SN	**EQUIPMENT DESCRIPTION**	**QUANTITY**
	4. Measurement frequency range: For dual and single crystal, narrow band (-3dB) frequency upto 15 MHz (minimum). 5. Rectification: Should be Full wave, Half wave (positive and negative) and un-rectified RF mode 6. There should be LCD display. The pulse repetition frequency should be up to 1KHz. (minimum). 7. Equipment should operate on mains supply (AC 230 V single phase, 50 Hz) as well as on battery fitted in the in-built compartment and there should be provision for recharging of the batteries inbuilt as well as separately. Equipment should be supplied with leak-proof rechargeable battery of type -Ni-Cd / NiMH / Li-Ion, with minimum continuous operation of 6 hours. 8. Equipment should have two nos. gates, which could start from 0% to100% of screen and width of gate should be adjustable from 1 to 100 % of screen. There should be provision of alarm which could be activated after crossing the threshold values and threshold values should adjustable. 9. Equipment should have provision of DAC (Distance Amplitude Correction Curve) and DGS curve 10. The equipment should have capability of direct calculation of sound path, surface distance and flaw path and their display on screen.	
9	Ultrasonic testing machine -PAUT with scanner, Probes and calibration blocks A portable Ultrasonic Phased Array (UTPA) and Time of Flight Diffraction (TOFD) System include Ultrasonic Phased Array & TOFD equipment, Magnetic Scanner, Softwares, Probes & Wedges, calibration blocks and accessories Capability of driving phased array probes of 16:128 or 32:128 or higher configuration (max no. of active pulser elements: total no of receiver path) [having capability of simultaneous excitation of 16 or 32 or higher elements, as the case may be	2 nos
10	ToFD Equipment for weld inspection A portable Ultrasonic Phased Array (UTPA) and Time of Flight Diffraction (TOFD) System include Ultrasonic Phased Array & TOFD equipment, Magnetic Scanner, Softwares, Probes & Wedges, calibration blocks and accessories Capability of driving phased array probes of 16:128 or 32:128 or higher configuration (max no. of active pulser elements: total no of receiver path) [having capability of simultaneous excitation of 16 or 32 or higher elements, as the case may be	1 no
11	Magnetic Particle Inspection-Yoke Type	1 no

SN	EQUIPMENT DESCRIPTION	QUANTITY
	Portable Electro Magnetic Crack detector yoke type equipment and accessories shall be used for detection of Surface/ sub-surface cracks in ferromagnetic materials. Equipment shall confirm to ASTM E1444/ IS 3703 or any other international standard Magnetic Crack Detector Yoke Type Equipment must be electric shock proof and must have not any spark or hot spot on the job during operation Articulated legs to suit differing component contours. Inter pole distance adjustable from 0 to 300 mm. Mode of Operation: AC/DC at 220 -240 VAC, 50 Hz Single phase Lifting power (in AC Mode): 4.5 Kg min. at 100 mm leg spacing Lifting power (in DC Mode): 18 Kg min. at 100 mm leg spacing Weight (Yoke equip, excluding cable)-: Not more than 3.5 Kg Control system: On/Off Switch, AC/DC Switch	
12	Magnetic Particle Inspection-Coil Type with cables This specification is for a mobile (moving on wheels) MPI equipment, as described in ASME Boiler & Pressure Vessel Code, Section V-2001(ASTM E-1444-01) for detection of surface & sub-surface cracks of power plant components in service namely, turbine shafts (including bore), blades etc. using coil wrap, prod, or central conductor method of magnetization. Technical features sought in the equipment include: Max. Magnetising Current Output**:** AC **(rms vales) &** HWDC **(average)** Magnetising current output of the equipment should be as follows for different length of copper cables in cable wrap method of magnetisation **–for each length there would be two copper cables of that length in parallel configuration and each having 120 sq mm cross section of copper conductor**: Output 6000 A (AC/HWDC) for 10 or 12 m standard length of cable Output not less than 4500 A (AC/HWDC) for 15 m length of cable Output not less than 4000 A (AC/HWDC) for 20 m length of cable **(b) Line Input:** 415 V, 3 phase, current not exceeding 250 Amp. **(c) Magnetising cable:** Supply of high current cables with copper connectors at each end to be used with the equipment - (i) Standard length 10 m or 12 m (to carry output current 6000 A AC/HWDC) (ii) Additional cable of length 15 m (to carry output current not less than 4500 A AC/HWDC with this length of cable) (iii) Additional cable of length 20 m (to carry output current not less than 4000 A AC/HWDC with this length of cable) for each of the above three length of cable, **there would be two copper cables of that length in parallel configuration and each having 120 sq mm cross section of copper conductor**:	1 no

