**Global Expression of Interest**

**FOR**

**Disposal of 2\*110 MW ,Unit-I & II,(Stage-1) of Guru Nanak Dev Thermal Plant (GNDTP) Bathinda, Punjab**

PSPCL (Punjab State Power Corporation Ltd) is planning to Dispose Unit no 1 &2 (2\*110 MW) under Stage-1 of GNDTP, Bathinda.

**Details of the EOI can be downloaded from the following website:**

[**https://www.pspcl.in/tenders/Expression-of-interest**](https://www.pspcl.in/tenders/Expression-of-interest)

Interested parties are requested to submit their EOI along with the relevant details on or before 29.11.2019, 11:00 hrs in hard copy format to the office of Chief Engineer, GNDTP, Bathinda-151002.

Note: All updates, amendments, corrigenda etc. (if any) will be posted only on above websites. There will not be any publication of the same through newspapers or any other media

**INDEX**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sr. No.** | **Title** | | | **Page No.** | |
| 1 | Brief Description of the Stage – 1 GNDTP Bathinda | | 3 | |
| 2 | General Terms & Conditions | | 5 | |
| 3 | Detailed performance parameters of Unit -1 &II | | 8 | |
| 4 | Detailed Specifications of: | |  | |
|  | i. | Turbine Side Equipment | 9 | |
| ii. | Boiler Side Equipment | 17 | |
| iii. | AHP Equipment | 27 | |
| iv. | ESP Equipment | 30 | |
| v. | Coal Mills & Auxiliary Fans | 32 | |
| vi. | Firefighting Equipment | 35 | |
| vii. | Control & Instrumentation Equipment | 45 | |
| viii. | Electrical Equipment | 52 | |
| Annexure – A Details of Electrical Motors of Stage-1 Units with Location | | | 57 | |
| Annexure – B Details of Electrical Protections | | | 65 | |
| Annexure – C Details of Transformers installed in for Stage-1 | | | 66 | |
| Annexure – D Details of LT Switch Gear | | | 67 | |

**Global Expression of Interest (EOI)**

1. **Background**

Guru Nanak Dev Thermal Power Plant(GNDTP), Bathinda (Punjab) is a unit of Punjab state Power Corporation Ltd (PSPCL) and is situated on NH-7 highway .The power plant is one of the coal based power plants of PSPCL having an installed capacity of 460 MW i.e. two units of 110 MW each & 2 Units of 120 MW each. The unit I & II were commissioned during the year 1974 and 1976 respectively Major R&M as per guidelines of CEA was carried out and Units II &I were again commissioned in 2006 and 2007 respectively.

1. **Introduction**

Major Equipments in Unit I and Il were replaced /upgraded /renovated in last decade under major R&M. Due to changed power scenario in Punjab with addition of supercritical thermal units, GNDTP units has run less as compared to their capacity in recent years. As per Govt. of Punjab notification dated 21-12 2017, PSPCL has decided to permanently shut down all the four units (unit 1 to 4) at GNDTP, Bathinda. However all the units are technically fit for power generation.

1. **EXPRESSION OF INTEREST (EOI).**

**PSPCL invites Expression of Interest (EOI) to identify the interested parties (both Indian and international) for means & modes for disposal of 2 units of stage-I GNDTP, Bathinda on “ As is where is” basis where interested parties may :-**

**Dismantle the plant / individual equipment in the present state and use as per their requirement.**

1. **BRIEF DESCRIPTION OF THE UNITS IS AS UNDER**

| **Description** | **Unit 1** | **Unit 2** |
| --- | --- | --- |
| Capacity | 110 MW | 110 MW |
| Year of Commissioning | 1974 | 1975 |
| Year of commissioning after R&M | 2007 | 2006 |
| Boiler | Drum and internals, furnace, wall system, Superheater, Reheater, Economizer, circulation system, firing equipment & Wind Box. | Drum and internals, furnace, wall system, Superheater, Reheater, Economizer, circulation system, firing equipment & Wind Box. |
| Turbine | Horizontal, 3 cylinder, impulse, condensate type Turbine with reheat and regenerative system and HP/LP bypass. | Horizontal, 3 cylinder, impulse, condensate type Turbine with reheat and regenerative system and HP/LP bypass. |
| Coal Mills | Tube type(BHEL Make) | Tube type(BHEL Make) |
| Generator | Type TGH -30-2 Hydrogen Cooled, BHEL make 125 MVA, 11.5 KV, 6500 A at 0.88 lag, 50 Hz, 3 phase, Double star two pole generator. Insulation Class –B, YOM: 1970, allied equipment like protection/ Metering CTs/PTs, Excitation Transformer and Bus ducts etc. | Type TGH -30-2 Hydrogen Cooled, BHEL make 125 MVA, 11.5 KV, 6500 A at 0.88 lag, 50 Hz, 3 phase, Double star two pole generator. Insulation Class –B, YOM: 1970, allied equipment like protection/ Metering CTs/PTs, Excitation Transformer and Bus ducts etc. |
| Control System | DCS System:- Microprocessor based ABB makes Symphony System. | DCS System:- Microprocessor based ABB makes Symphony System. |

1. **GENERAL TERMS & CONDITIONS:**

The proposal by the bidder must carry at least the following information in the below format :-

|  |  |  |
| --- | --- | --- |
| 1. **General Information** | | |
| 1.1 | Name of the Bidder Firm |  |
| 1.2 | Nature or legal status of the firm |  |
| 1.3 | Name and nature of the associated companies to be involved with relationship and role, if any |  |
| 1.4 | Registered Address of the Firm |  |
| 1.5 | Details about the authorized personnel to communicate for this proposal |  |
| 1.6 | Designation and Address of Contact Person |  |
| 1.7 | Email ID |  |
| 1.8 | Operational and Financial Details of Business Entity/Group |  |
| 1.10 | In case of subsidiary, indicate the role of parent company |  |
| 1.12 | Whether the bidder is interested in the whole plant or individual equipments/systems. In case of individual equipments or systems , the same must be specified along with quantity |  |
| 1.13 | Previous experience of similar nature of job, if any |  |
| 1.14 | Critical/vital issues which needs to be addressed by PSPCL before awarding the contract |  |
| 1.15 | Expected time line for carrying out the activity |  |
| 1.16 | List of the documents attached with proposal |  |

Note :-

* + 1. If required, interested parties may visit the site on any working day with prior intimation & approval of PSPCL. Interested parties are requested to submit their detailed proposal in response to this EOI.
  1. Each page of the document submitted shall be duly authenticated by the applicant. The language of submission of application shall be in English
  2. All Expression of Interest documents, upon submission by any applicant to this EOI shall become the property of PSPCL. PSPCL is not liable for any cost or compensation in relation to the consideration of this EOI
  3. All information contained in this, Expression of Interest (EOI) subsequently provided/clarified is in good interest and faith. This is not an agreement and is not an offer or invitation to enter into an agreement of any kind with any party
  4. Interested parties should conduct its own investigation and analysis & should check the accuracy & make their own independent investigation in relation to any additional information that required. PSPCL may invite bidder’s conference on suitable date if required.
  5. Based on the response to this EOI, PSPCL may float NIT for Request for Proposal (RFP) to shortlist eligible parties, which can participate for Request for Quotation (RFQ). However, PSPCL may, at its absolute discretion either modify or abandon any part or whole of the document and /or process, without giving prior notice to any or all the applicant.
  6. EOI shall be submitted in hard copy at address given below. EOI received through FAX/Email etc. shall not be accepted.
  7. PSPCL will not be responsible for any cost or expenses incurred by the bidder in connection with preparation or delivery of EOI.

1. PSPCL reserves the right to call the bidder for presentation and may visit the sites of the bidder. The bidder shall have no objection whatsoever in this regard and shall facilitate PSPCL to obtain the same.
2. PSPCL shall not be responsible for any cost or expenses incurred by the bidder for visiting its office for presentation.
3. **SUBMISSION OF EOI**

Interested parties may furnish their “Expression of Interest” with all the necessary details & documents in hard as well in soft form (CD) in a sealed cover envelope super-scribing: **EOI: Disposal of Unit I & II. Guru Nanak Dev Thermal Plant (GNDTP) Bathinda, Punjab** along with the covering letter duly signed by an authorized representative by **11.00 Hrs dated 29/11/2019** in the office of,

Superintending Engineer/MM-1,

GNDTP, Bathinda 151002

Punjab, India

Email:

1. In case of any clarification regarding EOI, following is the contact person :

Er. R.K.MIttal SE/MM-1, 9646107129

Email: semm-gndtp@pspcl.in

| **Detailed performance parameters of Unit -1 &II (yearly Data from 2011 to Dec 2017)** | | | | | | | | |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **YEAR** | **UNIT** | **GEN (MUs)** | **PLF(%)** | **AUX.CONS (MUs)** | **SP.COAL CONS. (KG/KWH)** | **SP.OIL CONS. (ML/KWH)** | **HEAT RATE GCV BASED (KCAL/KWH)** | **THERMAL EFFICIENCY GCV BASED (%)** | |  |
| 2011-12 | U#1 | 763.583 | 79.03 | 168.048 | 0.72 | 1.02 | 2829.78 | 30.39 | | |
| U#2 | 825.204 | 85.4 | 0.72 | 0.78 | 2854.83 | 30.12 | | |
| 2012-13 | U#1 | 610.212 | 63.33 | 136.415 | 0.70 | 1.38 | 2828.23 | 30.41 | | |
| U#2 | 636.397 | 66.04 | 0.70 | 1.57 | 2847.25 | 30.2 | | |
| 2013-14 | U#1 | 628.230 | 65.2 | 132.179 | 0.68 | 0.81 | 2806.13 | 30.65 | | |
| U#2 | 544.111 | 56.47 | 0.68 | 1.34 | 2847.12 | 30.21 | | |
| 2014-15 | U#1 | 402.223 | 41.74 | 82.400 | 0.68 | 0.82 | 2810.1 | 30.6 | | |
| U#2 | 312.397 | 32.42 | 0.71 | 2.1 | 2949.22 | 29.16 | | |
| 2015-16 | U#1 | 180.576 | 18.69 | 48.371 | 0.70 | 2.64 | 2873.09 | 29.93 | | |
| U#2 | 224.040 | 23.19 | 0.71 | 1.69 | 2918.32 | 29.47 | | |
| 2016-17 | U#1 | 84.888 | 8.81 | 17.975 | 0.68 | 3.17 | 2896.41 | 29.69 | | |
| U#2 | 69.714 | 7.23 | 0.69 | 1.73 | 2946.14 | 29.19 | | |
| 2017-18 (upto Dec17) | U#1 | 10.199 | 1.4 | 7.136 | 0.62 | 16.4 | 2731.58 | 31.48 | | |
| U#2 | 16.047 | 2.21 | 0.65 | 10.41 | 2782.26 | 30.91 | | |

**Detailed Specifications of Unit -I &II**

**1. TURBINE SIDE EQUIPMENT**

**1.1.1 TG**

Horizontal, 3 cylinder, impulse, condensate type Turbine with reheat and regenerative system and HP/LP bypass.

**HPT** : Renovated in 2004-06 by M/s NASL with Alstom make HP turbine with old outer casing having 16 stages reaction type and one Impulse wheel whereas the old BHEL make having two impulse wheels and 8 stages.

**MPT:** 12 stages Impulse –reaction type. No renovation works done in this part, only restoration of inter stage seals were carried out. New nozzle and sealing rings of inlet pipe fitted.

**LPT:** 4 double flow stages. Last two stages modified with new blades and new guide wheels for these stages. LP body cast iron portion metal stitching carried out.

**1.1.2 BHEL GENERATOR**

TYPE: TGH -30-2 Hydrogen Cooled

MAKE: BHEL

HYDROGEN PRESSURE: 2.0 kg/cm2

RATED SPEED: 3000RPM

RATED KVA: 125000

**1.1.3 SEAL OIL SYSTEM (**One per unit)

TYPE OF SHAFT: SEAL RING TYPE

SEAL OIL FLOW: 190 Ltr. Per minute per seal

RING RELIEF OIL PRESSURE: 0.9 kg/cm2 more than seal oil pressure.

**1.1.4 CONDENSER**

TYPE: Two way Surface condenser type, single shell

in two pathwith two independent CW inlet/ outlet. (2 no per unit)

AREA: 3380m2 (stage-I)

NUMBER OF TUBES: 6800

TUBE SIZE: OD-22mm ID-20mm Length-7500mm

CW FLOW: 2\* 7700 m3/hr (stage I)

Hot well Capacity: 6200 ltr (2 no per unit)

**1.1.5 GLAND STEAM CONDENSER (**One per unit)

Max. flow: 3800 kg/hr.

No. of tubes: 256

Tube size dia: 15 / 13mm

Tube material: Brass

Steam side area: 80 m2

**1.1.6 Chimney Steam Condenser (**One per unit)

Type: Surface vertical mounted

Operating pressure: 2 kg/cm2 (shell side)

28 kg/cm2 (tube side)

Tube surface area: 30 m2

Material of tubes: Brass

No. of tubes: 122

Tube size dia: 15 / 13mm

**1.1.7 L.P. HEATERS**

**LPH1 (**two per unit)**&LPH2 (**two per unit)

Nos. off 1 1

LPH 1&2 Vertical design area: 80 m2

No tubes: 242 of Brass

Diameter: 15/13mm U shaped.

Operating pressure: 0.80 (kg/cm2) Shell side

19.963 (kg/cm2) Tube side

Tube surface area(M2): 400

No. of water passes: 4

Tube dia& thickness: 15 & 13mm

Material of tubes: Brass

No.of tubes: 242 each

**LPH3,4 & 5 (**One each per unit)

Surface Area: 250 m2

Shell Material: Steel

Shell Pressure: 10 ata

Tube Material: Brass

No of Tubes: 710

Size (Dia / thickness): 15/13mm

**1.1.8 HP HEATERS HPH-1 (**One per unit)&**HPH-2 (**One per unit)

OPERATING PRESSURE (SHELL) (kg/cm2): 20

TUBE SIDE PRESSURE (kg/cm2): 280

STEAM TEMPRATURE (ºC): 235 -500

FEED WATER I/L TEMPRATURE (ºC): 158-164

**1.1.9 DEAERATOR (One per unit)**

Diameter of each degasifier: 2500 mm

Length of each degasifier: 3950 mm

Operating Temperature: 158 ºC

Operating pressure: 5 kg/cm2

**1.1.10 FEED WATER STORAGE TANK (One per unit )**

CAPACITY: 97000 Liters

* + 1. **VALVES INVOLVED IN SYSTEM Hand Operated, Gate valves, Globe valves, Safety valves, NRV’s, Butterfly valves etc.**

**SIZES OF VALVES:-**

ABOVE 100MM SIZE: 150 Nos./ unit (approximately)

100 MM & BELOW SIZE: 400 Nos./ unit (approximately)

**1.1.12 PIPE LINES**

PIPE DIA: 12 MM TO 1200 MM

THICKNESS: 2 MM TO 56 MM

MATERIAL: Carbon steel, Alloy steel Stainless Steel etc.

