ml. |
| 5.0 | Acid Nitric A.R. | 4 X 2.5 lits. |
| 6.0 | Acid Thioglycolic | 2 X 500 ml. |
| 7.0 | Acid Oxalic | 1 X 500 gms |
| 8.0 | Acid Phosphoric | 4 X 500 ml. |
| 9.0 | Acid Pyrogallic | 2 X 500 g. |
| 10.0 | Acid Sulphuric A.R. | 4 X 2.5 lits. |
| 11.0 | Acid Succinic | 1 X 250 gms |
| 12.0 | Acid Tartaric | 1 X 500 gms |
| 13.0 | Acid 1- Amino - 2 - Napthol – 4 - Sulphonic | 1 X 500 gms |
| 14.0 | Alcohol (Absolute) | 1 X 2.5 lits. |
| 15.0 | Alcohol Iso Amyl | 1 X 1 lit. |
| 16.0 | Alcohol Isopropyl | 1 X 2.0 lit. |
| 17.0 | Liquid ammonia | 6 X 500 ml |
| 18.0 | Ammonium Chloride | 1 X 500 gms. |
| 19.0 | Ammonium Acetate | 1 X 500 gms. |
| 20.0 | Ammonium Oxalate | 1 X 500 gms. |
| 21.0 | Ammonium Persulphate | 1 X 500 gms. |
| 22.0 | Ammonium Thiocyanate | 1 X 500 gms. |
| 23.0 | Acetone | 4 X 500 ml. |
| 24.0 | Ammonium Molybdate hepta hydrate | 2 X 500 gms. |
| 25.0 | Aluminium Nitrate | 1 X 500 gms. |
| 26.0 | Bromocresol green | 2 X 5 gms. |
| 27.0 | Bromocresol purple | 2 X 5 gms. |
| 28.0 | Benzene | 1 X 500 ml. |
| 29.0 | Barium Chloride | 1 X 500 gms. |
| 30.0 | Barium Chromate | 1 X 500 gms. |
| 31.0 | Bromophenol Blue | 1 X 5 gms |
| 32.0 | Bromocresol purple | 1 X 5 gms |
| 33.0 | Bentonite | 1 X 500 gms |
| 34.0 | Calcium Chloride | 4 X 500 gms. |
| 35.0 | Calcium Chloride (fused) | 2 X 2.5 kgs. |
| 36.0 | Calcium Oxide | 1 X 500 gms. |
| 37.0 | Calcium Carbonate | 1 X 500 gms. |
| 38.0 | Citric Acid | 2 X 500 gms |
| 39.0 | Carbon Tetra Chloride | 4 X 500 ml. |
| 40.0 | Copper Oxide (Wire form) | 1 X 500 gms. |
| 41.0 | Copper Sulphate | 1 X 500 gms. |
| 42.0 | Cuprous Chloride | 2 X 500 gms. |
| 43.0 | Dextrose | 2 X 500 gms. |
| 44.0 | Di - phenyl Amine | 2 X 500 gms. |
| 45.0 | EDTA Di-Sod. Salt | 2 X 500 gms |