SN	**EQUIPMENT DESCRIPTION**	**QUANTITY**
	(iv) A pair of cables of length 5 m each of size 120 sq. mm copper conductor with plugs and prod with copper tip with copper braiding or copper pad and trigger switch for carrying out **MPI with prod.**	
13	Pie Gauge for MPI as per requirement	1 no
14	Gaussmeter for MPI as per requirement	1 no
15	Ni-Cr Panel for DPT as per requirement	1 no
16	UV lamp for Fluorescent MPI & DPT as per requirement	1 no
17	Remote Field Eddy current testing/Advance Electromagnetic testing as per requirement	1 no
B	**MECHANICAL TESTING AND MEASURING EQUIPMENT**	
1	Hardness tester (Rebound Type) A non-destructive type of portable hardness tester (CONFORMING TO ASTM A956-97) for measurement of hardness of power plant components namely, pipes, headers, valves, rotor, blades, casing, diaphragm etc., in in-situ condition **Range:** Lower limit not more than 200 HL, Upper limit not less than 890 HL (Leeb value)	1 no
2	Hardness tester (UCI method) A non-destructive type Ultrasonic contact Impedance (UCI base) portable hardness tester for measurement of hardness of power plant components namely, pipes, headers, valves, rotor, blades, casing, diaphragm i.e equipment should be capable of measuring the hardness of broad variety of metals on surfaces (flat, round, thin or large surfaces etc.), in *in-situ* condition. The equipment used for the proposed hardness tester should consist of UCI probe with a resonance device/ indenter having a diamond crystal/pyramid at the tip. Diamond pyramid should have an angle 136°. There should be provision for automatic conversion of Hardness values between Vickers (HV), Rockwell (HRC) & Brinell (HB) as per the VDI/VDE guidelines 2616, page1 or DIN 50150, ASTM 140, or ASTM A1038-05 or latest and specific confirmation thereto should be given.	1 no
3	Ultrasonic Thickness meter (D-Meter-Digital) Ultrasonic thickness gauge should be portable, light weight and capable of measure metal thickness/thickness loss of on account of corrosion/erosion even when the metal surface is coated or painted using pulse echo method (A scan display)	2 nos

SN	EQUIPMENT DESCRIPTION	QUANTITY
	Weight of Ultrasonic thickness gauge with cable should not exceed 1.0 kg. Equipment should operate at 220-230 V, a.c. main supply and with inbuilt chargeable battery (Ni Cd battery) and operate for at least 25 hrs in normal measurement mode with backlight off. Equipment should have the following features- Min. thickness gauge range- 0.25 – 1.27 mm. Max. thickness gauge range – 0.080 – 635.0mm Material velocity range – 0.508 – 13.998 mm/micro-second. Resolution -0.01 mm. Transducer frequency range- 2 –15 MHz. Operating temperature – 0- 50° C. Sealed color-coded keypad with tactile and audible feedback. Water resistant case with sealed connectors. Liquid crystal display with backlight and contrast keypad Rectification in full wave, half wave positive or negative & RF mode Size and weight should not be exceeded by 240x140x38 mm and 1.0 Kg respectively.	
4	Vernier 300 mm Scale	2 nos
5	Vernier 600 mm Scale	2 nos
6	Outside Micrometre as per requirement	2 nos
7	Inside Micrometer 25-750 (dial)	2 nos
8	Measuring Tape as per requirement	2 nos
9	Helium Leak Detector as per requirement	1 no
10	Ultimate Tensile Testing M/C (UTM) **100 KN Servo Electric Elevated Temperature Universal Testing Machine**	1 no
11	Paint thickness Meter(Elcometer)-Ultrasonic digital as per requirement	1 no
12	Paint adhesion testing kit as per requirement	1 no
13	Hardness tester (TIV-Through Indentation viewing) **The optical Through-Indenter-Viewing method (TIV)-GE Make**	1 no
14	ABI (Automated Ball Indentation) Tester for Mechanical properties (TS, YS, Hardness, Fracture toughness) Advanced Automated Ball Indentation (ABI) System, accessories, and additional bench top mount etc., suitable for (a) Nondestructive ABI tests on in-service components (in the field) to measure key mechanical properties including yield strength, flow properties (true-stress versus true-plastic-strain curve), strain hardening parameters, and fracture toughness of various power plant components like rotors, piping, headers, casings etc.	1 no