TEMPRATURE: Upto 545 ºC

* + 1. **GOVERING VALVES : 4 nos per Unit**
    2. **INTERCEPTER VALVE: 2 No. per Unit**

* + 1. **Quick Closing Valve :4 no. per unit**

**1.1.16 LUB OIL SYSTEM OF TURBINE**

Main Oil Tank : 1 no. per Unit

Lube Oil cooler : 3 no. per Unit

SOP : 2 NO. per Unit Capacity : 2000 liters/min (Each)

EOP/AC : 1 no. per Unit

Capacity : 800 liters/min (Each)

EOP/DC : 1no. per Unit

Capacity : 800 liters/min (Each)

JOP : 7 No per Unit

(3 Single , 2 Duplex)

Capacity : 25 liters/min (Each)

Single jacking oil pump

CENTRIFUGE : 1 No. per Unit

**1.1.17 HP and LP Bypass System –**

**CCI SULZER Make : 2 NOS each**

HP By Pass Valve : 2 no. (200 mm size ) per Unit

LP Bypass Valve : 2 no. (200 mm sixe) per Unit

Injection Valve : 2 no. (75 mm size) per Unit

BD Valve : 1 no.( 75 mm size) per Unit

**1.2 TG PUMPS**

**1.2.1 BOILER FEED PUMP**

**Unit 1 : 2 no. BFPs (1 no. 200 KHI and 1 NO. 200 KHI-S)**

**Unit 2 : 2 no. BFPs (1 no. 200 KHI and 1 NO. 200 KHI-S)**

**Details :**

Type: 200KHI Barrel Type 200KHI-S Barrel Type

Make: BHEL BHEL

Delivery Capacity: 445 T/Hr. 476 T/Hr.

Feed Water Temp: 1580C 1640C

Dil.Head Developed: 1960 mwc 1830mwc Speed: 4500 RPM 4320 RPM

**1.2.2 HYDRAULIC COUPLING : 2 no. per Unit .**

Type: R 16 K

Make: Voith

Oil tank capacity: 700 Ltrs.

**1.2.3 CONDENSATE EXTRACTION PUMP 3 No**.per Unit

Type: 150CNJV VERTICAL PUMP

Make: B.H.E.L

No. of stages: 7

Rated output: 160 m3/Hr

Differential pressure (Max.): 22 Kg/cm2

Speed: 1490 Rpm

**1.2.4 CW PUMPS 05 No.( for both the Units)**

Type: Wet Pit type mixed flow

Make: Johnston Pumps LTD(Now WPIL)

Motor (KW): 800

Capacity: 8600 m3/Hr

Speed (Full Load): 595 RPM

**1.2.5 BCW PUMP 3 NO. per Unit .**

Type: ET ISO 30

Make: Mather & Platt Pumps

Flow: 380 m3/Hr

Discharge head: 30 meters

Pump input (KW): 55

**1.2.6 VACUUM PUMPS, 2 No.**

Type: ZUN 9

Make: SIGMA LUTIN

Discharge: 190/ltr

**1.2.7 PHOSPHATE DOZING PUMPS 03 No.( for Stage-1)**

**1.2.8 HYDRAZINE DOZING PUMP 03 No.(For Stage-1)**

**1.2.9 H2 COOLER BOOSTER PUMP 02 No. per Unit**

Make: KIRLOSKAR (02 No) WPIL (02 No)

**1.2.10 PIPING AND VALVES**

**1.3 MECHANICAL AUXILIARY**

**1.3.1 D.M. PLANT STAGE-I**

Capacity: Two Streams each 19 T/Hr (Approx.)

**a. Pressure Vessels.**

Contact Tank: 3 Nos.

Strong acid cation: 2 Nos.

Strong Base Anion: 2 Nos.

Mixed Bed: 2 Nos.

**b. Atmospheric Tanks**

Degasser water storage tank: 2 Nos.

Degasser tower: 1 Nos.

Acid/Alkali/Phosphate /Alum/

Polyelectrolyte/Lime preparation/

Measuring /Dilution tanks.(Small): 07 Nos.

Acid storage tank: 2No.(10 T& 12 T)

Gate/Globe/diaphragm. Valves: 100 Nos.(approx)

Various sizes

MSR/PVC lines of various sizes: 320 Mtrs.(approx)

**c. Pumps**

Degassed Water Pumps Qty: 2 no (Flow 25 m3/hr each)

1 No. Flow 40 m3/hr

DM transfer Pumps: Qty: 2 no (Flow 25 m3/hr)

Neutralise pit pumps: 2 no

Alkali transfer pumps: 1 no (Flow 10 m3/hr )

**d. Blowers**

Degasser air blower: 2 nos

**1.3.2 INSTRUMENT AND SERVICE AIR COMPRESSORS, AIR DRIERS**

**a. Air Compressors.**

No .of instrument air compressors: 4 (2 no. per Unit)

No. of service air compressors: 3 (For Stage-1)

**Technical specifications**

**IAC (Instrument Air Compressor)**

Make: K.G.Khosla Compressor Ltd.

Type: 2HA 2BIST Balanced opposed, Non- lubricated Air Compressor.

Speed: 680 RPM.

Application: Air

Free air delivery cap: 660 m3/hr.

Pressure: 8 Kg./cm2.

Piston Action: Double.

No. of stages: 2 Nos.

No. of cylinders: 2 Nos.

No. of cylinder/stage: 1 No.

Type of cylinder: Horizontal.

Cylinder lubrication: (Non-lubricated).

Cylinder Bore: HP 160 mm dia.

LP 280 mm dia.

Power reqd: 100 HP

**SAC (Service Air Compressor)**

Make: Kirloskar Pneumatic Co.

Screw compressor KES 75:1 No.

Capacity: 15.12 m3/min

Working Pressure: 7 Kg./cm2

Make: K.G.Khosla Compressor Ltd Type 2HATER: 2 No.

Capacity: 11.35 m3/min

Working Pressure: 7 Kg./cm2

Speed: 525 RPM

Along with accessories such as safety valves moisture traps, suction filters, inter and After coolers Air receivers, decompression system, isolating valves and lines of air and cooling water.

**b. Air Driers**

No. of driers: 04( 2 no. per Unit)

Type: Blow hot.

Blower Model: KAY 500

Capacity: 300 m3/hr.

Pressure: 0.1 Kg./cm2.

Desiccant: Activated Aluminum balls 640 kg in each dryer.

**c. Air Receivers**

Instrument air receivers: 2 Nos.(For Stage-1)

Capacity: 2.5 M3

Max. Working pressure: 7.5 Kg. /cm2

Service Air Receiver: 1 No.

Capacity:

Max. Working pressure: 7 Kg. /cm2

**1.3.3 REFRIGERATION & AC SYSTEM**

**a. Central AC Plants stage-I**

**CAC plant UCB stage-1**

Capacity: 3 X 45 TN Compressor

Make: KIRLOSKAR Compressor

Model: SMC-670

No. of AHU: 3

Location: 8m UCB floor

**b. AIR WASHER SYSTEM stage-I**

No. of Blowers: 04 nos (02 at each unit)

Rotation: Clockwise

**c. Hydrogen Driers**

Unit-1

Make: M/s. Jindal Electronics #1

Model: JEL3TG40

Type: Refrigerated type

Location: Ground Floor Turbine side

Unit-2

Cylindrical Dryer: 2 No.

Diameter: 1365 mm

Height: 530 mm

Desiccant: Sillica Gel

**1.3.4 DG SETS**

Diesel Engine stage-I: (2 Nos)

Make: Kirloskar Oil Engine Ltd.

Type: NTA-855 HP 372

**2. BOILER SIDE EQUIPMENT**

**Boiler:** The steam generator is a radiant reheat, natural circulation, single drum, and semi outdoor type unit, designed for firing coal as the principal fuel.

**2.1 DRUM**: - The steam drum includes the following:

Location: Upper front

Number: One (1)

Inside Diameter: 1800mm

The drum is of fusion welded construction fabricated from carbon steel plates and Equipped with two (2) number 415 mm \* 300 mm oval shape manholes.

**a.** DRUM Internals: Necessary internals complete for limiting the solids carry over in the steam leaving the drum has been provided.

**b.** Drum connections: Necessary welding inlet and outlet connections required for valves and accessories have been provided.

**c.** Drum supports:- The necessary drum supports have been provided.

**2.2 FURNACE WALL SYSTEM**

The furnace wall system includes the following:

**2.2.1 HEADERS**

The inlet and outlet headers complete with necessary inlet and outlet connections of receive the connecting piping and element tubing.

**2.2.2 Water wall**

**LOCATION NUMBER O.D. (MM) TYPE OFCONST.**

Front wall 125 63.5 Fusion welded

Rear wall 125 63.5 & 76.1 Fusion welded

Side wall(per side) 117 63.5 Fusion welded

Extended side wall 31 63.5 Fin welded

**2.2.3 FURNACE**

Surface Area 1390 M2

Furnace width 9601 mm

Furnace depth 9781 mm

The furnace water wall system is fabricated from seamless carbon steel tube of SA 210 Gr. A1 material. The fusion welded walls has been made of tube OD 63.5 mm kept at 76.2mm pitch.

**2.2.4** **DOWN TAKE PIPES (DOWN COMERS)**

Twenty Eight (28) numbers of unheated down take pipes of outside diameter 193.7mm.The complete supply and riser piping required for the circulation system.

**2.2.5 SUPPORTS**

Necessary supports material to support the elements/header from the roof structure complete.

**2.3 SUPERHEATER**

The super heater system equipment includes the following:-

**2.3.1 SUPPORTS**

Necessary supporting materials to support the various steam cooled wall section and various stages of super heater elements headers and connected piping complete.

**2.3.2 DE-SUPER HEATERS FOR SUPER HEATERS**

The De-Super heater for super heater includes the following:

One number spray type de-super heaters, located after LTSH outlet header is for controlling steam temperature super heater finish pendant spaced section to 540oC from 60% MCR to 100% of Boiler.

All necessary spray water piping, valves and fittings are fabricated.

**2.3.3 STEAM COOLED WALLS**

| Location | Number | OD (MM) | Construction |
| --- | --- | --- | --- |
| Furnace Roof | 77 | 4405 | Fusion Welded |
| Back Pass Front | 90 | 38.1 | -do- |
| Back Pass Rear | 99/119 | 38.1 | -do- |
| Back pass (per side) | 71 | 38.1 | -do- |
| Back pass extended (per side) | 21 | 38.1 | -do- |

The steam cooled walls have been fabricated from carbon steel ( SA 210 Gr.A1)

**2.3.4 SUPERHEATER SECTION**

**Description Rear LTSH Final**

**Horizontal Pendant Platen**

**LTSH**

Number of assemblies 82 82 20

Tube O.D. (mm) 38.1 38.1 50.8/ 44.5

Transverse pitch (mm) 114 114 457.2

Longitudinal pitch (mm) 76.2 76.2 54

(Along gas path).

Approximate total heating surface: 4777

**2.4 REHEATERS**

**2.4.1 HEADERS**

The inlet and outlet headers of the re-heater section with necessary inlet and outlet connections to receive the connecting tubes piping and element tubing.

**2.4.2 DETAILS OF RE-HEATER SECTION (PLATENISED)**

**Description Front Finish**

**Pendant Pendant**

No. of assemblies. 41 41

Tube O.D.(mm) 57.2 57.2

APPROXIMATE TOTAL HEATING SURFACE (Circumferential):- 1630 M2

**2.4.3 ELEMENT FRONT PENDANT SECTION**

Assemblies consisting of elements fabricated from tubing of carbon moly and chrome moly steel in quantities as required.

**2.4.4 FINISH PENDANT SECTION**

Assemblies consisting of elements fabricated from tubing of chrome moly and austenitic stainless steel in quantities as required.

**2.4.5 SUPPORTS**

Necessary supporting materials to support the re-heater elements and header.

**2.4.6 DE-SUPER HEATER FOR REHEATER**

The De-super heater for re-heater includes the following.

One Number spray type emergency de-super heater located in the cold reheat steam piping is for use during any abnormal or emergency condition for controlling the reheat steam temperature at re heater outlet to 5400C.

All necessary spray water piping, valves and fittings.

**2.5 ECONOMISER**

The economizer system includes the following:

**2.5.1 HEADERS**

Headers complete with necessary inlet and outlet connection to receive the connecting piping element tubing.

**2.5.2 ELEMENTS:**

**Type** **Plain tube seamless continuous loop**

Tube spacing (mm)

Vertical 101.6

Horizontal 114.3 Tube arrangement

Horizontal in line

No. of assemblies 82

No. of tubes into one assembly

Eco. Upper 21

Eco. Lower 21

No. of elements/Assembly One

Direction of gas flow down

Direction of water flow up

Tube material Carbon steel(SA 210Gr.A1)

Size of tube O.D. mm 50.8

Heating surface 5162 M2(Approx.)

The tubes are horizontally arranged such that the tubes of each assembly are in line in relation to the tubes of adjacent assemblies.

**2.5.3 SUPPORT**

Necessary support material for supporting the elements/headers piping complete.

**2.6 CIRCULATION SYSTEM**

The circulation system includes the necessary piping, headers and tubing to & from a circulation system as described below. Feed water from the economizer is discharged in to the steam drum below the water level where it mixes with re circulated boiler water. The mixed water flown through down take pipes (Down comers) to the lower ring header. The ring header acts as the inlet to the furnace walls. The water flows upwards through the heat absorbing water walls and is partially evaporated into steam. The water steam mixture from the water walls flows back to the steam drum through riser piping

**2.7 FIRING EQUIPMENT & WIND BOX**

This includes the 4 no. approximately 660 mm wide burner assemblies of compartmented fuel and air nozzle arranged vertically complete with necessary insulation, scanners, dampers and fuel connections for installation, near each corner of furnace and wind box compartment provided on both sides of the furnace.

**DETAIL OF WIND BOX ASSEMBLIES:**

i) No. of Oil Burners 08 Nos. (2 per corner)

ii) No. of coal burners 16 Nos. (4 per corner)

(Coal compartment assemblies)

iii) End air nozzle tip 08 Nos. (2 per corner)

iv) OFA nozzle tip 08 Nos. (2 per corner)

v) Igniter guide pipe assembly 08 Nos. (2 per corner)

vi) Scanner assembly 08 Nos. (2 per corner)

**2.8 Oil System**

Heavy Oil heating Station including all associated piping valves and fittings.