| CHEMICALS FOR YADADRI PROJECT | | |
|--------------------------------------|---------------------------------------|--------------------|
| List of Chemicals | | (AR Grade) |
| S.N. | Chemical's Name | Quantity |
| 46.0 | Dimethyl Glyoxime | 1 X 5 gms |
| 47.0 | Eriochrome Black T | 1 X 25 gms. |
| 48.0 | Diethyl Ether | 2 X 500 ml. |
| 49.0 | Ethanol | 4 X 500 ml |
| 50.0 | Ferrous Ammonium Sulphate | 2 X 500 gms. |
| 51.0 | Ferric Chloride | 2 X 500 gms. |
| 52.0 | Ferrous Sulphate | 2 X 500 gms. |
| 53.0 | Formaldehyde | 2 X 500 ml. |
| 54.0 | Fuller's Earth | 1 X 500 gms. |
| 55.0 | Glycerol | 4 X 500 ml. |
| 56.0 | Hydrazine di-hydrochloride | 2 X 100 gms. |
| 57.0 | Hydroxyl amine hydrochloride | 4 X 100 gms. |
| 58.0 | Hydrogen Peroxide (30%) | 4 X 500 ml. |
| 59.0 | Iodine ample (N/10) | 6 X 6 amps |
| 60.0 | Iron Standard Solution (100 ppm) | 2 X 100 ml. |
| 61.0 | Indigo Caramine | 1 X 25 gms. |
| 62.0 | Iodine, sublimed/Resublimed | 1 X 500 gms. |
| 63.0 | Kaolin | 1 X 2.5 kg. |
| 64.0 | Lead Acetate | 1 X 500 gms. |
| 65.0 | Lead Chromate | 1 X 500 gms. |
| 66.0 | Litmus, universal | 1 X 6 roll/400 Lvs |
| 67.0 | Magnesium Chloride | 1 X 500 gms. |
| 68.0 | Magnesium Oxide | 1 X 250 gms. |
| 69.0 | Magnesium Sulphate | 2 X 500 gms. |
| 70.0 | Mercuric Chloride | 2 X 500 gms. |
| 71.0 | Mercuric Thiocyanate | 1 X 250 gms. |
| 72.0 | Murexide (Ammonium Perpurate) | 1 X 10 gms. |
| 73.0 | Mercuric Iodide | 4 X 250 gms. |
| 74.0 | Methanol | 6 X 500 ml |
| 75.0 | Methyl Orange powder | 2 X 25 gms. |
| 76.0 | Morpholine Standard solution | 2 X 100 ml |
| 77.0 | Methyl Red powder | 2 X 25 gms. |
| 78.0 | Nitric acid | 4 X 2.5 lit |
| 79.0 | Para di-methylamine benzaldehyde | 2 X 100 gms. |
| 80.0 | Petroleum ether (40 - 60) | 6 X 500 ml. |
| 81.0 | pH Buffer Capsule, 4.0 | 6 X 10 caps. |
| 82.0 | pH Buffer Capsule, 7.0 | 6 X 10 caps |
| 83.0 | pH Buffer Capsule, 9.2 | 6 X 10 caps |
| 84.0 | Phenolphthalein powder | 2 X 100 gms. |
| 85.0 | Potassium bi-carbonate | 4 X 500 gms |
| 86.0 | Potassium di-hydrogen Ortho Phosphate | 2 X 500 gms |
| 87.0 | Potassium Chloride | 2 X 500 gms. |
| 88.0 | Potassium Hydroxide | 4 X 500 gms. |
| 89.0 | Potassium Permanganate | 2 X 500 gms. |
| 90.0 | Potassium Iodide | 2 X 500 gms. |

| CHEMICALS FOR YADADRI PROJECT | | |
|--------------------------------------|---------------------------------------------|-----------------|
| List of Chemicals | | (AR Grade) |
| S.N. | Chemical's Name | Quantity |
| 91.0 | Potassium Iodate | 1 X 500 gms. |
| 92.0 | Potassium Chromate | 1 X 500 gms. |
| 93.0 | Potassium Dichromate | 4 X 500 gms. |
| 94.0 | Potassium Dihydrogen Phosphate | 1 X 500 gms |
| 95.0 | Potassium Persulphate | 1 X 500 gms. |
| 96.0 | Potassium Nitrate | 1 X 500 gms. |
| 97.0 | Potassium Acid Phthalate | 1 X 500 gms. |
| 98.0 | Phenolphthalein | 1 X 25 gms |
| 99.0 | Phenol | 1 X 500 gms. |
| 100.0 | Silica/Silicate standard solution, 100 ppb | 2 X 100 ml. |
| 101.0 | Silica/Silicon Standard Solution , 1000 ppm | 2 X 100 ml. |
| 102.0 | Silver nitrate ample (N/10) | 6 X 6 amps |
| 103.0 | Silver Nitrate | 2 X 250 gms. |
| 104.0 | Sodium carbonate anhydrous | 6 X 500 gms |
| 105.0 | Sodium chloride anhydrous | 6 X 500 gms |
| 106.0 | Sodium hydroxide pallets | 6 X 500 gms. |
| 107.0 | Standard copper solution, 100 ppm | 2 X 100 ml. |
| 108.0 | Starch, potato | 2 X 500 gms |
| 109.0 | Sulphuric acid | 4 X 2.5 lts. |
| 110.0 | Sodium acetate | 1 X 500 gms |
| 111.0 | Sodium carbonate | 1 X 1.0 kg |
| 112.0 | Sodium Bicarbonate | 1 X 500 gms. |
| 113.0 | Sodium Meta Bisulphite | 4 X 500 gms. |
| 114.0 | Sodium Sulphate | 1 X 500 gms. |
| 115.0 | Sodium Sulphite | 1 X 500 gms. |
| 116.0 | Sodium Thiosulphate | 4 X 500 gms |
| 117.0 | Sodium Nitrate | 1 X 500 gms. |
| 118.0 | Stop Cock Grease (Silicon) | 1 X 250 gms. |
| 119.0 | Silica (Quartz, Pulverized) | 1 X 500 gms. |
| 120.0 | Stannous Chloride | 1 X 100 gms. |
| 121.0 | Silica Gel (6 - 20 mesh) | 1 X 500 gms. |
| 122.0 | Toluene | 1 X 500 ml. |
| 123.0 | Thorin Indicator | 1 X 5 gms. |
| 124.0 | Universal pH indicator | 1 X 500 ml. |
| 125.0 | Zinc Sulphate hepta hydrate | 2 X 500 gms. |
| 126.0 | Zinc Dibenzyl Dithiocarbamate | 1 X 100 gms. |