SN	EQUIPMENT DESCRIPTION	QUANTITY
	(b) ABI test on small volume of metals (samples in lab) for measuring above mechanical properties (c) Destructive testing of mini-tensile specimen and disc-compact fracture toughness specimen. (d) System should be capable for testing on material such as Inconel 617, P11, P12, P22, P91, Carbon Steel, X20, IN 738, High Cr-Mo-V Steel, Nickel and Nickel base Alloys, HSLA Steel, Al, Medium Carbon Steel, Copper etc. The variations between values obtained for tensile and fracture properties with conventional testing and with the testing by the supplied system should be within ± 5%. (e) The components/parts/all external cables of the Advanced ABI system (especially the electronics) shall be rugged enough and tropicalized to withstand wear and tear of site operation without failure. (f) The mechanical components of the system shall be as under: a. **Load Frame:** Two columns with very high stiffness, weight of the load frame should not exceed 18 kg with at least 3 m (10 ft) cables. b. **Actuator:** (a) Mechanical ball screw actuator driven by a motor with high torque capability for 4.45 KN or more force. c. **Load Cell:** Two numbers, each not less than 113.4 Kg, Tension/Compression type precision load cells with 150% safe operational range and having non-linearity not exceeding 0.2% of full scale, non-repeatability not exceeding 0.05% of full scale and output 2 mV/V, complete with signal conditioner. d. **Grips/fixtures:** Grips and fixtures suitable for holding the indenter, test piece (round or flat) along with miniature tensile grips and grips & fixture for disc compact fracture toughness (required for field and lab testing as described in **sl no. 1** above). The test component could be magnetic or non-magnetic and test area could be flat or round. Indicative range of outer diameter (OD) of magnetic or nonmagnetic pipes is 300 to 1000 mm. e. **Linear variable differential transducer (LVDT):** Two numbers AC-AC ultra-precision LVDT should be included with the system – the second LVDT is a spare sensor for field use with following characteristics: Working range - ± 0.5 mm (± 0.020"), Sensitivity - 5mV/V/0.025 mm (0.001") or	

SN	**EQUIPMENT DESCRIPTION**	**QUANTITY**
	better, Linearity - ± 0.20% FS or better, Repeatability - 0.00010 mm (0.000004") or better. f. **Indenter and holder**: System should be capable to use precision tungsten carbide ball indenters of various sizes in the range of 0.508 - 1.575 mm (0.020 - 0.062") diameter to be used with the appropriate load cells. Four numbers of indenters of 0.76mm (0.030 in) diameter for field testing and four numbers of indenters of diameter 1.575mm (to be used in lab with 454 Kg load cells) are to be supplied with the system.	
15	Ultrasonic Tensile tester as per requirement	1 no
16	Exfoliation Meter for SS tubes **<u>Portable Boiler Tube Oxide Scale Nondestructive Tester Along with Accessories</u>** Portable Boiler Tube Oxide Scale Nondestructive Tester Along with Accessories, suitable for in-situ measurement of the spalling and accumulation of oxide skin (Magnetic) in stainless steel pipe (Non Magnetic) of power plant boiler. This measuring instrument should be suitable for the measurement of laminated rust in non-magnetic stainless steel tube. The equipment should be powered with a rechargeable battery, suitable for field environment operation for at least 4 hours with full charging. **The supplied equipment should have following features/capabilities:** a. Power supply: AC 220V/0.5A. b. Test range: 20.00 mWb with peak hold function. c. The accuracy of DC magnetic field should be better than 1.0% (corresponding to the full range of each gear). d. Minimum resolution of magnetic field: 10 uWb. e. Volume: 250mm × 180mm × 100mm; weight should not be more than: 1.3kg. f. Operating environment: 0 ℃ to +50 ℃; humidity: 35 ~80%. g. It should be capable to operate on battery and battery for the same to be supplied along with the charger/adaptor.	1 no
17	Oxide Measurement for Boiler Tubes	1 no
18	Thermography camera as per requirement	1 no
19	Holiday Detector as per requirement	1 no
20	Engineering stethoscope as per requirement	1 no
21	Portable Vibration Meter as per requirement	1 no
22	Comparator as per requirement	1 no
23	Surface roughness meter as per requirement	1 no
24	Spirit level as per requirement	2 nos
25	Noise level meter as per requirement	1 no
26	Torque wrench as per requirement	1 set