**2.9 Tubular AIR PREHEATER**

Two no of air pre heaters/ boiler. Each having three blocks in pass A and B

**2.10 AUXILIARY PRDS**

There is one Aux PRDS per Boiler. It includes pressure reducing station, spray station and Aux. Header. Steam Station used for tank heating, wagon heating, atomizing station, Gland sealing, Oil preheating station and Dearerator. High pressure piping and valves, Low pressure piping and valves, flange joints and drain valves are included. Its drains are terminated in CBD tank.

**2.11 CBD TANK**

There is one IBD tank per boiler at 24 mtr elevation.

Test pressure 10.5 kg/cm2

Working pressure. 6 kg/cm2

Temperature 165oc

**2.12 IBD TANK**

There is one IBD tank per boiler at 0 mtr . All drain valves and piping from the related system are included. Tentative technical parameters are as under:

Test pressure 3.9 kg/cm2

Working pressure 1.0 kg/cm2

Temperature 143oc

**2.13 STEAM STATION**

There is one station per boiler at firing floor. It include steam lines from Aux. PRDS to this station, all tracing lines, all drain lines up to IBD tank, Atomizing steam lines up to firing system at corners at different elevation. Piping and valves steam trap, NRVs strainers.

**2.14 F.O. STATION**

There is one fuel oil station per boiler. All piping and valves from oil heating station to firing equipment are included.

**2.15 L.D.O. STATION**

There is one LDO station per boiler. All piping and valves up to firing equipment are included.

**2.16 ATOMISING AIR STATION**

There is one atomizing air station per boiler. All piping, fittings and valves at firing station up to corner fittings is included.

**2.17 DUCTING AND DAMPERS**

Flue gas ducting below economizer area up to air pre heater, secondary hot air ducting from air pre heater outlet to wind box is included. Flue gas dampers at inlet of air pre heater and out let dampers on secondary hot air are included.

**2.18 VALVES & ACTUATORS Boiler Side**

**2.18.1 Electrically Actuator Operated Valves ( BHEL)**

| S/N | Type/Class | Size | Qty Unit-1 | Qty Unit-1 |
| --- | --- | --- | --- | --- |
| 1 | Gate valve: Class 300/1500/2500 | 25/150/200/250/300 | 18 | 18 |

**2.18.2 Manually Hand operated valve (BHEL)**

| S/N | Type: Class | Size | Qty. unit-1 | Qty. unit-2 |
| --- | --- | --- | --- | --- |
| 1 | Globe valve: Class 300/1500/2500 | 15/25/40/150/200/250/300/350 mm | 301 | 301 |
| 2 | Gate valve: Class 300 /500/1500 | 25/50/75/100/150/200/250 mm | 46 | 46 |
| 3 | NRV: Class 300 /500/1500 | 25/50/75/100/150/200/250 mm | 46 | 46 |

**2.18.3Pneumatic operated valve (Fisher/MIL/CCI/IL )**

| S/N | Category | Size | Qty. unit-1 | Qty. unit-2 |
| --- | --- | --- | --- | --- |
| 1 | Small | Up to 75 mm | 43 | 43 |
| 2 | Medium | 80 to 150 mm | 11 | 11 |
| 3 | Large | Above 150 mm | 4 | 4 |

**2.18.4 Safety Valves ( BHEL)**

| S/N | Class | Size | Qty. unit-1 | Qty. unit-2 |
| --- | --- | --- | --- | --- |
| 1 | Class 2500 | 65/150/200 mm | 11 | 11 |

**2.19 Milling Circuit**

Unit no 1 and 2 are indirect fired Boilers. In addition to dampers and ducts following are parts of milling circuit.

| S/N | Name of equipment | Qty on unit 1 | Qty on unit 2 |
| --- | --- | --- | --- |
| 1 | Raw Coal Bunkers 500 Ton | 3 | 3 |
| 2 | Raw coal Chain feeders | 3 | 3 |
| 3 | Classifier | 3 | 3 |
| 4 | Cyclone Separator | 3 | 3 |
| 5 | Turniket | 3 | 3 |
| 6 | Vapour line Junction Box | 3 | 3 |
| 7 | PC Bunkers 50 Ton Each | 4 | 4 |
| 8 | PC feeders pipe size 309 \*12mm | 16 (4 at each corner) | 16 (4 at each corner) |
| 10 | PA Header | 1 | 1 |
| 11 | Vapor lines 324 \*8 | 12( 3 at each corner) | 12( 3 at each corner) |

**2.20 ELECTROSTATIC PRECIPITATOR**

Type: 2-FAA-7x37.5H-96-125 -I

No. of ESP/Boiler: 1

No. of gas path/Boiler: 2

No. of electrical fields in series: 7 in direction of gas flow.

Total no. of electrical fields unit 1&2: 28

Total no. of collecting Emitting rapping: 56 Gear box on unit no 1&2.

Height of collecting electrodes: 12.5

Specific collecting areas: 231.9 m2 /m³ /Sec. in stg-I

**2.21 DUCTING & DAMPERS/GATES:**

Dampers and gates of all ducts( Primary air/Secondary air/Flue Gas and milling circuit.

Primary air dampers: 12nos. Stg-I

Secondary air dampers: 28 nos. Stg-I.

Flue gas dampers: 10 nos.Stg.-I.

**3. AHP & ESP EQUIPMENT**

**3.1BOTTOM ASH HOPPER**

Each unit has 2 bottom ash hoppers underneath the boiler furnace. Below these hoppers clinker grinder are placed in unit 1 & 2 mixture of water and ash is discharged through the inclined feed gate and into clinker grinder which crush the clinkers. The crushed clinkers and ash water mixture are discharged in the slurry sump.

**No. of clinker Grinder**

Unit-1 2nos

Unit-2 2nos

**No. of Hydro ejector**

Unit-1 2nos

Unit-2 2nos

**3.2 FLY ASH SYSTEM**

The Fly ash system is collected in the Hoppers as given below:-

**Economizer Hopper**

Unit-1 2nos

Unit-2 2nos

**Air pre Heater Hopper**

Unit-1 4nos

Unit-2 4nos

**Electrostatic Precipitator**

Unit-1 28nos

Unit-2 28nos

**Stake Hopper**

Unit-1 1nos

Unit-2 1nos

**3.3 PUMPS**

The following pumps are provided for both units:-

**3.3.1 Seal water pump** – 160USGPM at 430 Ft. TDH. There are two (2) seal water pumps for both units. Normally only one pump is operated at a time allowing the other pump to serve as a standby.

**3.3.2** **High pressure water pump** – 560USGPM at 425 Ft. TDH. There are 4 H.P. Water Pumps in stage -1. One pump is operated when bottom ash is being removed of each unit and all pumps for whole system, when fly ash is being removed.

**3.3.3** **Ash slurry pump** – 2200 USGPM at 122 Ft. TDH. There are two set/ash slurry pumps, each set comprising of two (2) pumps connected in series. These pumps transfer the slurry from ash slurry sump to ash disposal area.

**3.3.4 Low pressure water pumps** – 2200 USGPM at 210Ft. TDH. There are two(2) LP Pumps for both units. Normally One pump is operated at a time, the other pump serves as a standby.

**3.4 SILO:**

Two storage silos each capacity 450 MT stores fly ash in dry states. Adequately 150mm vide air slide are arranged in the silo floor to fluidize ash during unloading. Vent filter located on the roof of each silo are automatically placed in operation whenever silo is loaded or unloaded. One Fluidizing blower is located on each silo.

**3.5 Vacuum pump**

There are 3nos. Vacuum pumps for each unit. These pumps are used to create vacuum in fly ash lines to clear fly ash on dry mode. Normally two pumps are operated at a time allowing the other pump to serve as a standby. The RPM of these pumps are 550/M.

| **Wet Ash system** Major equipment of Wet Ash Handling of Stage-1 | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Wet Ash Handling Major equipment of Wet Ash handling of Stage-1 | | | | | | | |
| Major equipment in Unit-1 | | | | Major equipment in Unit-2 | | | Stage-1 |
| Equipment Name | Size | Qty | Where it is located | Size | Qty | Where it is located |  |
| Material Handing valve | - | 28 | E.S.P. Hopper | - | 28 | E.S.P. Hopper |  |
| Knife Gate valve | 8” | 8 | E.S.P. Hopper | 8” | 7 | E.S.P. Hopper |  |
| Knife Gate valve | 12” | 4 | APH Hoppers | 12” | 3 | APH Hoppers |  |
| Knife Gate valve | 12” | 2 | Economizer Hoppers | 12” | 2 | Economizer Hoppers |  |
| Segregate Valve | 8” | 4 | E.S.P. Hopper | 8” | 4 | E.S.P. Hopper |  |
| Segregate Valve | 8” | 3 | APH Hoppers | 8” | 3 | APH Hoppers |  |
| Segregate Valve | 8” | 2 | Vacuum breaker | 8” | 2 | Vacuum breaker |  |
| Segregate Valve | 8” | 1 | Economizer Hoppers | 8” | 1 | Economizer Hoppers |  |
| Hydrovactor | - | 2 | Pump house | - | 2 | Pump house |  |
| Wetting head | - | 2 | Mixing tank tower | - | 2 | Mixing tank tower |  |
| Mixing Tank assembly | - | 2 | Mixing tank tower | - | 2 | Mixing tank tower |  |
| NRV Valve | 3” | 4 |  |  |  |  | 1&2 |
| NRV Valve | 4” | 2 |  |  |  |  | 1&2 |
| NRV Valve | 6” | 1 |  |  |  |  | 1&2 |
| NRV Valve | 8” | 1 |  |  |  |  | 1&2 |
| NRV Valve | 10” | 5 |  |  |  |  | 1&2 |

**3.6 ESP Blower**

There are two ESP Fluidizing blowers for both units. These blowers are used for Fluidizing ESP Hoppers. Normally only one blower is operated at a time allowing the other blower to serve as a standby. The RPM of these blowers are 1365/M and the capacity of each blower is 1044M3/Hr.

**3.7 Cell Collector Blower**

There are two nos of 3 Cell collector Blowers installed at stage-1. These blowers are used to fluidize whole system of Dry Fly Ash both stages 1 & 2 and silo of stage-2.

**3.8 Blow down Pumps**

There are three nos. of pumps in stage-1.These pumps are used to maintain the water level of Blow down sump. Normally One pump is operated at a time, the other two pumps serve as standby.

| **Dry Fly Ash system** Major equipment of Ash Handling of Stage-1 | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Major equipment in Unit-1 | | | | Major equipment in Unit-2 | | | | Stage-1 | |
| Equipment Name | Size | Quantity | Where it is located | | Size | Quantity | Where it is located | |  |
| TRSG Valve | 8” | 2 | Vacuum breaker | | 8” | 2 | Vacuum breaker | |  |
| TRSG Valve | 10” | 2 | Bag filter tower | | 10” | 2 | Bag filters tower | |  |
| Bag filters |  | 2 | Bag filter tower | |  | 2 | Bag filter tower | |  |
| Transfer Hopper |  | 2 | Bag filter tower | |  | 2 | Bag filter tower | |  |
| Buffer hopper |  | 1 | Bag filter tower | |  | 1 | Bag filter tower | |  |
| Denseveyor with dome valve complete assembly |  | 2 | Below Bag Filter tower | |  | 2 | Below Bag Filter tower | |  |