Note:
Undertaking required for supply of chemicals with manufacturing date not older than 03 Months at the time of dispatch.

| GLASSWARE FOR YADADRI TPS PROJECT | | | | |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------|-----------------|
| List of Glasswares (Class-A Certificate) | | | | |
| 1.0 | Burettes – Straight bore stopcock, Borosil/Corning/Duran/equivalent Class A with works certificate | | | |
| | Capacity (ml) | Graduation Interval (ml) | Tolerance (+/- ml) | Quantity(Nos.) |
| | 100 | 0.2 | 0.1 | 3 |
| | 50 | 0.1 | 0.05 | 6 |
| | 25 | 0.1 | 0.05 | 6 |
| | 10 | 0.05 | 0.02 | 6 |
| 2.0 | Burettes, Automatic Zero, mounted on reservoir, Borosil Corning/ Duran/ equivalent (Reservoir Capacity – 2000 ml.) | | | |
| | Capacity (ml) | Graduation Interval (ml) | Tolerance (+/- ml) | Quantity (Nos.) |
| | 50 | 0.1 | 0.1 | 3 |
| | 25 | 0.1 | 0.1 | 3 |
| | 10 | 0.05 | 0.05 | 3 |
| 3.0 | Pipettes, Transfer volumetric, Accuracy as per Class A with works certificate Borosil / Corning/Duran/equivalent | | | |
| | Capacity | Tolerance (+/- ml) | Quantity (Nos.) | |
| | 100 | 0.08 | 6 | |
| | 50 | 0.05 | 6 | |
| | 25 | 0.03 | 6 | |
| | 10 | 0.02 | 6 | |
| | 5 | 0.015 | 6 | |
| | 2 | 0.01 | 4 | |
| 1 | 0.007 | 4 | | |
| 4.0 | Pipettes (Mohr type). Accuracy as per Class A with works certificate Borosil / Corning/ Duran/equivalent | | | |
| | Capacity (ml) | Graduation Interval (ml) | Tolerance (+/- ml) | Quantity (Nos.) |
| | 10 | 0.1 | 0.05 | 12 |
| | 5 | 0.1 | 0.05 | 12 |
| | 2 | 0.1 | 0.01 | 6 |
| | 1 | 0.1 | 0.006 | 4 |
| 5.0 | Volumetric flasks with stopper. Accuracy as per Class A with works certificate Borosil / Corning/ Duran/equivalent | | | |
| | Capacity (ml) | Interchangeable | Tolerance (+/- ml) | Quantity (Nos.) |
| | | Stopper size | | |
| | 2000 | 24/25 | 0.4 | 2 |
| | 1000 | 19/20 | 0.4 | 4 |
| | 500 | 19/20 | 0.25 | 6 |
| | 250 | 14/15 | 0.15 | 6 |
| | 100 | 14/15 | 0.1 | 12 |
| | 50 | 15/10 | 0.06 | 12 |
| | 25 | 15/10 | 0.04 | 12 |

| GLASSWARE FOR YADADRI TPS PROJECT | | | | |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------|-----------------|
| List of Glasswares (Class-A Certificate) | | | | |
| 6.0 | Graduated cylinders single Metric scale as per Class A with works certificate Borosil /Corning/Duran/equivalent | | | |
| | Capacity (ml) | Graduation Interval (ml) | Tolerance (+/- ml) | Quantity (Nos.) |
| | 2000 | 20 | 10 | 2 |
| | 1000 | 10 | 5 | 4 |
| | 500 | 5 | 2.5 | 6 |
| | 250 | 2.5 | 1 | 6 |
| | 100 | 1 | 0.5 | 6 |
| | 50 | 1 | 0.5 | 6 |
| | 25 | 0.5 | 0.25 | 6 |
| | 10 | 0.2 | 0.1 | 6 |
| 7.0 | Flasks, Erlenmeyer, Conical, Narrow mouth, Borosil/ Corning/Duran/ equivalent | | | |
| | Capacity (ml) | O.D X Height (mm x mm) (Approx) | Neck O.D. (mm) | Quantity (nos) |
| | 1000 | 131 X 220 | 42 | 6 |
| | 250 | 85 X 140 | 34 | 12 |
| | 150 | 72 X 124 | 24 | 12 |
| 8.0 | Beakers, Griffin Low Form with spout. Borosil/Corning/Duran/equivalent | | | |
| | Capacity (ml) | O.D X Height (mm x mm) (Approx) | Quantity (nos) | |
| | 2000 | 131 X 190 | 4 | |
| | 1000 | 105 X 148 | 12 | |
| | 400 | 77 X 105 | 12 | |
| | 250 | 68 X 95 | 12 | |
| | 100 | 50 X 72 | 12 | |
| | 50 | 42 X 55 | 12 | |
| 9.0 | Flasks, Boiling, Round Bottom, Short Neck with Interchangeable Joint. Borosil/ Corning/Duran/ equivalent | | | |
| | Capacity (ml) | Size of inter changeable stopper (mm) | Height (mm) | Quantity (nos) |
| | 1000 | 24/29 | 188 | 4 |
| 500 | 24/29 | 160 | 4 | |
| 10.0 | Flasks, distilling with side arm Borosil/ Corning/Duran/ equivalent | | | |
| | Capacity (ml) | O.D X Height (mm x mm) (Approx) | Neck O.D. (mm) | Quantity (Nos.) |
| 500 | 110 X 250 | 28 | 4 | |