SN	**EQUIPMENT DESCRIPTION**	**QUANTITY**
27	Pressure gauge (accuracy class 0.25%, Range-up to 100 Kg/cm2, LC-1 kg/cm2 Min)	2 nos
28	Mercury thermometer (accuracy up to 0.1 Deg. C, up to 1000 Deg. C)	2 nos
29	Infra Red Thermometer, Non-contact type (up to 1600C)	1 no
30	Digital Techometer (Non-contact type) as per requirement	1 no
31	Digital Techometer (Contact Type) as per requirement	1 no
32	Thermocouple test furnace up to 1400 deg C with uncertainty of 1 deg C	1 no
33	Barometer(aneroid) 660 to 800 mm/dg accuracy, +/- 0.3 % of full scale	2 nos
34	Manometer (test & U tube) as per requirement	1 no
35	Hygrometer as per requirement	1 no
36	Thermocouple test furnace up to 1400 deg C with uncertainty of 1 deg C	1 no
37	Barometer(aneroid) 660 to 800 mm/dg accuracy, +/- 0.3 % of full scale	2 no
C	**METALLURGICAL TESTING EQUIPMENT**	
1	Replica kit for in-situ Metallography Portable In- situ Metallography Equipment & Accessories, consumables including portable Microscope and C-mount Camera are required to reveal microstructure and to take replica of microstructure on the flat and curved surfaces to assess the material degradation. Portable microscope with C-Mound Camera shall be used to examine the microstructure under direct viewing of microstructure as well as to take direct photograph of the microstructure of different types of metals.	1 no
2	Optical microscope for replica interpretation Optical microscope and Image Analysis System Stereo Microscope with Camera Attachment	1 no
3	Sample preparation tools / machines (Cutting, grinding & Polishing) Specimen preparation facility - Abrasive cutting m/c Specimen preparation facility - Automatic Mounting Press Specimen preparation facility - Automatic Grinding Polishing M/c Micro-hardness testing machine Portable X-ray Residual Stress system	1 no
4	Internal oxide scale measuring system with Probe (UT based) Portable system for measurement of streamside (i.e. on internal side) oxide scale thickness on superheater and reheater tubes of power plant in in-situ condition and transfer/storage/printing of data/ waveform through laptop computer. Tubes are generally made of low alloy steels (grades SA 213 T 11 & SA 213 T22, as per ASME code for boiler & pressure vessels code) and they have nominal thickness in the range of 5 to 8 mm and nominal diameter in the range of 45 to 75 mm.	1 no
5	In-situ Metallogrpahy kit- Grinder and polisher with accessories	1 no

SN	EQUIPMENT DESCRIPTION	QUANTITY
D	**VISUAL TESTING EQUIPMENT**	
1	Videoscope / Borescope for Boiler tube, Header Inspection & **retrieval tool** An industrial Videoimagescope System & accessories suitable for inspection of pipings, headers, rotor bore, tubes etc. to visualize inter-ligaments crackings/discontinuities, oxide deposits, pitting, corrosion, foreign material, distortion of internal geometry, breakage and damage etc. and for measurement of the observe defect's size, depth, length, area, point to line distance etc. The system should consist of video-probe (with CCD located at the tip of the probe), light and power source as required, CCD camera, camera control unit function, handy LCD monitor (size not less than 6 inch) and others essential accessories for viewing as well as measuring of defects or discontinuity. The image should be seen simultaneously on both handy monitor and laptop computer screen and moving image should be stored on the laptop computer hard disk. Insertion tube working Length – 20 meter and above Tip Articulation for straight tube – (up/down, left/right) - minimum 90° Insertion tube should– i. of tungsten wire braid with higher durability ii. Consist of Temperature sensor iii. Be Flexible iv. Be Abrasion resistant v. Be waterproof vi. Must include **retrieval tool**	1 no
2	Binoculars as per requirement	2 nos
3	Laser alignment Kit with target kit as per requirement	1 no
4	Video imagescope with measuring facility Advanced industrial Videoimagescope System & accessories having measurement facility.	1 no
5	Magnifying glass as per requirement	4 nos
E	**WELDING AND PWHT**	
1	Welding Simulator as per requirement	1 no
2	MCF (Magnetic Stauroscope) for assessment of quality of PWHT Portable Magnetic Structurescope (MC-04H-2) System (Magnetic Coercive Force (MCF) Measurement), suitable for in-Situ Measurement of Magnetic Coercive Force (MCF) of Welds of ferromagnetic materials for the evaluation of post-weld heat treatment (PWHT) quality based on magnetic coercivity. The equipment should also be capable for estimation of residual stresses, fatigue changes and residual life evaluation of the component.	1 no