**3.11: Piping and Structure:**

**Complete piping (CI and MS) with necessary supporting structure**

**4. Coal Mills and Auxiliary Fans**

**4.1 Coal Mills**

**4.1.1. DRUM MILLS: STAGE-I**

1.1 TYPE OF MILL : DRUM MILLS (supplied by BHEL).

1.2 Size : Drum Mill 300/579

1.3 Capacity : 27 Tons/hr

1.4 No. of Mills/Boiler : 3

1.5 Rating of drive motor: 990 RPM,

1.6 Type of coupling : Geared coupling and Bibby resilient Coupling

1.7 Power of drive motor : 630KW

**4.1.2. LUBRICATION FOR JOURNAL BEARINGS**

2.1 No. of LOPs/ Coal Mill: ONE

2.2 No. of motors/Coal Mill: ONE

2.3 Drive motor rating: 1.1KW

2.4 RPM: 1380.

2.5 No. of filters/ Coal Mill: Two.

**4.1.3. LUBRICATION FOR GEAR BOX**

3.1 No. of LOPs/ Coal Mill: Two

3.2 No. of motors/Coal mill: Two.

3.3 Drive motor rating: 2.2 KW

3.4 RPM: 1400.

3.5 No. of filters/ Coal Mill: Two.

**4.2 Fans**

**4.2.1. INDUCED DRAFT FAN:**

1.1 Type / Size of each fan : Centrifugal, Single inlet, backward curved-

laminated Blade Fan/ 2415mm Dia SIBCB-92

1.2 No.of fans/ Boiler : Two

1.3 Air capacity handled : 112.26 m³/Sec

1.4 Discharge Head : 454 mm WC.

1.5 Type of Control : control Dampers.

1.6 Type of coupling of : Voith Hydraulic coupling.

1.7 Drive motor rating : 725 KW.

1.8 Speed of fan : 980 RPM

**4.2.2. FORCED DRAFT FAN**

2.1 Type/Size of fan: Centrifugal, Single inlet, backward Aerofoil Bladed Fan/ 2125mm Dia SIBAB-92

2.2 No. of fans/Boiler : Two

2.3 Air capacity/fan handled : 72.58m³/Sec

2.4 Discharge head : 434mm WC.

2.5 Type of control: control vanes.

2.6 Drive motor rating: 425KW.

2.7 Speed of fan: 982 RPM.

**4.2.3. PRIMARY AIR FAN**

3.1 Type / Size of each fan: Centrifugal, Double inlet, backward curved-

laminated Blade Fan/1715mm Dia DIBCB-11

3.2 Air capacity /fan: 17.97m³/Sec

3.3 Discharge Head: 944mm WC.

3.4 No. of fans/Boiler: Two (2)

3.5 Type of control: control dampers.

3.6 Drive motor rating: 230 KW

3.7 Speed of fan: 1480 RPM

**4.2.4. VAPOUR FAN**

4.1 Type / Size of each fan: Single inlet Centrifugal type fan (supplied by BHEL).

4.2 No. of fans/Stage 1: Two of unit 1 and three of unit 2.

4.3 Type of control: control dampers.

4.4 Drive motor rating: 370 KW

4.5 Speed of fan: 1480 RPM

4.6 Type / Size of each fan: Single inlet Centrifugal type fan 2010mm Dia SIPSC-08/4

4.7 Air capacity /fan: 17m³/Sec

4.8 Discharge Head: 1280mm WC.

4. 9 No. of fans/Unit: 3

4.10 Type of control: control dampers.

4.11 Drive motor rating: 370 KW

4.12 Speed of fan: 1480 RPM

**4.2.5. LUBRICATION FOR BEARINGS OF VAPOUR FANS**

5.1 No. of LOPs/ vapour fan: One

5.2 No. of motors/ vapour fan: One.

5.3 Drive motor rating: 0.75 KW

5.4 RPM: 1440.

5.5 No. of filters/ vapour fan: One.

**4.2.6. SCANNER AIR FAN**

6.1 Type / Size of each fan: Centrifugal type fan

6.2 No. of fans/Boiler: Two (2).

6.3 Volts: 2200v

6.4 Drive motor rating: 7.5 KW

6.5 Speed of fan: 2900 RPM

**5. Firefighting Equipment**

5.1 Emulsifier sprinkler alarm system

5.1.1 Cable Gallery Unit 1 & 2

5.1.2 Deluge valve control Penal = 8 No

5.1.3 Deluge valve-100NB = 8 No

5.1.4 By pass inlet Gate valve -100 mm = 8 No

5.1.5 Drain valve -100 mm = 8 No

5.1.6 Butter fly valve 100 mm = 16 No

5.1.7 Spray water nozzle = 172 No

5.2 Unit 1& 2 Turbine Main oil tank (T G Hall) & Dirty oil Tank (-3.5 mtr level) (Near G T Unit -1)

5.2.1 Deluge valve control Penal = 3 No

5.2.2 Deluge valve - 80NB = 3 No

5.2.3 By pass inlet Gate valve - 80 mm = 3 No

5.2.4 Drain valve - 80 mm = 3 No

5.2.5 Butter fly valve 80 mm = 6 No

5.2.6 Spray water nozzle = 44 No

5.3 Emulsifier System Furnace Oil Tank & L D O Tank

5.3.1 Deluge valve control Penal = 5 No

5.3.2 Deluge valve - 80NB = 5 No

5.3.3 By pass inlet Gate valve - 80 mm = 5 No

5.3.4 Drain valve - 80 mm = 5 No

5.3.5 Butter fly valve 80 mm = 10 No

5.3.6 Foam Tank = 2 No

5.3.7 Foam Spray Line = 5 No

5.4 Water sprinkler alarm system (Furnace Oil Tank & L D O Tank)

5.4.1 Deluge valve control Penal = 2 No

5.4.2 Deluge valve - 150NB = 2 No

5.4.3 By pass inlet Gate valve - 150 mm = 2 No

5.4.4 Drain valve - 150 mm = 2 No

5.4.5 Butter fly valve 150 mm = 4 No

5.4.6 LDO Tank Spray Water Nozzle = 68 No

5.5 Smoke Detectors

5.5.1 Smoke Detector in U C B (stage 1) = 14 No

5.5.2 Smoke Detector in Switch gear (stage 1) = 14 No

5.5.3 Smoke Detector in Boiler MCC (Unit -1 & 2) 8+8 = 16 No

5.5.4 Smoke Detector on Ground floor E S P Control Room = 8 No

5.5.5 Smoke Detector in 1st floor E S P Control Room = 6 No

5.5.6 Smoke Detector in C W Pump house Stage -1 = 8 No

5.5.7 Smoke Detector in D M Plant Stage -1 = 6 No

5.5.8 Smoke Detector in Wet Ash handing Plant Stage -1 = 6 No

5.5.9 Smoke Detector in C H P Control Room Ground Floor = 6 No

5.5.10 Smoke Detector in C H P Control Room 1st Floor = 4 No

5.5.11 Smoke Detector in DG set Room Stage-1 = 4 No

5.5.12 Smoke Detector & Alarm system Auto Panel (FAP-1) Stage- 1 UCB Unit-1

5.5.13 Smoke Detector & Alarm system Auto Panel (FAP-3) CHP Control Room 1st Floor

5.5.14 Smoke Detector & Alarm system Auto Panel (Repeater - 1) Fire station

5.6 Sprinkler Alarm Auto / Electrical Operation system Panel Stage- 1 UCB Unit -1

(-3.5 mtr level Cable Gallery Unit 1&2, dirty oil tank & Main oil Tank Turbine Unit 1& 2)

5.7 Sprinkler Alarm Auto / Electrical Operation system Panel CHP Control Room 1st Floor (LDO Tank & Foam Oil Tank)

5.8 IRD Point in Conveyors

5.8.1 Conveyor No – 5 A&B = 6

5.8.2 Conveyor No – 4 A&B = 4

5.8.3 Conveyor No – 7 A&B = 4

5.8.4 Conveyor No – 12 A&B = 2

5.8.5 Conveyor No – 10 A&B = 1

5.8.6 Conveyor No – 15 A&B = 2

5.8.7 Conveyor No – 16 A&B = 2

5.9 1 No of PC along with peripherals

5.9 Emulsifier System (G T Unit No 1 & 2(150MVA) Station Tr. 22.5 MVA)

5.9.1 Deluge Valve 150 NB = 3 No

5.9.2 Isolative Valve 150mm = 6 No

5.9.3 Fire Detector = 61 No

5.9.4 Water spray Nozzle = 160 No

5.10 PC Bunker - CO2 System (Unit No 1 & 2)

5.10.1 CO2 Spray Nozzle Unit -1 PC BUNKER = 8 No (30mtrLevel)

5.10.2 CO2 Spray Nozzle Unit -2 PC BUNKER = 8 No (30mtr Level)

5.10.3 CO2Cylinder Spray assembly = 20 No (24 mtr Level)

5.10.4 CO2Cylinder Small (Fluid Control System) Type 20101-1.2-2G With solenoid Valve = 2 No (24 mtr Level)

5.10.5 CO2Cylinder (Total) = 38 No (Stock) (24 mtr Level)

5.10.6 Pneumatic Actuator Valve = 4 No (24 mtr Level)

5.10.7 CO2 Panel Out Door Type -1 = 1 No (24 mtr Level)

5.11 Emulsifier System Air Compressor Stage -1 Near Condenser Unit No-1

Air Compressor : 1 No

Make : Ingersoll Rond

Type : 30

Model : 242

Size : 4x2.5x2/3/4

5.12 IRD System Air Compressor (All Conveyor Belt) In LDO Pump Room Stg -1)

Air Compressor : 2 No

Make : Kirlosker

Type : ECT 17.5

RMP : 750

Year : 2006

Jeson Supply Penal : 1 No Air compressor panel in LDO Pump Room

5.13 Isolative Valve

| **Sr** | **Valve** | **No** | **Location** | **Remark** |
| --- | --- | --- | --- | --- |
| 1 | Isolative Valve 8” | 1 | Near G T No 1 | Emulsifier system Stage No 1& 2 |
| 2 | Isolative Valve 6” | 1 | Near cycle stand | Emulsifier system conveyor No 2, 4 & 9 |
| 3 | Isolative Valve 6” | 1 | Basement -3.5 mtr | Water sprinkler system Stage No 1 & 2 |
| 4 | Isolative Valve 4” | 2 | Basement -3.5 mtr | Water sprinkler system Stage No 1 & 2 |
| 5 | Isolative Valve 6” | 3 | Basement - 0 mtr | Fire system Stage No 1 & 2 |
| 6 | Isolative Valve 10” | 3 | D M Plant Stage-1 | Water sprinkler system Stage No 1 |
| 7 | Isolative Valve 6” | 6 | D M Plant Stage-1 | Water sprinkler system Stage No 1 |
| 8 | N R V 6” | 5 | D M Plant Stage-1 | Water sprinkler system Stage No 1 |
| 9 | Deluge Valve 6” | 1 | D M Plant Stage-1 | Water sprinkler system Stage No 1 |
| 10 | Isolative Valve 8” | 1 | Nearcoal mill | Water sprinkler system Stage No 1 & 2 |
| 11 | Isolative Valve 6” | 7 | Near Coal Mill | Water sprinkler system Stage No 1 & 2 |
| 12 | Isolative Valve 6” | 4 | Near Coal Mill | Water sprinkler system Stage No 1 |
| 13 | Isolative Valve 4” | 2 | Near Coal Mill | Water sprinkler system Stage No 1 |
| 14 | Isolative Valve 4” | 2 | Main Crasher | Water sprinkler system Stage No 1 & 2 |
| 15 | Isolative Valve 8” | 4 | Near Cooling tower No-1 | Water sprinkler system Stage No 1 & 2 |
| 16 | Isolative Valve 6” | 1 | Near Cooling No - 2 | Water sprinkler system Stage No 1 & 2 |
| 17 | Isolative Valve 4” | 2 | Near conveyor belt wear house | Water sprinkler system Stage No 1 & 2 |
| 18 | Isolative Valve 14” | 2 | Blow down Pump | CW PUMP HOUSE Stage No 1 |
| 19 | N. R. V 14” | 3 | Blow Down Pump | CW PUMP HOUSE Stage No 1 |
| 20 | Isolative Valve 8” | 1 | D G Room Stage-1 Fire Pump | Water sprinkler system Stage No 1 & 2 |
| 21 | N R V 6” | 1 | D G Room Stage-1 Fire Pump | Water sprinkler system Stage No 1 & 2 |
| 22 | Isolative Valve 8” | 1 | L D O Room Stage-1 Fire Pump | Water sprinkler system Stage No 1 & 2 |
| 23 | Isolative Valve 6” | 1 | Near L D O Tank Stage-1 | Water sprinkler system Stage No |
| 24 | Isolative Valve 6” | 1 | Under The Near conveyor No-7 | Water sprinkler system Stage No 1 & 2 |
| 25 | Isolative Valve 6” | 1 | Near Wagon tippler | Water sprinkler system Stage No 1 & 2 |
| 26 | Isolative Valve 6” | 2 | Near Wagon tippler | Water Spray Pump in coal Plant |
| 27 | Isolative Valve 4” | 6 | Near Wagon tippler | Water Spray Pump in coal Plant |
| 28 | Non Return Valve 4” | 2 | Near Wagon tippler | Water Spray Pump in coal Plant |
| 29 | Non Return Valve 3” | 2 | Near Wagon tippler | Water Spray Pump in coal Plant |
| 30 | Isolative Valve 4” | 2 | Near Wagon tippler | Submersible Pump in coal Plant |
| 31 | Isolative Valve 6” | 2 | Near Wagon tippler | Submersible Pump in coal Plant |
| 32 | Inlet gate valve 4” | 1 | Near left stage- 1 | Intts.Air line stage -1 |
| 33 | Inlet gate valve 2” | 1 | Near left stage- 1 | Intts.Air line stage -1 |
| 34 | Inlet gate valve 2” | 3 | Near Coal mial- 1 | Intts.Air line stage -1 |
| 35 | Inlet gate valve 2” | 3 | Near Turbine - 1 | Intts.Air line stage -1 |

5.14 Water Landing Valves for fire control system

| Landing Valve No | Location | Remarks |
| --- | --- | --- |
| 4 No | Turbine Hall -8 mtr | Fire control system Stage -1 |
| 2 No | G T -1& 2 back | Fire control system Stage -1 |
| 3 No | G T -1& 2 Front | Fire control system Stage -1 |
| 2 No | In Sub Station | Fire control system Stage - 1 |
| 4 No | Basement -3.5 mtr | Fire control system Stage -1 |
| 4 No | Basement - o mtr | Fire control system Stage -1 |
| 20 No | Boiler 8mtr To 30 mtr | Fire control system Stage -1 |
| 4 No | Near Coal Mill | Fire control system Stage -1 |
| 1 No | Near Work Shop | Fire control system Stage -1 |
| 3 No | Near wear house | Fire control system Stage -1 |
| 3 No | E.S.P. | Unit -1 |
| 6 No | E.S.P. | Unit -2 |
| 4 No | LDO Tank | CHP |
| 4 No | Main crasher | CHP |
| 1 No | D M Plant | Stage -1 |
| 1 No | Near Compressor Room No-1 | Stage -1 |
| 1 No | Near Fire station | Stage -1 & 2 |
| 3 No | Near Gas plant | Stage -1 & 2 |
| 4 No | 8 mtr PA Fan | Stage -1 |
| 2 No | 13 mtr Chain Feeder | Stage -1 |
| 4 No | 18 mtr | Stage -1 |
| 2 No | 26 mtr | Stage -1 |
| 4 No | 30 mtr | Stage -1 |
| 4 No | Secondary Crasher | CHP |
| 1 No | Conveyor No -11 | CHP |
| 2 No | Near Coal Plant office | CHP |
| 4 No | Primary Crasher | CHP |
| 3 No | Conveyor No 14 &15 | CHP |
| 2 No | Wagon Tripler | CHP |
| 1No | Conveyor No 7 | CHP |
| 2 No | Elevator boiler side | Stage -1 |
| 1No | Main Gate Thermal | Stage -1 |

5.15 Isolative valve, deluge valve & water sprinkler installed near conveyor belts

| CONVEYOR BELT No | ISOLATIVE VALVE | Deluge valve | WATER SPRINKLER | Location |
| --- | --- | --- | --- | --- |
| 2 A & B | 6”= 1 No | 6” = 1 No | 130 No | CHP |
| 4 A & B | ----------- | ----------- | 2 27 No | CHP |
| 4A &B | 6”= 1 No | 6”= 1 No | ------- | CHP |
| 9 A & B | ----------- | ------------- | 154 No | CHP |
| 5 A & B | 6” = 2 No | 6” = 1 No | 220 No | CHP Conveyor Belt |
| 6 A & B | --------- | --------- | 232 No | 30Mtr. |
| 7 A & B | 6”= 1 No | 6” = 1 No | 272 No | CHP |
| 10 | 6”= 1 No | 6” = 1 No | 178 No | CHP |
| 11 | 6”= 1 No | 6” = 1 No | 98 No | CHP |
| 12 | --------- | --------- | 94 No | CHP |
| 14 | 6”= 1 No | 6” = 1 No | 220 Appr. | CHP |
| 15 | 6”= 1 No | 6” = 1 No | 92 No | CHP |
| 16 | ---------- | ------- | 90 No | CHP |