| GLASSWARE FOR YADADRI TPS PROJECT | | | | |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------|-----------------|
| List of Glasswares (Class-A Certificate) | | | | |
| 11.0 | Funnels, Plain 60° Long Stem, Borosil/ Corning/ Duran/ equivalent | | | |
| | Diameter | Quantity | | |
| | (mm) | (Nos.) | | |
| | 50 | 6 | | |
| | 75 | 6 | | |
| 100 | 4 | | | |
| 12.0 | Funnels, Separating with Stopcock and Interchangeable Stopper, pear shape. Borosil / Corning/Duran/equivalent | | | |
| | Capacity (ml) | Stopper Size (mm x mm) | Quantity (Nos.) | |
| | 500 | 24/25 | 3 | |
| | 250 | 19/20 | 10 | |
| | | | | |
| 13.0 | Bottles, Reagent Plain Narrow Mouth and Interchangeable Stopper, pear shape. Borosil/ Corning/ Duran/equivalent | | | |
| | Capacity (ml) | O.D X Height (mm x mm) (Approx) | Size of Interchangeable Stopper | Quantity (Nos.) |
| | 2000 | 126 X 265 | 34/35 | 4 |
| | 1000 | 104 X 200 | 29/32 | 24 |
| | 500 | 80 X 172 | 24/29 | 24 |
| | 250 | 64 X 147 | 19/26 | 24 |
| | 125 | 54 X 120 | 19/26 | 12 |
| 14.0 | Bottles, Reagent Amber. Narrow Mouth with interchangeable flat head stopper | | | |
| | Capacity (ml) | Approx Height (mm) | Quantity (Nos.) | |
| | 1000 | 200 | 6 | |
| | 500 | 172 | 6 | |
| | 250 | 147 | 6 | |
| | | | | |
| 15.0 | Dropping Bottles | | | |
| | Dropping bottles with suitable | | | |
| | Capacity (ml) | Quantity (Nos.) | | |
| | 100 or 125 | 12 | | |
| | Dropping bottles clear glass, T.K. | | | |
| | Capacity (ml) | Quantity (Nos.) | | |
| | 100 or 125 | 6 | | |
| | Dropping bottles, Amber glass, T.K. | | | |
| | Capacity (ml) | Quantity (Nos.) | | |
| | 100 or 125 | 6 | | |
| | Winchester bottles, with slotted | | | |
| | Capacity (ml) | Quantity (Nos.) | | |
| | 2500 | 6 | | |
| 1000 | 6 | | | |

| GLASSWARE FOR YADADRI TPS PROJECT | | | | |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------|-----------------------|
| List of Glasswares | | | | (Class-A Certificate) |
| 16.0 | Bottles, Aspirator with tubular at bottom and connection designed with flexible tubing. Borosil / Corning/ Duran/ equivalent | | | |
| | Capacity (Lit.) | Quantity (Nos.) | | |
| | 5 | 2 | | |
| | 10 | 2 | | |
| 17.0 | Bottles, wash, complete with interchangeable stopper. Borosil/Corning/Duran/equivalent | | | |
| | Capacity (ml) | Quantity (Nos.) | | |
| | 1000 | 4 | | |
| 18.0 | Bottles, weighing with interchangeable stopper. Borosil / Corning/Duran/equivalent | | | |
| | Diameter (mm) | Body Height (mm) | Quantity (Nos.) | |
| | 20 | 40 | 6 | |
| | 40 | 80 | 6 | |
| 19.0 | Watch glasses. Borosil / Corning/Duran/equivalent | | | |
| | Diameter (mm) | Quantity (Nos.) | | |
| | 75 | 12 | | |
| | 100 | 12 | | |
| 20.0 | Watch glasses, Borosil / Corning/Duran/equivalent | | | |
| | Diameter (mm) | Quantity (Nos.) | | |
| | 50 | 6 | | |
| | 100 | 6 | | |
| 21.0 | Petri Dishes, Crystallizing, Borosil/ Corning/ Duran/ equivalent | | | |
| | O.D. X Height (mm x mm) | Quantity (Nos.) | | |
| | 50 X 17 | 12 | | |
| | 80 X 17 | 12 | | |
| 22.0 | Dishes, Evaporating, Flat Bottom with pour out Borosil/ Corning/Duran/ equivalent | | | |
| | O.D. X Height (mm x mm) | Quantity (Nos.) | | |
| | 80 X 45 | 6 | | |
| 23.0 | Desiccators with knob top Borosil/Corning/Duran/ equivalent | | | |
| | ID of Ground Flange (mm) | Overall Height (mm) (Approx) | Chamber Depth (mm) (Approx) | Quantity (Nos.) |
| | 100 or 120 | 150 | 50 | 4 |
| | 150 or 160 | 225 | 95 | 3 |