SN	EQUIPMENT DESCRIPTION	QUANTITY
3	Argon Purity tester as per requirement	1 no
4	Inspector Kit for Welding Inspection as per requirement	1 set
5	SMAW Equipment as per requirement	2 nos
6	GTAW Equipment as per requirement	2 nos
7	Temperature Gun up to 90 to 1000 degree C	1 no
F	**CIVIL TESTING EQUIPMENT**	
1	Impact Testing Machine as per requirement	1 no
2	Crushing Value Testing Machine as per requirement	1 no
3	Los Angeles Abrasion Testing Machine as per requirement	1 no
4	Flakiness and Elongation Index Test Gauges as per requirement	2 nos each
5	Aggregate Water absorption Test set up as per requirement	1 set
6	Pycnometer as per requirement	2 nos
7	IS Sieves for Coarse Aggregate as per requirement	1 set
8	IS Sieves for Fine Aggregate as per requirement	1 set
9	Automatic Sieve Shaker as per requirement	1 no
10	Bitumen Extractor Machine as per requirement	1 no
11	Vicat Apparatus with Deskpot as per requirement	2 set
12	Le-Chatlier Flasks and Moulds as per requirement	1 no
13	Burette as per requirement	2 nos
14	Measuring Cylinders as per requirement	4 nos
15	Trowel (small & big), Trays, Sampling Scoop and Steel Buckets as per requirement	4 each
16	Cement Cube Moulds as per requirement	18 nos
17	Automatic/Manual Mortar Mixer as per requirement	1 no
18	Vibrating Machine as per requirement	1 no
19	Curing Tank with Controlled Temperature as per requirement	1 no
20	Atterberg Limits set-up (Liquid Limit and Plastic Limit) as per requirement	1 set
21	Shrinkage Limit Apparatus with mercury as per requirement	1 no
22	Hydrometer Analysis Set-up as per requirement	1 no
23	Free Swell Index Apparatus as per requirement	1 no
24	Proctor Testing Equipment as per requirement	1 set
25	Core Cutter Test set up for in-situ density (min. 6 mould) with 01 hammer as per requirement	1 no
26	Sand Replacement Test set up for in-situ density as per requirement	1 set
27	Moisture Container for OMC by conventional Method as per requirement	10 nos
28	Hot Air Oven as per requirement	2 nos
29	Physical Balance (Electronic) as per requirement	1 no
30	Rapid Moisture Meter as per requirement	1 no
31	Thermometer for measurement of room temperature as per requirement	1 no
32	Thermometer for measurement of temperature of bitumen, concrete as per requirement	1 no