5.16 STAGE -1 PUMPs

| Sr.No | Name of Pump | Make of pump | Cap. | TYPE/Model | Suc. | Dis. | Location | Remarks |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | Emulsifier Pump | Flow More | 273m3/H | H - END SUC /5525 | 8” | 6” | D M Plant Stage-1 | Stage 1 |
| 2 | Fire Hydrant pump | Mathar & Platt | ------ | ------ | 8” | 6” | D M Plant Stage-1 | Stage 1 |
| 3 | Fire Hydrant/ Emulsifier Pump with Diesel Engine | Lyland / Mathar & Platt | ------ | ------ | 8” | 6” | D M Plant Stage-1 | Stage 1 |
| 4 | Fire Hydrant Booster Pump | Flow More | 171m3/hr | HES /5523 | 6” | 5’’ | In LDO Pump house Stage -1 | Stage 1 |
| 5 | Fire Hydrant Booster Pump | Flow More | 171m3/hr | HES /5523 | 6” | 5” | Diesel Gen. set No -1 | Stage 1 |
| 6 | Sump Pump | Flow More | 150m3/hr | V I S /5413AWS | 4” | 4” | -3.5mtr Basement | Stage -1 (Unit-1) |
| 7 | Sump Pump | Flow More | 35m3/hr | V I S /5412AWS | 2” | 2” | -3.5mtr Basement | Stage -1 (Unit-1) |
| 8 | Sump Pump | Kirloskar | --------- | ---------- | 2” | 2” | -3.5mtr Basement | Stage -1 (Unit-2) |
| 9 | Sump Pump | Flow More | 150m3/hr | V I S /5413AWS | 4” | 4” | -3.5mtr Basement | Stage -1 (Unit-2) |
| 10 | Sump Pump | Presicon | --------- | ---------- | 2” | 2” | D M Plant | Stage -1 |
| 11 | Cable Trench Sump pump | Presicon | --------- | ---------- | 2” | 2” | Near G T -1& 2 | Stage -1 |
| 12 | Cable Trench Sump pump | Presicon | --------- | ---------- | 2” | 2” | Sub station | 220/132KV S/S. |
| 13 | Cable Trench Sump pump | Kirlosker | --------- | ---------- | 2” | 2” | Sub station | 220/132KV S/S. |
| 14 | Cable Trench Section pump | Kirlosker |  |  | 4” | 4” | Sub Sation | 220/132KV S/S. |
| 15 | Cable Trench Sump pump | Kirlosker | --------- | ---------- | 2” | 2” | Cooling tower #1 | Stage -1 |
| 16 | Cable Trench Sump pump | Kirlosker | --------- | ---------- | 2” | 2” | Near ID Fan unit#1 | Stage -1 |
| 17 | Cable Trench Sump pump | Kirlosker | --------- | ---------- | 2” | 2” | Near AHP Stage-1 | Stage -1 |
| 18 | Cable Trench Sump pump | Kirlosker | --------- | ---------- | 2” | 2” | Near ID Fan unit#2 | Stage -1 |
| 19 | Cable Trench Sump pump | Kirlosker | --------- | ---------- | 2” | 2” | Near CHP Control Room | Stage -1 |
| 20 | Spray Pump –2 No | Chem flow | 165 m3/h | 6x4-9 | 6” | 4” | Near Wagon tippler | Stage 1&2 |
| 21 | Spray Pump –1 No | Kirlosker | --------- | --------- | 3” | 3” | Near Wagon tippler | Stage 1&2 |
| 22 | Spray Pump –1No | D S M3ME | --------- | ------- | 4” | 3” | Near Wagon tippler | Stage 1&2 |
| 23 | Submersible Pump No-1 | ------ | ------ | ------- | ---- | 4” | Near Wagon tippler | Stage 1&2 |

5.17 Fire booster Pumping Station electrical Panel in LDO Pump Room : 1 No

5.18 Fire booster Pumping Station electrical Panel in D G Room Stage -1 (Unit -1)

5.19 415/240v AC Distribution electrical Panel – 1 (CHP Control Room 1st floor)

5.20 Fire Panel 415/220v AC Distribution electrical Panel (Switch gear Unit -2)

5.21 Siren Control electrical Panel - 1 No in fire station Room

5.22 Annunciator Cum Control panel 1 No in fire station Room

**6. Control & Instrumentation Equipment**

**6.1 Distributed Control System (ABB Symphony)& annunciation system**

Open Loop/ Closed Loop & Measurement system of microprocessor based ABB makes Symphony System. DCS system having integrated facility of annunciation system of PROCON. Microprocessor based system includes various communication network, GPS clock system, Peripherals, LAN switches, Workstation, Servers, engineering station, Archiving station, Historian, Trends, Sequence of events. DCS System is called Melody and DAS is Maestro having CMC70 processor cards, Window 2000 Professional+sp4 based Engineering and Archiving stations. DAS is Maestro UX basic software version 2.6 C1-sp2 and Maestro UX operating system vrs HP-UX 10.20 ACE software installed.

1. Controller & Card Panels (ABB Make) : 7x2 No.
2. Relay Panels (ABB Make) : 7x2 No.
3. Terminations Panels (ABB Make) : 7x2 No.
4. Servers (HP B2600) : 2x2 No.
5. Operating Station Console : 6x2 No.
6. Annunciation Control Panels (PROCON) : 3x2 No.
7. GPS Clock Set (Hopf 7001) : 1x1 No.
8. Unit Control Panels : 5x2 No.
9. Annunciation Lamp Box (50 Windows) : 7x2 No.

| **Sr.No.** | **Details of equipment under DCS& annunciation** | **Unit-1 (Qty)** | **Unit-2 (Qty)** |
| --- | --- | --- | --- |
| **DCS SYSTEM** | | | |
| 1 | Controller CMC 70 | 14 | 14 |
| 2 | Analog Output Card (CAO10) | 28 | 28 |
| 3 | Analog Input Card (CAI20) | 19 | 19 |
| 4 | Binary Output Card (CBO10) | 75 | 75 |
| 5 | Binary Input Card (CBI20) | 71 | 70 |
| 6 | Temperature Input Card (CTI20) | 29 | 30 |
| 7 | Coupling modbus Interface Card (CCF10) | 1 | 1 |
| 8 | Interposing Relay, 5A, 220VAC Paramount | 533 | 535 |
| 9 | Interposing Relay, 24VDC Jyoti Ltd | 62 | 62 |
| 10 | Contactor, ABB AL9 40 00 | 24 | 20 |
| 11 | Isolator ICC321, 4-20mA | 7 | 26 |
| 12 | Isolator Radix SL 4P, 4-20mA | 6 | 6 |
| 13 | Relay ICR ABB 24VDC | 25 | 12 |
| 14 | Relay Jyoti Ltd 24VDC | 2 | 2 |
| 15 | Relay K11, Elesta, 24VDC | 15 | 15 |
| 16 | MCB C10,K10 ABB | 6 | 12 |
| 17 | Fuse 32mA | 16 | 16 |
| 18 | Engineering Station (Composer) | 1 | 1 |
| 19 | Maestro UX Server | 2 | 2 |
| 20 | Operating Station | 6 | 6 |
| 21 | Ethernet Switch | 4 | 4 |
| 22 | Archive PC | 1 | 1 |

| **Details of Power Supply Unit in DCS** | |
| --- | --- |
| **DC-DC Conversion in CS430** | No. of Nodes each units = 07 |
| No. of Supply Card CS430 in 1 Node = 02 |
| Total No. of CS430 Cards = 07\*02=14 |
| **Fuse and diagnostic Module CS 435** | No. of Nodes each units = 07 |
| No. of Supply Card CS435 in 1 Node = 01 |
| Total No. of CS430 Cards = 07x01=07 |

| **X-Terminals of Unit # 1** | | | |
| --- | --- | --- | --- |
| **S.No.** | **Type** | **Model** | **Qty** |
| 1 | MUX (New) | Dell - Model- D09U | 2 |
| 2 | NCD | NC900 | 1 |
| 3 | MUX | LXT03T | 3 |

|  | **X-Terminals of Unit # 2** | | | |
| --- | --- | --- | --- | --- |
|  | **S.No.** | **Type** | **Model** | **Qty** |
|  | 1 | MUX | LXT03T | 4 |
|  | 2 | NCD | NC900 | 2 |

| **Details of equipment on PROCON make Annunciation System** | | | |
| --- | --- | --- | --- |
| **Sr. No.** | **Item** | **Qty at #1** | **Qty at #2** |
| 1 | Power Supply Module | 4 | 4 |
| 2 | ARC Card | 4 | 4 |
| 3 | MPC Card | 2 | 2 |
| 4 | PRGV Card | 2 | 2 |
| 5 | PRGE Card | 4 | 4 |
| 6 | RPC Card | 6 | 6 |
| 7 | IPC Card | 40 | 40 |
| 8 | PAT | 40 | 40 |

| **Details of instruments on Unit Control Panel** | | | |
| --- | --- | --- | --- |
| **Sr. No.** | **Item** | **Qty at #1** | **Qty at #2** |
| 1 | Power Supply Module | 14 | 14 |
| 2 | LPC Card | 10 | 14 |
| 3 | LDC Card | 7 | 7 |
| 4 | RLC Card | 7 | 7 |
| 5 | Comc 2100 Card | 7 | 7 |
| 6 | Auto-Manual Station (AMS) (Masibus) | 24 | 24 |
| 7 | Bargraph (Masibus) | 24 | 24 |
| 8 | Recorder (Yokogawa) | 18 | 18 |
| 9 | Flow Meter Analog (Yokogawa) | 20 | 20 |
| 10 | Digital Indicator (Masibus) | 5 | 5 |
| 11 | Digital Indicator (Masibus) | 6 | 6 |
| 12 | Digital Scanner (Masibus) | 5 | 5 |
| 13 | Digital Recorder (Yokogawa) | 2 | 3 |
| 14 | Digital Recorder (Yokogawa) | 1 |  |
| 15 | Digital Analyzer (Marathon) | 2 | 2 |
| 16 | Level indicator (Levelstate) | 3 | 3 |
| 17. | Level Indicators for PC Bunkers | 3 | 4 |

**6.2 HP/LP BYPASS SYSTEM AND ANALYSERS**

| S/N | Description | Qty | | |
| --- | --- | --- | --- | --- |
| Unit-1 | Unit-2 | Total |
| 1 | Steam & Water Analysis System (SWAS) Consisting of:-  M/s Polymetorn Make Specific Conductivity Transmitter, PH Transmitter, Dissolve Oxygen Analyser, Silica Analyser, Sodium Analyser, Hydro Stat.  M/s Forbes Marshall make Conductivity Cell, Hotwell Conductivity Cell, Digital Panel Indicator.  M/s Juno Net make Ph Sensor. | 1 SET | 1 SET | 2 SETS |
| 2 | Continuous Emission Monitoring System Consisting of:-  M/s Codel make IR based Sox and Nox Analyser.  M/s Land Combustion & Codel make Dust Analyser.  M/s ABB make Oxygen Analyser. | 1 SET | 1 SET | 2 SETS |
| 3 | M/s ABB make H2 Purity Analyser. | 1 SET | 1 SET | 2 SETS |
| 4 | M/s CCI Switzerland Make HP/LP Bypass Control System having Control Panel with electronic modules along with field instruments. | 1 SET | 1 SET | 2 SETS |

| **S/N** | **Details of equipments under HP/LP bypass, analysers etc** | **Unit-1 (Qty)** | **Unit-2 (Qty)** |
| --- | --- | --- | --- |
| 1 | HP/LP Bypass card | 13 | 13 |
| 2 | Quint Power Supply | 4 | 4 |
| 3 | Positioner Electro Module | 6 | 6 |
| 4 | Touch Panel 10.4" | 1 | 1 |
| 5 | Position Feedback Transmitter | 9 | 9 |
| 6 | Pressure Switch of HP/LP oil Supply unit | 4 | 4 |
| 7 | Dust Monitor | NIL | NIL |
| 8 | Sox Nox Analyzer | 1 (Defective) | 1 (Defective) |
| 9 | H2 Purity Analyzer | 1 | 1 |
| 10 | O2 Analyzer | 2 (Defective) | 2 (Defective) |
| 11 | O2 Analyzer (For HI Temp) | 2 (Defective) | 2 (Defective) |
| 12 | Specific Conductivity Transmitter | 6 | 5 |
| 13 | Conductivity Cell | 6 | 6 |
| 14 | Hot Well Conductivity Cell | 2 | 2 |
| 15 | PH Transmitter | 5 | 5 |
| 16 | PH Sensor | 4 | 4 |
| 17 | Dissolve Oxygen Analyser | 2 | 2 |
| 18 | Digital Panel Indicator(DPI) | 13 | 12 |
| 19 | Silica Analyser | 1 | 1 |
| 20 | Sodium Analyser | 2 | 2 |
| 21 | Hydro Stat | 1 | 1 |
| 22 | H2 Purity Indicator | 1 | 1 |

**6.3 FLAME SCANNERS, IGNITORS, TRANSMITTERS, LEVEL SWITCHES**

**& FLOW METERS**

Oil gun igniter assembly make COEN Bharat Ltd 4x : 8 no

Flame scanner Panel (BCPL) : 1x2 No.

Junction Boxes : 50x2 No.

LIR Panels : 13x2 No.

LIE panels : 30x2 No.

| **S/N** | **Details of ITEM** | **Unit-1 (Qty)** | **Unit-2 (Qty)** |
| --- | --- | --- | --- |
| 1 | LEVEL SWITCH | 20 | 45 |
| 2 | Ash Level Indicator (EIP) | NIL | NIL |
| 3 | FLOWMETER | 4 | 4 |
| 4 | TRANSMITTER (Yokogawa) | 91 | 89 |
| 5 | FLAME SCANNERs with complete assembly | 12 | 12 |
| 6 | Intensity & Fault Detection Card | 12 | 12 |
| 7 | Frequency Detection card | 20 | 20 |
| 8 | Lamp & Meter Card | 20 | 20 |
| 9 | 2/4 Flame & fault Detection Card | 3 | 3 |
| 10 | 4 Channel Card | 3 | 3 |
| 11 | Supply card | 5 | 5 |
| 12 | Signal Isolator | NIL | 8 |

**6.4 PNEUMATIC DAMPER & VALVES**

C&I accessories on Pneumatic operator valves (Fisher, CCI Drag, IL, Vulcan Copes etc)

| **S/N** | **ITEM** | **Unit-1 (Qty)** | **Unit-2 (Qty)** |
| --- | --- | --- | --- |
| 1 | I/P | 8 | 61 |
| 2 | Positioner | 90 | 95 |
| 3 | Position Feedback Transmitter | 27 | 80 |
| 4 | Air Lock Relay | Nil | 28 |
| 5 | Solenoids | 15 | 28 |
| 6 | Solenoid Relay | 15 | 28 |
| 7 | Limit Switches | 33 | 32 |
| 8 | Actuators & Valves | 141 | 141 |

**6.5 PRESSURE GAUGES, SWITCHES & TEMPERATURE GAUGES SWITCHS, RTD & THERMOCOUPLES**

| **S/N** | **ITEM** | **Unit-1 (Qty)** | **Unit-2 (Qty)** |
| --- | --- | --- | --- |
| 1 | Pressure Switches | 71 | 123 |
| 2 | Common Pressure Switches | 111 | |
| 3 | Pressure Gauges | 367 | 167 |
| 4 | Temperature Gauges | 113 | 92 |
| 5 | Temperature Switches | 49 | 52 |
| 6 | Thermocouple | 163 | 103 |
| 7 | RTD | 55 | 58 |
| 8 | Controllers | 3 | 1 |

**6.6 TURBOVISIORY SYSTEM**

Having Philips sensors and Rockwell Automation (now Allen Bradley) modules and processing elements

| **S/N** | **ITEM** | **Unit-1 (Qty)** | **Unit-2**  **(Qty)** |
| --- | --- | --- | --- |
| 1 | Absolute Vib. Pick UP | 12 | 12 |
| 2 | Diff. Expansion Pick UPs | 3 | 3 |
| 3 | Axial Shift Pick UP | 1 | 1 |
| 4 | Eccentricity Pick UP | 2 | 3 |
| 5 | Eccentricity Pick UP | 1 | 2 |
| 6 | Total Expansion HPS,MPS | 2 | 3 |
| 7 | Driver for Diff. Expansion Pick UP | 3 | 3 |
| 8 | Driver For Eccentricity | 3 | 1 |
| 9 | Turbine Speed | 1 | 1 |
| 10 | Key Phasor | 1 | 2 |
| 11 | Driver for Turbine speed & Key Phasor | 2 | 6 |
| 12 | Power Supply(SPS020) | 6 | 4 |
| 13 | TSI Card | 18 | 18 |
| 15 | Power Supply Unit | 2 | 8 |
| 16 | Vibration Module | 8 | 1 |
| 17 | Axial Shift, Diff Expansion Module | 1 | 1 |
| 18 | TSI Module | 1 | 2 |
| 19 | Eccentricity Measure | 2 | 2 |
| 20 | R.P.M Measure | 2 | 15 |
| 21 | Isolated Converter | 15 | 5 |
| 22 | TSI Indicator | 4 | 1 |
| 23 | Turbine Speed Indicator | 1 | 1 |
| 24 | Recorder | 4 | 4 |

**6.7 Local Control Panel at site**

Two NO local panels each on Unit 1&2 for turbine and BFP site are installed with local instruments relating to turbine parameters such as Hp, MP,LP expansions lube oil temp , MW Indicator , speed, Flow indicators etc.