| GLASSWARE FOR YADADRI TPS PROJECT | | | | | |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------|-----------------|--|
| List of Glasswares (Class-A Certificate) | | | | | |
| 24.0 | Desiccators, Vacuum with cover & sleeve Borosil/ Corning/Duran/ equivalent | | | | |
| | ID of Ground Flange (mm) | Overall Height (mm) (Approx) | Chamber Depth (mm) (Approx) | Quantity (Nos.) | |
| | 150 or 160 | 225 | 95 | 2 | |
| 25.0 | Distilling Apparatus with Graham Condenser, Interchangeable Joints, Interchangeable stopper, Borosil / Corning/Duran/equivalent | | | | |
| | Capacity (ml) | Condenser Jacket (mm) | Interchangeable Joint | Quantity (Nos.) | |
| | 500 | 200 | 19/26 | 2 | |
| 26.0 | Condensers, Liebig Drip Tip, Interchangeable joint and Interchangeable outer joint. Borosil / Corning / Duran / equivalent | | | | |
| | Jacket length (mm) | Interchangeable Inner | Joint Outer | Quantity (Nos.) | |
| | 300 | 24/29 | 24/29 | 2 | |

| Laboratory Safety Equipment | | |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Project : Yadadri Power Project site | | |
| Sl.No | Item and Size | Quantity |
| 1 | Coat Long Chest size 34", 36", 38"(Men's) | 6 |
| 2 | Rubberized cloth apron 114 (L) x 86 cm (W) | 6 |
| 3 | Asbestos gloves 20 cm (L) | 6 pairs |
| 4 | Natural rubber gloves Free Size | 6 pairs |
| 5 | Neoprene gloves Size 7 | 6 pairs |
| 6 | Neoprene gloves Size 8 | 6 pairs |
| 7 | Silicon Rubber Hand Protector | 12 |
| 8 | Respirator for toxic dust complete with filter | 6 |
| 9 | Gas mask suitable against ammonia, chlorine, sulphur dioxide, acid fumes | 3 |
| 10 | Safety goggles to avoid chemical splash, Soft vinyl frame with plastic ventilators, Optical quality, distortion free replaceable lens, with rubber head | 6 |
| 11 | First Aid Cabinet similar to Fisher Catalogue 203 No. 10-020 | 4 |
| 12 | Toxic and Hazardous chemicals chart similar to Fisher catalogue 203 No. 10-027-1. | 2 |
| 13 | Laboratory safety chart similar to Fisher Catalogue 203 No. 10-027-10 | 4 |
| 14 | Eye/Face wash wall mount similar to Fisher Catalogue 203 No. 91-572 | 4 |
| 15 | Safety signs such as eye wash, exit, fire extinguisher, no smoking, first aid kit, acid spillage, etc., displayed in the laboratory. | 4 |