SN	**EQUIPMENT DESCRIPTION**	**QUANTITY**
33	Digital Compression Testing Machine 2000 KN capacity	1 no
34	Digital Compression Testing Machine 500 KN capacity	1 no
35	Measuring Tape – 3m, 10m, 30m, 50m	2 nos each
36	Concrete Cube Moulds as per requirement	18 nos
37	Concrete Mixer 0.5 cum capacity (Electrically operated)	1 no
38	Concrete workability Test by compaction factor Test	1 set
39	pH meter	1 no
40	Paint thickness Meter (Elcometer)-Ultrasonic digital	1 no
41	Dial Callipers	2 nos
42	Vernier Callipers	2 nos
43	Digital Micrometre	2 nos
44	Outside Micrometres	2 nos
45	Depth Gauge	2 nos
46	Density Basket & Density Pot	1 each
47	Slump test apparatus	2 nos
48	Electric Platform Balance (150 Kg)	1 no
49	Electric Pan Balance 10 Kg (1gm)	1 no
50	Precision Balance 600 gm (0.1 gm)	1 no
51	Measuring flask	4 nos
52	UPV (Ultrasonic Pulse velocity) tester	1 no
53	Rebound Hammer	1 no
54	Core flattening machine	1 no
55	End Immersion test for Flush Door Sutter	1 no
56	Flexural test apparatus for Beam	1 no
57	Core cutting setup for concrete	1 no
58	Rebar detector to locate reinforcement before core cutting	1 no
G	**CONVEYOR BELT TESTING EQUIPMENT**	
1	Tensile Tester (Range: 0-2500N)	1 no
2	UTM (Range: 0-50 KN)	1 no
3	Flame Tester as per ISO-340	1 no
4	Drum Friction machine (0-600 Deg C) as per CAN/CSA/M422-M87, Type-C	1 no
5	Ageing Oven (Digital Temperature recorder (Six Channel)	1 no
6	Digital Insulation Tester (Megger) (50V-1KV)	1 no
7	Humidity Chamber (0 to 50°C/0 to 100%RH)	1 no
8	Electronic Balance (0-60gm)	1 no
9	Sp. Gravity Balance (200gm)	1 no
10	Digital Weighing Balance(up to 300 gm)	1 no
11	Abrasion Tester	1 no
12	Digital Timer (0-99 sec)	2 nos
13	Digital Temperature Indicator (0-1200 deg C)	1 no
14	Dial Thickness Gauge (0-20 mm)	2 nos

SN	EQUIPMENT DESCRIPTION	QUANTITY
15	Digimatic Caliper (0-150 mm)	2 nos
16	Shore Hardness (0-100 Shore A)	2 nos
H	**ELECTRICAL TESTING EQUIPMENT**	
1	Multimeter (Digital & Analog)	2 each
2	Megger (0-5 KV) Motorised, 0-1KV hand operated	1 each
3	Tong tester-AC & DC (400 AMP)	2 nos
4	H.V. Tester (0-50 KV)	1 no
5	Earth tester	2 nos
6	Fault Locator (cable test kit)	1 no
7	Grounding device/Earthing Device	2 nos
8	Pressure gauge (accuracy class 0.25%, Range-up to 100 Kg/cm2, LC-1 kg/cm2 Min)	2 nos
9	Wattmeter, Ammeter, Voltmeter	1 each
10	Resistance Bridge: Kelvin Bridge	1 no
11	Relay Test Kit	1 set
12	BDV tester for Oil	1 no
13	Vibration meter	1 no
14	Ductor for Transformer winding, “R”	1 set
15	Variable AC/DC source (0-220V)	2 nos
16	Dead Weight test (accuracy class min 0.05%)	1 no
17	Electro Pneumatic calibrator (accuracy 0.1% of full scale)	1 no
18	Fluidised Temp Bath (100-600 deg C, stability +/-0.2 % deg C)	1 no
19	Portable V-meter Calibrator	1 no
20	Resistance thermometer (bridge 0-2000, resolution 0-001, accuracy +/-0-005, sensitivity 0.001%, Amb Temp 50 deg C +/- 0.005% of span per 1 deg C	1 no
21	Decade resistance Box	1 no
22	Rheostat	2 nos
23	Test (reference) RTD	2 nos
24	Digital storage Oscilloscope	1 no
25	Sweep Frequency Response Analyser (SFRA)	1 no
26	Frequency Domain Spectroscopy (FDS)	1 no
27	Electromagnetic Core Imperfection Detector(ElCID)	1 no
28	Recurrent Surge Oscilloscope for Gen. Rotor(RSO)	1 no
29	Portable PD Test set	1 no
30	Tan delta test Kit	1 no
31	Transformer Winding Resistance	1 no

SN	**EQUIPMENT DESCRIPTION**	**QUANTITY**

General Notes: -

1. The field laboratory for QA and QC activities shall be established and installed with the adequate facilities to meet the requirement of envisaged day to day tests. The range & accuracy of equipment shall be such as to cover the testing requirements of the installed machinery/equipment/systems.
2. The equipment shall be latest & shall conform relevant governing standards.
3. Before handing over, all equipment and instruments shall be calibrated by NABL or such accrediting agency complying with ISO/IEC-17025 accreditation as per the manufacturer's recommendation and the calibration reports shall be submitted to EIC for their review and acceptance.