**6.8 Special Instruments**

Special flow meters for the measurement of LDO, FO and Dm flow, Secondary Air flow etc are installed at site.

**7. Electrical Equipment**

**7.1 Turbo Generator**

Type : TGH 30-2

Make : BHEL

Rated Speed : 3000 RPM

Rated KVA : 125000

110 MW Turbo Generator, 11.5KV, 6560 A, PF 0.88 ,50 Hz, 3 Phase, Double star, Hydrogen cooled, Stator water cooled, Insulation class – B, YOM 1970. Allied equipment like protection / metering CTs /PTs, Bus Ducts etc. is also installed.

**7.2 Excitation system**

Year of Installation : 2010-11

Excitation of the Generator is through excitation transformer directly connected to generator 11kv Stator voltage is tapped and stepped down to 280 v which is then rectified and controlled with the help of latest Digital Voltage regulation system of BHEl make (MAX DNA system) and fed to rotor through slip rings.

Hydrogen Driers:

Unit:1

Make : M/s JIndal Electronics

Model : JEL3TG40

Type : Refrigerated type

Location : Ground Floor (Turbine Side)

Unit 2

Cylindrical Dryer : 2 NO.

Diameter : 1365 mm

Height : 530 mm

Desicant : Silica Gel

**7.3 Transformers**

Generator Transformers , Unit Auxilliary Transfomer and Excitation Transformer are directly connected to

Generator : Rating

GT No 1 : 138 MVA, 11kv, 138 KV

GT No 2 : 125 MVA, 11kv, 138 KV

UAT

**7.4 Excitation Transformer**

BHEL make Static Excitation Equipment for nominal field current of 1320 A and nominal field voltage of 280 V, YOM-2010-11.Static excitation T/F: BHEL MAKE, Dry type cast resin transformer 1500 KVA, Standard generally to IVS 11171:1985, 3-Phase, 50Hz,HV-11000 volt/LV

-570Volts,Rated current HV- 78.73A, Rated current LV- 1519.3A.

**7.5 Synchronization**

Both units generate power at 11kv voltage which is stepped upto132 Kv by Generator Transformers installed at each unit and is synchronized to 132 KV grid through SF6 breaker.

**7.6 6.6 Kv Switchgear:**

**Unit Buses**

In 6.6 kv Switchgears , two no Unit buses A&B are fed through Unit Auxiliary Transformers(UATs) .All the Breakers (23 each for Unit 1&2 ) installed in 6.6KV switchgears are Vacuum Circuit Breakers (VCB ) of Schneider make (year of commissioning 2012) with rating 1250 A &1600 A DC voltage 220V DC . The feeders for auxiliaries PA Fan (2), ID fan (2), FD fan (2), BFP (1+1standby) , Coal Mills 3 , Vapour Fan (3 ) , CEP(3) , CW pump (2), HP pump, ESP T/F, UAT, Unit Service T/F , Ash Handling T/F and PT panels are also connected on 6.6 kV buses.

Total no. of VCB

Capacity 1250A 22+22 =44

1600A 2+2 =4

Allied equipments like protection/metering CTs /PTs, Bus Ducts and latest protection relays of Numeric type and static etc is also installed .

**Station Bus:**

2 no. Station Bus fed C1A & C1B are fed through Station Transformer. All the Breakers installed are VCB type of Schneider make (year of commissioning 2012) with rating 1250 A & 1600 A. The breakers are C1A-1A , Station Service Transformer –A, C1A-2A , Incomer , CW pump , ESP T/F B , HP pump No 1 , Tie C1A-CIIA, Station Service T/F B , C1B to CHP, Ash Handling T/F dry system, Incomer C1B, CB to 2B, ESP T/F C , Tie C1B –CIIB , C1B to Unit bus 1B.

Total No of VCB =16

Capacity

1600A = 3+3=6

1250A = 5+5=10

**7.7 DG Set**

Diesel Engine set stage-1 Make: Kirloskar Electric, 1000 RPM, 310 KVA, 3 Phase, PF 0.88, AC Volts 433V, AC Amp 414

Type: NTA-855 HP 372

**7.8 Detail of ESP (Electrical Part) for Stage 1**

Type of ESP : FAA-7X37.5H-96-125-A2

No. of ESP per Boiler : 1

No. of Gas Path per boiler : 2

No. of Fields in each gas path : 7

Total no. of Fields : 28

Total no. of Collecting/Rapping Gears: 28

Height of Collecting Electrodes : 12.50 m

Specific Collecting Area : 231.9m2/m3/sec

ESP is dry type and consists of 2 Gas Paths each having 7 fields (Totaling 14 fields) for each unit and so have total of 28 fields for the 2 units of Stage-1. ESP’s are fed through 3 no. (1 no. standby) 6.6 KV, 1000 KVA Transformers, 28 No. Ador Powertron Ltd. HVRs of 70 KV DC output are installed for giving supply to stage-1 fields (Unit 1 & 2). The voltage is suitably rectified and controlled through semi pulse controllers model EPIC-II of Alstom make.

EPIC Controller+RTU --------- NIL

**7.9 LT switchgear consists of 415 LT buses named**

-USSG (Unit service switchgear ) fed from unit service transformer

- SSSG (Station Service Switcgear ) A&B fed from Station Service T/F

-Emergency bus fed from Station service buses/Unit Service bus/ DG set.

- CWP House Switch gear

- DM plant Switchgear

- CHP Switchgear

- ESP Switchgear

Besides above LT switchgears and MCCs of Boiler valves, Soot Blowers and turbine valves are installed. All LT auxiliaries as mentioned in Annexure-D are run through feeder connected to these switchgear. Details of Modules installed in Stage-1 is as per Annexure –D.

Allied equipment like CTs/PTs, Bus ducts and adequate protection relays are also installed.

**7.10 HT and LT Motors**

As per Annexure-A

**7.11 Backup Supply**

**i) +24 V Battery Charger** of Chhabi make (one for each Unit) with current rating : 84 A , 29 V Dc

Battery Bank: +24V, 600 AH, 04 Set (2 Set for each Unit) Exide make 2006 installation year and no. of cells 13

**ii) 220 V Battery charge**r (1 set for each unit): HIRECT make with capacity

60/31KVA and rated voltage 415 V ±10%

Battery Bank: 220 V, 600 AH Capacity, 02(1 for each unit)

Exide make with 110 Cell

Year of installation : 2014 & 2017

**iii) UPS Supply**

2x45 KVA UPS of HIREL make (1 for each unit) with rated voltage

415/230 Volt AC.

Battery bank of Exide make (1 for each Unit) with 180 cell of capacity 300 AH and Year of installation: 2005/2006.