CHEMICAL LABORATORY FURNITURE FOR YADADRI PROJECT

List of Furniture

| S. N. | Item | Material of Construction | Qty. | Dimensions (in mm) | | |
|-------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------------|-------|--------|
| | | | | Length | Width | Height |
| F1 | Fume Chamber | Double skin 20 SWG CRCA Steel with an inner lining of compressed asbestos (1.6 mm) Painted with epoxy paint. | 1 No. | 1500 | 750 | 2350 |
| F2 | Working Table | The Bench Tops shall be made from core of block board to which tiles are to be bonded with polyurethane or epoxy compound. The area joined with acid resistant cement. | 10 Nos. | 1200 | 750 | 750 |
| F3 | Wall Mounted Chemical Storage Units | 20 SWG CRCA with epoxy paint, 2 tier adjustable shelves | 10 Nos. | 750 | 300 | 600 |
| F4 | 9- Cabinet Island Assembles With Elevated Shelves & End Sink Peninsula type | To be equipped with mixing faucet, plastic p-trap, 2 cold water faucets, 6 double gas/air /vacuum cocks, 2 double faced duplex electrical outlet boxes. The bench top shall be designed as per F2. | 1 No. | 4860 | 1500 | 850 |
| F5 | Elevated Shelves | 2 tire reagent shelves with polyurethane or epoxy finish. The shelves shall be made of 20 SWG CRCA steel. | 10 Nos. | 900 | 300 | 600 |
| F6 | Modular Under-Bench Storage Units | 20 SWG Steel with epoxy coated | 10 Nos. | 700 | 500 | 800 |
| F7 | Wall Storage Cupboard | The units shall have horizontal sliding glass doors in plastic channels. Two adjustable shelves are to be provided | 10 Nos. | 750 | 300 | 600 |
| F8 | Anti-Vibration Instrument Table | Tops shall be furnished in shell white melamine laminate, antivibration rubber pads are to be fixed on surface. | 8 Nos. | 900 | 600 | 700 |
| F9 | Working Desk | 1 drawer & 1 shutter unit. | 10 Nos. | 1200 | 750 | 750 |
| F10 | 4- Cabinet Island Assemblies With Elevated Shelves & Center Sink, Peninsula Type | The Top shall be as per F4. | 1 No. | 2100 | 1500 | 900 |
| F11 | Steel Racks | Slotted angle steel racks with antirust paintings. | 10 Nos. | 900 | 450 | 1800 |
| F12 | Revolving Chairs | As per Fisher Catalogue | 12 Nos. | | | |
| F13 | Revolving Stools | As per Fisher Catalogue | 10 Nos. | | | |

NOTE:

The entire furniture module shall comply with the following properties:

1. Chemical Properties: Resistance to acids, alkalis, solvents.
2. Physical Properties: Resistance to heat and temperature Change, Static, Conductivity
3. Mechanical Properties: Impact resistance, surface hardness, workability.
4. All metallic parts of modular furniture shall be epoxy powder coated electro statically. Prior to this, it
5. The Fume Chamber unit shall be provided with a sink in 16 SWG SS 316 grade, 1 x water point, 2 x 5/15 amp. Electrical point at front facia.

The fume chamber shall be inclusive of FRP, centrifugal blower with 1 HP-3 phase electrical motor. The blower is connected through fume chamber by 225 mm dia. HDPE pipe of 2.5 kg/cm² pressure.

| GENERAL LABORATORY REQUISITE FOR YADADRI PROJECT | | |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| List of General Laboratory Requisite | | |
| S.No. | General Laboratory Requisite | Quantity |
| 1 | Nickel plates steel tongs (lengths - 50 cms) | 4 |
| 2 | Nickel plates steel tongs (lengths - 25 cms) | 4 |
| 3 | Steel Tongs - 25 cms | 4 |
| 4 | Stainless steel beaker tongs - 25 cms | 4 |
| 5 | Stainless steel basin tongs - 25 cms | 4 |
| 6 | Stainless steel flask tongs,length 25 cms. | 4 |
| 7 | Pipette stand Fisher type | 6 |
| 8 | Test tube stand Fisher type | 6 |
| 9 | Double burette stand | 12 |
| 10 | Rectangular retort stand bases with retort stand rods | 12 |
| 11 | Tripod stand, Triangular top Wire gauge | 50 |
| 12 | S Steel spatulas with riveted handles | 12 |
| 13 | Stainless steel spatulas flask with spoon end | 12 |
| 14 | Scissors, stainless steel | 6 |
| 15 | Burette Brushes | 12 |
| 16 | Test tube brushes | 12 |
| 17 | Flask Brushes | 12 |
| 18 | Asbestos Mats- 150 sq. m | 24 |
| 19 | Asbestos Mats- 300 sq. m | 24 |
| 20 | Cork borer sets with borer sharpener | 6 |
| 21 | Velvet corks (assorted size) | 100 |
| 22 | Corks rubber (assorted size) | 100 |
| 23 | Mortar, porcelain with lip, fitted with wood handle | 2 |
| 24 | Agate motor and pastel (dia. 5 cms) | 2 |
| 25 | Agate motor and pastel (dia. 7.5 cms) | 2 |
| 26 | Crucibles, Porcelain with perforated bottom and complete with perforated discs : 4.5 cms x 4.2 cms | 6 |
| 27 | Crucibles, Porcelain with perforated bottom and complete with perforated discs : 4.9 cms x 3.6 cms | 6 |
| 28 | Crucibles Platinum with Lid Capacity : 30 ml, weight: 30 gm approx. Purity: 99.95% with purity certificate in original from authorised certified agency. | 4 |