SN	SPECIFICATION REFERENCE			EXISTING	READ AS
	SEC/ PART	PAGE NO.	CLAUSE NO.		
F-1	SECTION – VI, PART-B, SUB-SECTION-A-25 SOLAR P.V.	1 of 26	1.3	Determination of optimal grid connected solar PV systems for south facing walls (BIPV) of different buildings of this package.	Deleted
F-2	SECTION – VI, PART-B, SUB-SECTION-A-25 SOLAR P.V.	10 of 26	13	BIPV (BUILDING INTEGRATED PHOTOVOLTAIC) A BIPV system is a photovoltaic system in which the PV modules satisfy the definition above for BIPV products. It includes the electrical components needed to connect the PV modules to external AC or DC circuits and the mechanical mounting systems needed to integrate the BIPV modules into the building. BIPV facade system is to be install on the south facing building of this package with proper ventilation. Bidder shall follow all suitable standards for BIPV system with latest amendments.	Deleted

SN	SPECIFICATION REFERENCE			EXISTING	READ AS
	SEC/ PART	PAGE NO.	CLAUSE NO.		
F-3	SECTION – VI, PART-B, SUB-SECTION-A-25 SOLAR P.V.	1 of 26		The final plant capacity (Rooftop/ sheds/ south facing walls) shall be as per detailed approved engineering design of each of the building's rooftops. During detailed engineering EIC may leave or relocate the building/sheds or walls of buildings depending on site conditions.	The final plant capacity (Rooftop/ sheds) shall be as per detailed approved engineering design of each of the building's rooftops. During detailed engineering EIC may leave or relocate the building/sheds depending on site conditions. Approx. Roof top Capacity & Solar PV Capacity on Car park/ Coal Stock Yard etc, are: 900kWp & 500KWp, respectively. If the actual capacity during project execution varies from the estimated capacity, the variation in capacity shall be adjusted based on unit rate for addition/deletion of capacity on per kWp basis.

S. No.	Specification Reference				Existing	Read As
	Sec/Part	Sub Sec	Page No.	Clause No.		
G-01	VI/C	GTR	44 of 114	26.02.00 (b)	The 'Initial Operation' of the complete facility as an integral unit shall be conducted for 720 continuous hours. During the period of initial operation of 720 hours, the unit shall operate continuously at full rated load for a period not less than 72 hours.	The 'Initial Operation' of the complete facility as an integral unit shall be conducted for 720 continuous hours. During the period of initial operation of 720 hours, the unit shall operate continuously at full rated load for a period not less than 72 hours **with demonstration of the capability of the machine to raise load upto 105% of full rated load.**
G-02	VI/C	GTR	44 of 114	26.03.00	The final test as to prove the Functional Guarantees shall be conducted at Site by the Contractor in presence of the Employer. **The contractor's Commissioning, start-up Engineer shall make the unit ready to conduct such test before start of initial operation.** Such test shall be conducted along with the Initial Operations.	The final test as to prove the Functional Guarantees shall be conducted at Site by the Contractor in presence of the Employer. **To conduct such tests, the contractor's Commissioning, start-up Engineer shall make the unit ready (including tuning and all other enabling activities as required for PG tests) before start of initial operation.** Such test shall be conducted along with the Initial Operations.
G-03	VI/A	I	5 of 8	4.02.00	Regarding, coal & fuel oil, the Contractor shall quote the total maximum quantity of the coal and fuel oil as required upto the successful completion of "Initial Operation" (as defined in General Technical Requirements, Part-C, Section-VI of Technical Specification) for both the units which shall be issued to it free of charge by the employer for such operation during execution. These quantities for both coal and fuel oil shall be compared with the respective quantities as quoted by various bidders. The quantities over & above the base value (minimum among the quoted figures for coal & fuel oil) shall be used as a loading factor and corresponding computed price (total for coal & fuel oil) shall be added to the quoted bid price for deriving the total bid price. The cost of coal & fuel oil shall be used as Rs. 2108/Ton (Rupees Two Thousand One Hundred and Eight only per ton of coal) Rs. 40,000/KL (Rupees Forty Thousand per KL of fuel oil) for such purpose. Further, during execution any requirements (of coal & fuel oil) beyond the quoted quantities by the successful bidder would be issued by NTPC but charged back to the contractor as per the prevailing landed rate at site at that time. There shall be no rebate to the Contractor if the coal & oil quantities as consumed during execution (up to the initial operation as above) remains lesser than the quoted values.	As per Annexure-I