**7.12 LIGHTING POINT DETAILS**

70 W Sodium vapour / metal halide lamp : 1490 no

250 W Sodium vapour / metal halide lamp : 190 no

2X36W Fluorescent tube light : 216 no

1X36 w Fluorescent tube light : 10 no

**DC light:**

2X28 W tube light fittings : 36 no

28 W tube light fittings : 30 no

**Annexure -A**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Details of L T MOTORS of Stage-1 Units with Location** | | | | | | | | | | | | | | | | | |  |
| **T.G. HALL (UNIT -1)** | | | | | | | | | | | | | | | | | |  |
| **SR. NO.** | **DESCRIPTION** | | **MAKE** | | **QTY.** | | | **RATING (KW) (HP)** | | | | **RPM** | | **BEARING NO.** | | |  | |
| 1 | CONDSTATE BOOSTER PUMP | | SIEMENS | | 2 | | | 55 | | 75 | | 1475 | | 316 | | |  | |
| 2 | B.C.W | | CROMPTON GREAVES | | 3 | | | 45 | | 60 | | 1475 | | 6313 | | |  | |
| 3 | HYDROGEN COOLER BOOSTER PUMP | | KIRLOSKAR | | 2 | | | 18.5 | | 25 | | 1470 | | 6309 | | |  | |
| 4 | SUMP PUMP | | SIEMENS | | 1 | | | 15 | | 20 | | 1455 | | 6306 | | |  | |
| 5 | SUMP PUMP | | KIRLOSKAR | | 1 | | | 3.7 | | \_\_\_ | | 1450 | | 6205 | | |  | |
| 6 | MOT EX. FAN | | MEZ | | 1 | | | 0.8 | | \_\_\_ | | 1360 | | 6304 | | |  | |
| 7 | CHIMNEY STEAM EXU. FAN | | HBB | | 2 | | | 5.5 | | 7.5 | | 2800 | | 6306Z | | |  | |
| 8 | STATION AIR COMP. | | KIRLOSKAR | | 2 | | | 75 | | 100 | | 1475 | | 6319 | | |  | |
| 9 | AIR WASHER PUMP | | CROMPTON GREAVES | | 3 | | | 18 | | 25 | | 1450 | | N210 | | |  | |
| 10 | AIR WASHER BLOWER | | CROMPTON GREAVES | | 2 | | | 45 | | 60 | | 1475 | | N217 | | |  | |
| 11 | S.O.P MOTOR | | KIRLOSKAR | | 2 | | | 95 | | \_\_\_ | | 1440 | | N321 | | |  | |
| 12 | JACKING OIL PUMP | | MEZ | | 1 | | | 30 | | 40 | | 1460 | | 6410 | | |  | |
| 13 | BARRING GEAR MOTOR | | MEZ | | 1 | | | 30 | | 40 | | 1460 | | 6410 | | |  | |
| 14 | AIR COMPRESSOR | | CROMPTON GREAVES | | 1 | | | 37 | | 50 | | 1475 | | \_\_\_ | | |  | |
| 15 | E.O.P (DC) | | KIRLOSKAR | | 1 | | | 8.3 | | 11.4 | | 1465 | | 6307 | | |  | |
| 16 | E.O.P (AC) | | N.G.E.F | | 1 | | | 9.3 | | 12.5 | | 1460 | | 6310 | | |  | |
| 17 | AUX. OIL PUMP | | CON HBG | | 2 | | | 4 | | 5.5 | | 1450 | | 6306 | | |  | |
| 18 | M.S.O.P (DC) | | MEZ | | 1 | | | 4.8 | | \_\_\_ | | 700 | | 6310 | | |  | |
| 19 | M.S.O.P (AC) | | MEZ | | 1 | | | 7 | | 9.5 | | 730 | | 6310 | | |  | |
| 20 | VACUUM OIL PUMP | | MEZ | | 1 | | | 7 | | 9.5 | | 730 | | 6310 | | |  | |
| 21 | CENTRIFUGAL PUMP | | CROMPTON GREAVES | | 1 | | | 7.5 | | 10 | | 1440 | | \_\_\_ | | |  | |
| 22 | A.O.T PUMP | | CROMPTON GREAVES | | 1 | | | 5.5 | | 7.5 | | 935 | | 6205 | | |  | |
| 23 | DIRTY OIL PUMP | | CROMPTON GREAVES | | 1 | | | 5.5 | | 7.5 | | 1440 | | 6208 | | |  | |
| 24 | CLEAN OIL PUMP | | CROMPTON GREAVES | | 1 | | | 2.2 | | 3 | | 950 | | 6208 | | |  | |
| 25 | L.P H.P BYPASS MOTOR | | BROWN BOVERI | | 2 | | | 7.5 | | 10 | | 1450 | | 6038 | | |  | |
| 26 | I.N LABELWALL MOTOR | | SIEMENS | | 4 | | | 1.5 | | 2 | | 1410 | | 6205 | | |  | |
| 27 | WATER FLY PUMP | | SIEMENS | | 4 | | | 1.5 | | 2 | | 1410 | | 6205 | | |  | |
| **BOILER MOTORS (UNIT -1)** | | | | | | | | | | | | | | | |  | | |
| **SR. NO.** | **DESCRIPTION** | | **MAKE** | | **QTY.** | | | **RATING (KW) (HP)** | | | | **RPM** | | **BERRING NO.** | | |  | |
| 1 | COLLECTING ELECTRODES MOTOR | | BHARAT BIJLEE | | 14 | | | 0.26 | | 0.35 | | 1380 | | \_\_\_ | | |  | |
| 2 | EMMITING ELECTRODES MOTOR | | BHARAT BIJLEE | | 14 | | | 0.37 | | \_\_\_ | | 1380 | | \_\_\_ | | |  | |
| 3 | SILO BLOWER PUMP | | N.G.E.F | | 2 | | | 45 | | 60 | | 980 | | N318 | | |  | |
| 4 | SCANNER AIR FAN (AC) | | CROMPTON GREAVES | | 1 | | | 7.5 | | 10 | | 2910 | | 6309ZZ | | |  | |
| 5 | SCANNER AIR FAN (DC) | | CROMPTON GREAVES | | 1 | | | 7.5 | | \_\_\_ | | 2900 | | 6309 | | |  | |
| 6 | CLINKER GRINDER | | SIEMENS | | 2 | | | 5.5 | | \_\_\_ | | 1450 | | 6208 | | |  | |
| 7 | GEAR LOP MOTOR FOR COAL MILL | | KIRLOSKAR | | 6 | | | 2.2 | | \_\_\_ | | 1400 | | 6206 | | |  | |
| 8 | LOP MOTOR FOR COAL MILL | | CROMPTON GREAVES | | 3 | | | 1.1 | | \_\_\_ | | 1380 | | \_\_\_ | | |  | |
| 9 | COMMON LOP MOTOR | | CROMPTON GREAVES | | 1 | | | 1.1 | | \_\_\_ | | 1380 | | \_\_\_ | | |  | |
| 10 | R C CHAIN FEEDER | | SIEMENS | | 3 | | | 9.3 | | \_\_\_ | | 1450 | | 6209 | | |  | |
| 11 | R C BUNKER GATE MOTOR | | CROMPTON GREAVES | | 12 | | | 2.2 | | 3 | | 1450 | | 6306 | | |  | |
| 12 | P.C FEEDER MOTOR | | BAUER | | 16 | | | 3.7 | | \_\_\_ | | 1420 | | 6208 | | |  | |
| 13 | LOP MOTOR FOR VAPOUR FAN MOTOR | | KIRLOSKAR | | 3 | | | 0.75 | | \_\_\_ | | 1440 | | 6305 | | |  | |
| 14 | TURNIKIT MOTOR | | KIRLOSKAR | | 3 | | | 2.2 | | 3 | | 1440 | | 6306 | | |  | |
| 15 | BLOWER (ESP) | | SIEMENS | | 2 | | | 18.5 | | 34 | | 1463 | | \_\_\_ | | |  | |
| 16 | VACUUM MOTOR NEAR ID FAN | | CROMPTON GREAVES | | 6 | | | 75 | | 100 | | 1480 | | 6318 | | |  | |
| **TG side Unit-2**   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **SR. NO.** | | **DESCRIPTION** | **MAKE** | | **QTY.** | | **RATING (KW) (HP)** | | | | **RPM** | | **BERRING NO.** | | | | 1 | | CONDSTATE BOOSTER PUMP | SIEMENS | | 2 | | 55 | | 75 | | 1475 | | 316 | | 6314 | | 2 | | B.C.W | CROMPTON GREAVES | | 3 | | 45 | | 60 | | 1475 | | 6313 | | 6313 | | 3 | | HYDROGEN COOLER BOOSTER PUMP | KIRLOSKAR | | 2 | | 18.5 | | 25 | | 1470 | | 6309 | | 6310 | | 4 | | SUMP PUMP | ABB | | 1 | | 15 | | 20 | | 1455 | | 6306 | | \_\_\_ | | 5 | | SUMP PUMP | KIRLOSKAR | | 1 | | 3.7 | | \_\_\_ | | 1450 | | 6205 | | \_\_\_ | | 6 | | MOT EX. FAN | MEZ | | 1 | | 0.8 | | \_\_\_ | | 1360 | | 6304 | | 6302 | | 7 | | CHIMNEY STEAM EXU. FAN | ABB | | 2 | | 5.5 | | 7.5 | | 2800 | | 6306Z | | 6306Z | | 8 | | STATION AIR COMP. | KIRLOSKAR | | 2 | | 75 | | 100 | | 1475 | | 6319 | | \_\_\_ | | 9 | | AIR WASHER PUMP | CROMPTON GREAVES | | 3 | | 18 | | 25 | | 1450 | | N210 | | 6210 | | 10 | | AIR WASHER BLOWER | CROMPTON GREAVES | | 2 | | 45 | | 60 | | 1475 | | N217 | | 6217 | | 11 | | S.O.P MOTOR | KIRLOSKAR | | 2 | | 95 | | 129 | | 1440 | | N321 | | 6319 | | 12 | | JACKING OIL PUMP | MEZ | | 1 | | 30 | | 40 | | 1460 | | 6410 | | 6413 | | 13 | | BARRING GEAR MOTOR | MEZ | | 1 | | 30 | | 40 | | 1460 | | 6410 | | 6413 | | 14 | | AIR COMPRESSOR | CROMPTON GREAVES | | 1 | | 37 | | 50 | | 1475 | | \_\_\_ | | \_\_\_ | | 15 | | E.O.P (DC) | KIRLOSKAR | | 1 | | 8.3 | | 11.4 | | 1465 | | 6307 | | 6307 | | 16 | | E.O.P (AC) | N.G.E.F | | 1 | | 9.3 | | 12.5 | | 1460 | | 6310 | | 6310 | | 17 | | AUX. OIL PUMP | CONZ | | 2 | | 4 | | 5.5 | | 1450 | | 6306 | | 6206 | | 18 | | M.S.O.P (DC) | MEZ | | 1 | | 4.8 | | \_\_\_ | | 700 | | 6310 | | 6307 | | 19 | | M.S.O.P (AC) | MEZ | | 1 | | 7 | | 9.5 | | 730 | | 6310 | | 6308 | | 20 | | VACUUM OIL PUMP | MEZ | | 1 | | 7 | | 9.5 | | 730 | | 6310 | | 6308 | | 21 | | CENTRIFUGAL PUMP | CROMPTON GREAVES | | 1 | | 7.5 | | 10 | | 1440 | | \_\_\_ | | \_\_\_ | | 22 | | A.O.T PUMP | CROMPTON GREAVES | | 1 | | 5.5 | | 7.5 | | 935 | | 6205 | | 6205 | | 23 | | DIRTY OIL PUMP | CROMPTON GREAVES | | 1 | | 5.5 | | 7.5 | | 1440 | | 6208 | | 6208 | | 24 | | CLEAN OIL PUMP | CROMPTON GREAVES | | 1 | | 2.2 | | 3 | | 950 | | 6208 | | 6208 | | 25 | | L.P H.P BYPASS MOTOR | BROWN BOVERI | | 2 | | 7.5 | | 10 | | 1450 | | 6038 | | 6307 | | 26 | | INLET BUTTER FLY VALVE MOTOR | SIEMENS | | 4 | | 1.5 | | 2 | | 1410 | | 6205 | | 6205 | | 27 | | OULET BUTTER FLY VALVE MOTOR | SIEMENS | | 4 | | 1.5 | | 2 | | 1410 | | 6205 | | 6205 | | **BOILER SIDE Unit-2** | | | | | | | | | | | | | | | | | **SR. NO.** | **DESCRIPTION** | | | **MAKE** | | **QTY.** | | **RATING (KW) (HP)** | | | | **RPM** | | **BERRING NO.** | | | 1 | COLLECTING ELECTRODES MOTOR | | | BHARAT BIJLEE | | 14 | | 0.26 | | 0.35 | | 1380 | | \_\_\_ | \_\_\_ | | 2 | EMMITING ELECTRODES MOTOR | | | BHARAT BIJLEE | | 14 | | 0.37 | | \_\_\_ | | 1380 | | \_\_\_ | \_\_\_ | | 3 | SILO BLOWER PUMP | | | N.G.E.F | | 2 | | 45 | | 60 | | 980 | | N318 | 6318 | | 4 | SCANNER AIR FAN (AC) | | | CROMPTON GREAVES | | 1 | | 7.5 | | 10 | | 2910 | | 6309ZZ | 6209 | | 5 | SCANNER AIR FAN (DC) | | | CROMPTON GREAVES | | 1 | | 7.5 | | \_\_\_ | | 2900 | | 6309 | 6309 | | 6 | CLINKER GRINDER | | | SIEMENS | | 2 | | 5.5 | | \_\_\_ | | 1450 | | 6208 | 6208 | | 7 | GEAR LOP MOTOR FOR COAL MILL | | | KIRLOSKAR | | 6 | | 2.2 | | \_\_\_ | | 1400 | | 6206 | \_\_\_ | | 8 | LOP MOTOR (COAL MILL) | | | CROMPTON GREAVES | | 3 | | 1.1 | | \_\_\_ | | 1380 | | \_\_\_ | \_\_\_ | | 9 | COMMON LOP MOTOR (COAL MILL) | | | CROMPTON GREAVES | | 1 | | 1.1 | | \_\_\_ | | 1380 | | \_\_\_ | \_\_\_ | | 10 | R C CHAIN FEEDER | | | SIEMENS | | 3 | | 9.3 | | \_\_\_ | | 1450 | | 6209 | 6209 | | 11 | R C BUNKER GATE MOTOR | | | CROMPTON GREAVES | | 12 | | 2.2 | | 3 | | 1450 | | 6306 | 6306 | | 12 | P.C FEEDER MOTOR | | | BAUER | | 16 | | 3.7 | | \_\_\_ | | 1420 | | 6208 | 6306 | | 13 | LOP MOTOR (VAPOUR FAN) | | | KIRLOSKAR | | 3 | | 0.75 | | \_\_\_ | | 1440 | | 6305 | \_\_\_ | | 14 | TURNIKIT MOTOR | | | KIRLOSKAR | | 3 | | 2.2 | | 3 | | 1440 | | 6306 | 6306 | | 15 | BLOWER (ESP) | | | SIEMENS | | 2 | | 18.5 | | 34 | | 1463 | | \_\_\_ | \_\_\_ | | 16 | VACUUM MOTOR NEAR ID FAN | | | CROMPTON GREAVES | | 6 | | 75 | | 100 | | 1480 | | 6318 | 6318 |   **ASH HANDLING PLANT (STAGE -I) (LT COMMON)** | | | | | | | | | | | | | | | |  | | |
| **SR. NO.** | | **DESCRIPTION** | | **MAKE** | | **QTY.** | **RATING (KW) (HP)** | | | | **RPM** | | **BERRING NO.** | | | |  | |
| 1 | | L.P. WATER PUMP | | N.G.E.F | | 2 | 120 | | 165 | | 1475 | | N320 | | 6320 | |  | |
| 2 | | ASH SLURRY PUMP | | N.G.E.F | | 4 | 110 | | 150 | | 980 | | N322 | | 6322 | |  | |
| 3 | | SEAL WATER PUMP | | N.G.E.F | | 2 | 30 | | 40 | | 1465 | | N313 | | 6313 | |  | |
| **DM PLANT (STAGE -I) (LT COMMON)** | | | | | | | | | | | | | | | |  | | |
| **SR. NO.** | | **DESCRIPTION** | | **MAKE** | | **QTY.** | **RATING (KW) (HP)** | | | | **RPM** | | **BERRING NO.** | | | |  | |
| 1 | | ALUM DOZING PUMP | | POWER MASTER | | 3 | 0.75 | | \_\_\_ | | 1425 | | 6305 | | 6304 | |  | |
| 2 | | SERVICE WATER PUMP | | CROMPTON GREAVES | | 3 | 15 | | 20 | | 1440 | | 6210 | | 6210 | |  | |
| 3 | | DEGASSER WATER PUMP | | CROMPTON GREAVES | | 2 | 7.5 | | 10 | | 2935 | | 6208 | | 6208 | |  | |
| 4 | | DEGASSER WATER PUMP | | SIEMENS | | 1 | 22 | | 30 | | 1460 | | 6310 | | 6310 | |  | |
| 5 | | BLOWER FOR DEGGESSER | | CROMPTON GREAVES | | 2 | \_\_\_ | | 2 | | 2830 | | 6505 | | 6205 | |  | |
| 6 | | RECIRCULATION WATER BOOSTER PUMP MOTOR | | CROMPTON GREAVES | | 2 | 5.5 | | 7.5 | | 2865 | | 6208 | | 6208 | |  | |
| 7 | | DM TRANSFER WATER PUMP | | CROMPTON GREAVES | | 2 | 5.5 | | 7.5 | | 2865 | | 6208 | | 6208 | |  | |
| 8 | | CLARIFY WATER PUMP | | CROMPTON GREAVES | | 2 | 5.5 | | 7.5 | | 2865 | | 6208 | | 6208 | |  | |
| 9 | | PORTABLE WATER SUPPLY PUMP | | CROMPTON GREAVES | | 2 | 3.25 | | 5 | | 2850 | | 6306 | | 6306 | |  | |
| 10 | | RAW WATER SUPPLY PUMP 1 | | KIRLOSKAR | | 1 | 9.3 | | 12.5 | | 2900 | | \_\_\_ | | \_\_\_ | |  | |
| 11 | | RAW WATER SUPPLY PUMP 2 | | KIRLOSKAR | | 1 | 11 | | 15 | | 2900 | | \_\_\_ | | \_\_\_ | |  | |
| 12 | | POLY PUMP MOTOR | | CROMPTON GREAVES | | 1 | 0.75 | | \_\_\_ | | 1440 | | 6203 | | 6203 | |  | |
| 13 | | BACK WASH PUMP | | CROMPTON GREAVES | | 2 | 3.25 | | 5 | | 2850 | | 6306 | | 6306 | |  | |
| 14 | | SUMP PUMP MOTOR | | KIRLOSKAR | | 1 | 2.2 | | 3 | | 1450 | | 6306 | | 6306 | |  | |
| 15 | | ALUM PREPRATION TANK AGITATOR MOTOR | | KIRLOSKAR | | 1 | 1.5 | | 2 | | 700 | | 6306 | | 6306 | |  | |
| 16 | | CLARIFY BRIDGE MOVING MOTOR | | KIRLOSKAR | | 2 | 1.2 | | 2 | | 700 | | \_\_\_ | | \_\_\_ | |  | |
| 17 | | CLARIFY BRIDGE STI MOTOR | | KIRLOSKAR | | 4 | 0.75 | | 1 | | 710 | | 6306 | | 6306 | |  | |
| 18 | | BLOWER FOR MIXED BED UNIT MOTOR | | CROMPTON GREAVES | | 1 | 5 | | 7.5 | | 1430 | | 6208 | | 6208 | |  | |
| 19 | | DM TRANSFER PUMP 1 | | CROMPTON GREAVES | | 1 | \_\_\_ | | 25 | | 1450 | | \_\_\_ | | \_\_\_ | |  | |
| 20 | | DISPOSAL WATER PUMP MOTOR 1 | | N.G.E.F | | 1 | 55 | | 75 | | 1470 | | \_\_\_ | | \_\_\_ | |  | |
| 21 | | DISPOSAL WATER PUMP MOTOR 2 | | N.G.E.F | | 1 | 37 | | 50 | | 1400 | | \_\_\_ | | \_\_\_ | |  | |
| 22 | | MULSIFIRE PUMP - 4 | | CROMPTON GREAVES | | 1 | 110 | | 150 | | 1488 | | \_\_\_ | | \_\_\_ | |  | |
| 23 | | FIRE HYDRANT MOTOR | | SIEMENS | | 2 | 75 | | \_\_\_ | | 2970 | | N314 | | 6313 | |  | |
| **DOZING ROOM (STAGE -I) (LT COMMON)** | | | | | | | | | | | | | | | |  | | |
| **SR. NO.** | | **DESCRIPTION** | | **MAKE** | | **QTY.** | **RATING (KW) (HP)** | | | | **RPM** | | **BERRING NO.** | | | |  | |
| 1 | | PHOSPHATE PUMP | | BHARAT BIJLEE | | 3 | 1.5 | | 2 | | 1415 | | 6205ZZ | | 6205ZZ | |  | |
| 2 | | MORPHILINE PUMP | | BHARAT BIJLEE | | 3 | 0.37 | | 0.50 | | 1380 | | 6202ZZ | | 6202ZZ | |  | |
| 3 | | HYDRAZINE PUMP | | POWER MASTER | | 3 | 0.25 | | 0.33 | | 1425 | | 6203Z | | 6203Z | |  | |
| **C W PUMP HOUSE (STAGE -I) (LT COMMON)** | | | | | | | | | | | | | | | |  | | |
| **SR. NO.** | | **DESCRIPTION** | | **MAKE** | | **QTY.** | **RATING (KW) (HP)** | | | | **RPM** | | **BERRING NO.** | | | |  | |
| 1 | | SEAL WATER PUMP | | KIRLOSKAR | | 2 | 9.3 | | 12.5 | | 2900 | | 6309 | | 6309 | |  | |
| 2 | | SEAL WATER PUMP | | ABB | | 1 | 5.5 | | 7.5 | | 1460 | | \_\_\_ | | \_\_\_ | |  | |
| 3 | | CRANE MAIN HOIST MOTOR | | CROMPTON GREAVES | | 1 | \_\_\_ | | 25 | | 960 | | \_\_\_ | | \_\_\_ | |  | |
| 4 | | CRANE LONG TRAVEL MOTOR | | CROMPTON GREAVES | | 1 | \_\_\_ | | 3 | | 910 | | \_\_\_ | | \_\_\_ | |  | |
| 5 | | CRANE SHORT TRAVEL MOTOR | | CROMPTON GREAVES | | 1 | \_\_\_ | | 1.5 | | 900 | | \_\_\_ | | \_\_\_ | |  | |
| 6 | | CABLE MAIN HOLE SUMP PUMP | | KIRLOSKAR | | 1 | 2.2 | | 3 | | 950 | | 6306ZZ | | 6306ZZ | |  | |
| 7 | | INTAKE WATER PUMP | | \_\_\_ | | 3 | 45 | | \_\_\_ | | 930 | | N217 | | 6217 | |  | |
| 8 | | SUMP PUMP MOTOR | | \_\_\_ | | 1 | 2.2 | | 3 | | 1430 | | 6206 | |  | |  | |
| **INSTRUMENT AIR COMP. (STAGE -I) (LT COMMON)** | | | | | | | | | | | | | | | |  | | |
| **SR. NO.** | | **DESCRIPTION** | | **MAKE** | | **QTY.** | **RATING (KW) (HP)** | | | | **RPM** | | **BEARING NO.** | | | |  | |
| 1 | | AIR COMPRESSOR  Spare motor | | Crompton | | 1 | 75 | | 100 | | 1430 | | 6318C3 | | 6318C3 | |  | |
| 2 | | AIR COMPRESSOR Motor | | SIEMENS | | 4 | 75 | | 100 | | 1485 | | 6317C3 | | 6317C3 | |  | |
| 3 | | EX.FAN MOTOR FOR COOLING TOWERS | | CROMPTON GREAVES | | 2 | 2.2 | | \_\_\_ | | \_\_\_ | | \_\_\_ | | \_\_\_ | |  | |
| 4 | | AIR BLOWER | | SIEMENS | | 4 | 2.2 | | \_\_\_ | | 1435 | | 6206ZZ | | 6206ZZ | |  | |
| 8 | | CRANE MAIN &AUX HOIST MOTOR | | KEC | | 1 | 45 | | 60 | | 980 | | \_\_\_ | | \_\_\_ | |  | |
| 9 | | CRANE LONG TRAVEL MOTOR | | KEC | | 1 | 30 | | 40 | | 970 | | \_\_\_ | | \_\_\_ | |  | |
| 10 | | CRANE SHORT TRAVEL MOTOR | | KEC | | 1 | 11 | | 15 | | 970 | | \_\_\_ | | \_\_\_ | |  | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UCB AC Plant Motors**   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **SR. NO.** | **DESCRIPTION** | **MAKE** | **QTY.** | **RATING (KW) (HP)** | | **RPM** | | 1. | AIR COMPRESSOR Motor | CROMPTON GREAVES | 3 | 45 |  | 1475 | | 2 | AIR HANDLING MOTORS | CROMPTON GREAVES | 3 | 11 | 15 | 1400 | | 3 | CHILLER PUMP MOTOR | CROMPTON GREAVES | 3 | 7.5 |  | 1455 | | 4 | COND. WATER MOTOR | CROMPTON GREAVES | 3 | 7.5 |  | 1455 | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **List of HT Motors Stage-I** | | | | |
| **S/N** | **Service** | **Make** | **Rating KW** | **Qty.** |
| 1 | BFP | BHEL | 3500 | 5 |
| 2 | CW PUMP | BHEL | 800 | 6 |
| 3 | CEP | BHEL | 200 | 6 |
| **S/N** | **Service** | **Make** | **Rating KW** | **Qty.** |
| 4 | HP PUMP | CG | 350 | 4 |
| 5 | COAL MILL | BHEL | 630 | 8 |
| 6 | VAP FAN | BHEL | 370 | 8 |
| 7 | PA FAN | BHEL | 230 | 5 |
| 8 | ID FAN | BHEL | 725 | 5 |
| 9 | FD FAN | BHEL | 425 | 5 |