| GENERAL LABORATORY REQUISITE FOR YADADRI PROJECT | | |
|---------------------------------------------------------|---------------------------------------------------------------------------------|-----------------|
| List of General Laboratory Requisite | | |
| S.No. | General Laboratory Requisite | Quantity |
| 29 | Combustion boats (50 ml) | 6 |
| 30 | Combustion boats (25 ml) | 6 |
| 31 | Pipe clay triangles iron wire with pipe Clay stalks for holding the above boats | 12 |
| 32 | Glass cutting knives | 4 |
| 33 | Rubber gloves assorted size | 12 |
| 34 | Rubber tubing assorted size | 12 |
| 35 | Bottle trays for acid bottle | 10 |
| 36 | Magnets with keepers (10 cm long) | 2 |
| 37 | Magnifying glass with handle | 2 |
| 38 | Wash bottle polythene (1000 ml capacity) | 12 |
| 39 | Polythene bottle - 1000 ml | 12 |
| 40 | Polythene bottle - 500 ml | 12 |
| 41 | Polythene bottle - 250 ml | 12 |
| 42 | Polythene bottle - 100 ml | 12 |
| 43 | Polythene bottle - 50 ml | 12 |
| 44 | Safety Tray | 6 |

CHEMICAL LAB EQUIPMENTS FOR 5X800 MW YADADRI PROJECT

TECHNICAL SPECIFICATIONS

PACKAGE: YTPS CHEMICAL LAB ITEMS PACKAGE-1 (68 ITEMS)

Note:

1. All standard accessories / standards / reagents required for installation & Commissioning and proper operation of the equipments listed above shall be supplied along with the instrument.
2. Detailed printed Catalogue / User Manual for the items must be submitted along with the offer.
3. Complete scope, Installation & Commissioning at Project site shall be in bidders scope.

Other Terms & Conditions**Document:**

The O&M manual shall be submitted in form of hard copies (03 nos.) and in the form of CDs (03 nos.). Two sets shall be packed with the instrument and sent to site and third copy of O&M manuals shall be sent to PCRI- HEEP Haridwar.

Installation and Commissioning: The supplier shall install & commission the equipment at site. Supplier should demonstrate the performance of the Equipment and all its accessories to ensure compliance with complete specifications & parameters quoted by them to the satisfaction of BHEL/end user. Training to chemists at site during installation should be provided for routine maintenance, operation and safety purpose. Failing to comply to the Installation and Commissioning clause, the offer will be rejected straightaway.

Arrangement Layout : Supplier will develop equipment & furniture arrangement layout in chemical lab after award of work. Civil details of chemical lab building would be shared with supplier for developing arrangement layout. This layout would be submitted before submission of documents for MDCC.

Warranty: The equipment shall be warranted for satisfactory performance for a period of 18 months from the date of installation or 24 months from date of dispatch, whichever is later. Failing to comply to the warranty clause, the offer will be rejected straightaway.

Packing & Dispatch: The equipment / accessories shall be packed in a suitable water proof/ vibration proof packing box capable of bearing air and road transit hazards. Packing box shall be properly identified and

INTEGRITY PACT**Between**

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____

_____ (hereinafter referred to as "Contract"). The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint panel of Independent External Monitor(s) (IEMs), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

- 1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles: -
 - 1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
 - 1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.
 - 1.1.3 The Principal will exclude from the process all known prejudiced persons.
- 1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

- 2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. The Bidder(s)/ Contractor(s) commits himself to observe the following principles during participation in the tender process and during the contract execution.

- 2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
- 2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
- 2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
- 2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.
- 2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.
- 2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and shall await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process, terminate the contract, if already awarded, exclude from future business dealings and/ or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 4 - Compensation for Damages

- 4.1 If the Principal has disqualified the Bidder (s) from the tender process before award / order acceptance according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.
- 4.2 If the Principal is entitled to terminate the Contract according to Section 3, or terminates the Contract in application of Section 3 above, the Bidder(s)/ Contractor (s) transgression through a violation of Section 2 above shall be construed breach of contract and the Principal shall be entitled to demand and recover from the Contractor an amount equal to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher, as damages, in addition to and without prejudice to its right to demand and recover compensation for any other loss or damages specified elsewhere in the contract.

Section 5 - Previous Transgression

- 5.1 The Bidder declares that no previous transgressions occurred in the last 3 (three) years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.
- 5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason or action can be taken as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 6 - Equal treatment of all Bidder (s)/ Contractor (s) / Sub-contractor (s)

- 6.1 The Principal will enter into Integrity Pacts with identical conditions as this Integrity Pact with all Bidders and Contractors.
- 6.2 In case of Sub-contracting, the Principal Contractor shall take the responsibility of the adoption of Integrity Pact by the Sub-contractor(s) and ensure that all Sub-contractors also sign the Integrity Pact.
- 6.3 The Principal will disqualify from the tender process all Bidders who do not sign this Integrity Pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 -Independent External Monitor(s)

- 8.1 The Principal appoints competent and credible panel of Independent External Monitor (s) (IEMs) for this Integrity Pact. The task of the IEMs is to review independently and objectively, whether and to what extent the parties comply with the obligations under this Integrity Pact.
- 8.2 The IEMs are not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.
- 8.3 The IEMs shall be provided access to all documents/ records pertaining to the Contract, for which a complaint or issue is raised before them as and when warranted. However, the documents/records/information having National Security implications and those documents which have been classified as Secret/Top Secret are not to be disclosed.
- 8.4 The Principal will provide to the IEMs sufficient information about all meetings among the parties related to the Contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the IEMs the option to participate in such meetings.

- 8.5 The advisory role of IEMs is envisaged as that of a friend, philosopher and guide. The advice of IEMs would not be legally binding and it is restricted to resolving issues raised by a Bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some Bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.
- 8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process or during execution of Contract, the matter should be examined by the full panel of IEMs jointly, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.
- 8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to the CMD, BHEL at the earliest. They may also send their report directly to the CVO, in case of suspicion of serious irregularities requiring legal/ administrative action. Only in case of very serious issue having a specific, verifiable Vigilance angle, the matter should be reported directly to the Commission. IEMs will tender their advice on the complaints within 30 days.
- 8.8 The CMD, BHEL shall decide the compensation to be paid to the IEMs and its terms and conditions.
- 8.9 IEMs should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the Principal should be looked into by the CVO of the Principal.
- 8.10 If the IEMs have reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code / Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the IEMs may also transmit this information directly to the Central Vigilance Commissioner, Government of India.
- 8.11 After award of work, the IEMs shall look into any issue relating to execution of Contract, if specifically raised before them. As an illustrative example, if a Contractor who has been awarded the Contract, during the execution of Contract, raises issue of delayed payment etc. before the IEMs, the same shall be examined by the panel of IEMs. Issues like warranty/ guarantee etc. shall be outside the purview of IEMs.
- 8.12 However, the IEMs may suggest systemic improvements to the management of the Principal, if considered necessary, to bring about transparency, equity and fairness in the system of procurement.
- 8.13 The word 'Monitor' would include both singular and plural.

Section 9 - Pact Duration

- 9.1 This Integrity Pact shall be operative from the date this Integrity Pact is signed by both the parties till the final completion of contract for successful Bidder, and for all other Bidders 6 months after the Contract has been awarded. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings.
- 9.2 If any claim is made/ lodged during currency of this Integrity Pact, the same shall be binding and continue to be valid despite the lapse of this Pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

- 10.1 This Integrity Pact is subject to Indian Laws and exclusive jurisdiction shall be of the competent Courts as indicated in the Tender or Contract, as the case may be.
- 10.2 Changes and supplements as well as termination notices need to be made in writing.
- 10.3 If the Bidder(s)/ Contractor(s) is a partnership or a consortium or a joint venture, this Integrity Pact shall be signed by all partners of the partnership or joint venture or all consortium members.
- 10.4 Should one or several provisions of this Integrity Pact turn out to be invalid, the remainder of this Integrity Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- 10.5 Only those bidders / contractors who have entered into this Integrity Pact with the Principal would be competent to participate in the bidding. In other words, entering into this Integrity Pact would be a preliminary qualification.
- 10.6 In the event of any dispute between the Principal and Bidder(s)/ Contractor(s) relating to the Contract, in case, both the parties are agreeable, they may try to settle dispute through Mediation before the panel of IEMs in a time bound manner. In case, the dispute remains unresolved even after mediation by the panel of IEMs, either party may take further action as the terms & conditions of the Contract. The fees/expenses on dispute resolution through mediation shall be shared by both the parties. Further, the mediation proceedings shall be confidential in nature and the parties shall keep confidential all matters relating to the mediation proceedings including any settlement agreement arrived at between the parties as outcome of mediation. Any views expressed, suggestions, admissions or proposals etc. made by either party in the course of mediation shall not be relied upon or introduced as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the dispute that is the subject of mediation proceedings. Neither of the parties shall present IEMs as witness in any Alternative Dispute Resolution or judicial proceedings in respect of the dispute that was subject of mediation.

 For & On behalf of the Principal
 (Office Seal)

 For & On behalf of the Bidder/ Contractor
 (Office Seal)

Place _____
 Date _____

Witness: _____
 (Name & Address) _____

Witness: _____
 (Name & Address) _____

Certificate

In line with Government Public Procurement Order No. P-45021/2/2017-BE-II dt. 15.06.2017 & P-45021/2/2017-PP (BE-II) dated 28.05.2018, we hereby certify that we M/s _____(supplier name) are local supplier meeting the requirement of minimum local content (50%) as defined in above orders for the material against Enquiry No. _____

Details of location at which local value addition will be made is as follows:

We also understand, false declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.

Seal and Signature of Supplier