**Annexure-B**

**1. Generator Protection (Each for Unit no. 1&2)**

Detail of Protections installed on Generator, Generator Transformer, UATs :

| **S/N** | **Description of Protection** | **MAKE** | **MODEL** | |
| --- | --- | --- | --- | --- |
| **GENERATOR PROTECTIONS** | | | | |
| 1 | **NUMERICAL GENERATOR PROTECTION RELAY**  **Main I &II**  Generator Differential Protection  Pole slip  Reverse Power  Low Forward Power Protection  Stator Earth Fault Protection  Loss of Excitation  Inter turn fault  Dead Machine  Negative Phase Sequence  Under/Over Frequency Protection  Over flux Protection  Back-Up Impedance | ABB | REG316\*4 | |
| 2 | Generator Differential Protection overall (87 O) | ABB | RET316\*4 | |
| 3 | Generator O/C 50/51 | ABB | SPAJ140C | |
| 4 | Rotar Earth Fault | VME | VMESPECIBF325F | |
| **2.UAT PROTECTIONS(Each for Unit no. 1&2)** | | | |
| 1 | UAT Overcurrent Protection (50/51UAT) | ABB | SPAJ140C | |
| 2 | UAT Differential Protection (87UAT) | ABB | REG316\*4 | |

#### 3. PROTECTIONS ON 6.6KV Auxiliaries

| 1 | Aux. Transformer protection | AREVA | P111 | 19 nos |
| --- | --- | --- | --- | --- |
| 2 | Motor Feeder Protection | AREVA | P211 | Nil |
| 3 | Incomers/UAT Incomers | AREVA | P127 | 6 nos |

**Annexure - C**

Detail of Transformers installed in for Stage-1

| **SR.**  **NO.** | **DESCRIPTION OF TRANSFORMERS** | **Make** | **CAPACITY** | **INCOMING SUPPLY**  **VOLTAGE** | **OUTGOING SUPPLY**  **VOLTAGE** | **TOTAL QTY.** |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | Generator Transformers No.-1 | BHEL | 138MVA | 11 KV | 138KV | 01 |
| 2 | Generator Transformers No.-2 | BHEL | 125 MVA | 11 KV | 138KV | 01 |
| 3 | Unit Auxiliary Transformer No-1 | Emco | 16 MVA | 11KV | 07KV | 01 |
| 4 | Unit Auxiliary Transformer No-2 | NEI | 5 MVA | 11 KV | 07KV | 01 |
| 5 | Station Transformer No-1 | Crompton | 22.5 MVA | 132 KV | 07KV | 01 |
| 6. | Unit Service Transformer No-1 | Martin Burn | 1 MVA | 6.6 KV | 433 V | 01 |
| 7 | Unit Service Transformer No-2 | Andrew Yole | 1 MVA | 6.6 KV | 433 V | 01 |
| 8 | Station Service Transformer No-1 | Nucom | 1 MVA | 6.6KV | 433V | 01 |
| 9 | Station Service Transformer No-2 | Nucom | 1.6 MVA | 6.6KV | 433V | 01 |
| 10 | Ash Handling Transformers | ECE | 1.6MVA | 6.6KV | 433V | 03 |
| 11 | ESP Transformers | Andrew Yole/ Emco | 1 MVA | 6.6KV | 433V | 03 |
| 12 | AHP transformers | Emco/ East India | 1 MVA | 6.6KV | 433V | 02 |
| 13 | CHP Transformers | Martin Burn | 1 MVA | 6.6KV | 433V | 02 |
| 14 | CHP Transformers | GEC | 1.6 MVA | 6.6KV | 433V | 02 |
| 15 | Intake pump house Transformers | Martin Burn | 1 MVA | 6.6KV | 433V | 02 |

**Annexure - D**

|  | | **CW PLANT MCC** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | | SIEMENS | | FEEDER | | 5KVA | | 1 | |
| 2 | | SIEMENS | | FEEDER | | 400 A | | 1 | |
| 3 | | SIEMENS | | FEEDER | | 25 A | | 3 | |
| 4 | | SIEMENS | | FEEDER | | 200 A | | 1 | |
| 5 | | SIEMENS | | BREAKER | | 1600 A | | 2 | |
| 6 | | SIEMENS | | FEEDER | | 15 KW | | 20 | |
| 7 | | SIEMENS | | FEEDER | | 10 KVA | | 1 | |
|  | | **D.M. PLANT UNIT # 1 & 2 (STAGE -I)** | | | | | | | |
| 1 | | SIEMENS | | FEEDER | | 40 A | | 1 | |
| 2 | | SIEMENS | | FEEDER | | 90 KW | | 1 | |
| 3 | | SIEMENS | | FEEDER | | 33 KW | | 6 | |
| 4 | | SIEMENS | | SUPPLY | | 25 A | | 4 | |
| 5 | | SIEMENS | | SUPPLY | | 200 A | | 1 | |
| 6 | | SIEMENS | | BREAKER | | 1600 A | | 4 | |
| 7 | | SIEMENS | | FEEDER | | 15 KW | | 64 | |
| 8 | | SIEMENS | | SUPPLY | | 100 A | | 1 | |
| 9 | | SIEMENS | | FEEDER | | 10 KVA | | 1 | |
| **BOILER MCC ,BOILER VALVE MCC ,SOOT BLOWER MCC x2 FOR #1 and #2** | | | | | | | | | |
| 1 | | HIC | | FEEDER | | 63 A | | 1 | |
| 2 | | SIEMENS | | FEEDER | | 50KVA | | 1 | |
| 3 | | SIEMENS | | FEEDER | | 33KW | | 3 | |
| 4 | | HIC | | FEEDER | | 3.7 KW | | 1 | |
| 5 | | SIEMENS | | FEEDER | | 25 A | | 1 | |
| 6 | | SIEMENS | | SUPPLY | | 200 A | | 9 | |
| 7 | | SIEMENS | | BREAKER | | 1600 | | 2 | |
| 8 | | SIEMENS | | FEEDER | | 15 KW | | 109 | |
| 9 | | SIEMENS | | FEEDER | | 10KVA | | 1 | |
| 10 | | HIC | | FEEDERS | | 0.75KW | | 24 | |
|  | | **ASH HANDLING S/G UNIT # 1 & 2 (STAGE -I)** | | | | | | | |
| 1 | | SIEMENS | | FEEDER | | 90 KW | | 3 | |
| 2 | | SIEMENS | | FEEDER | | 33 kW | | 1 | |
| 3 | | SIEMENS | | SUPPLY | | 200 A | | 3 | |
| 4 | | SIEMENS | | BREAKER | | 1600 A | | 21 | |
| 5 | | SIEMENS | | FEEDER | | 15 KW/30 A | | 9 | |
|  | | **INSTRUMENT AIR COMP. UNIT # 1&2 (STAGE -I)** | | | | | | | |
| 1 | | HIC | | FEEDER | | 75 KW | | 4 | |
| 2 | | HIC | | BREAKER | | 630 A | | 5 | |
| 3 | | HIC | | SUPPLY | | 1KVA | | 1 | |
|  | | **L.T.FEEDERS (SWITCHGEAR) STAGE 1** | | | | | | | |
| 1 | | SIEMENS | | FEEDER | | 90 KW/170 A | | 18 | |
| 2 | | SIEMENS | | SUPPLY | | 63 A | | 1 | |
| 3 | | SIEMENS | | SUPPLY | | 400A | | 1 | |
| 4 | | SIEMENS | | FEEDER | | 33 KW/63 A | | 12 | |
| 5 | | SIEMENS | | SUPPLY | | 25 A | | 50 | |
| 6 | | SIEMENS | | SUPPLY | | 200A | | 12 | |
| 7 | | SIEMENS | | BREAKER | | 1600 A | | 25 | |
| 8 | | SIEMENS | | SUPPLY | | 160 A | | 7 | |
| 9 | | SIEMENS | | FEEDER | | 15 KW/30 A | | 137 | |
| 10 | | SIEMENS | | FEEDER | | 10 KVA | | 1 | |
| 11 | | SIEMENS | | FEEDER | | 10VA | | 1 | |
| 12 | | SIEMENS | | FEEDER | | 20VA | | 1 | |
|  | **415V LT ESP Switchgear** | | | | | |  | |
| 1 | Incomer &Bus Couplers English Electric 1600 Amp | | | |  | | 5 | |
| 2 | Supply Feeder 400 Amp | | | |  | | 64 | |
| 3 | Supply Feeder 63 Amp | | | |  | | 4 | |
| 4 | Supply Feeder 32 Amp | | | |  | | 28 | |
| 5 | Supply Feeder 30Amp | | | |  | | 4 | |
| 6 | Supply Feeder 10Amp | | | |  | | 58 | |
|  | **220 V D C Bus system** | | | | | | | |
| Sr no | Make | | Description | | Current rating | | Quantity | |
| 1 | SIEMENS | | supply | | 200A | | 13 | |
| 2 | SIEMENS | | supply | | 100A | | 2 | |
| 3 | SIEMENS | | feeders | | 25A | | 45 | |
| 4 | SIEMENS | | feeders | | 60A | | 12 | |
| **Emergency BUS** | | | | | | | | |
| Sr no | Make | | Description | | Current rating | | Quantity | |
| 1 | SIEMENS | | FEEDER | | 10KWA | | 1 | |
| 2 | SIEMENS | | FEEDER | | 15KW | | 11 | |
| 3 | SIEMENS | | SUPPLY | | 160 A | | 7 | |
| 4 | SIEMENS | | BREAKER | | 1600 A | | 6 | |
| 5 | SIEMENS | | SUPPLY | | 200 A | | 5 | |
| 6 | SIEMENS | | SUPPLY | | 63 A | | 7 | |
| 7 | SIEMENS | | SUPPLY | | 90 A | | 4 | |