Annexure-I

Regarding, coal & fuel oil, the Contractor shall quote the total maximum quantity of the coal and fuel oil as required upto the successful completion of "Initial Operation" (as defined in General Technical Requirements, Part-C, Section-VI of Technical Specification) for both the units which shall be issued to it free of charge by the employer for such operation during execution. **Such quoted quantity shall include all pre-commissioning & commissioning activities (including running of unis for tuning or any other purpose as required before commencement of initial operation) and considering consumption during initial operation considering average load of 60% of rated value for both the units.**

These quantities for both coal and fuel oil shall be compared with the respective quantities as quoted by various bidders. The quantities over & above the base value (minimum among the quoted figures for coal & fuel oil) shall be used as a loading factor and corresponding computed price (total for coal & fuel oil) shall be added to the quoted bid price for deriving the total bid price. The cost of coal & fuel oil shall be used as Rs. 2108/Ton (Rupees Two Thousand One Hundred and Eight only per ton of coal) Rs. 40,000/KL (Rupees Forty Thousand per KL of fuel oil) for such purpose.

Further, during execution any requirements (of coal & fuel oil) beyond the quoted quantities by the successful bidder would be issued by NTPC but charged back to the contractor as per the prevailing landed rate at site at that time. **For this purpose, Bidder's quoted coal consumption quantity shall be corrected for variation above/below 60% of rated load during the period of initial operation as per following:**

The coal quantity quoted by the bidder for both units = X kg for average load of 60% of rated value during initial operation

Average Load for both units during Initial Operation = L % of rated load

Coal Consumption for both units during Initial Operation = Y kg

Corrected quoted coal consumption during execution = X + [Y*(L-60)/L]

There will be no correction for quoted consumption of oil. There shall be no rebate to the Contractor if the coal & oil quantities as consumed during execution (up to the initial operation as above) remains lesser than the quoted **consumption for oil and corrected quoted consumption for coal.**

EPC PACKAGE FOR TALCHER THERMAL POWER PROJECT, STAGE-III (2x660 MW)
Amendment No. 02 to Technical Specifications Section-VI of Bidding Document No.: CS-4540-001A-2

SL. NO.	SPECIFICATION REFERENCE				Existing	Read as
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
A-MH-33	**VI/A**	**IIA-16**	1 of 18	**1.01.03**	The equipment and materials to be supplied by the Contractor shall form a fully comprehensive Ash handling and Ash Water Recirculation system. The equipment and ……. specifically excluded.	The equipment and materials to be supplied by the Contractor shall form a fully comprehensive Ash handling and Ash Water Recirculation system **within Plant**. The equipment and ……. specifically excluded.
A-MH-34	**VI/A**	**IIA-16**	2 of 18	1.01.04 (f)	Ash water recirculation system for recycling ash water from Mine Void.	Ash water recirculation stream **within plant** for recycling ash water from Mine Void end.
A-MH-35	**VI/A**	**IIA-16**	11 of 18	**1.01.08 (ii)**	Four (04) lengths of combined ash slurry disposal MS pipe lines from combined ash slurry pumps **up to Mine Void including garlanding at mine end and extensions into the mine void at number of discharge points** complete with basalt lined pipe bends, fixtures, elbows, gaskets, nuts, bolts, structural steel supports and other accessories as specified and as required. **For garlanding of Mine Void, MS bends shall be provided. The length of combined Ash disposal pipe lines shall be 52,000 m (excluding fittings and including branch pipes for garlanding of mine void).**	Four (04) lengths of combined ash slurry disposal MS pipe lines of **Diameter 500 NB** from combined ash slurry pumps up to **5 m inside Plant Boundary,** complete with basalt lined pipe bends, fixtures, elbows, gaskets, nuts, bolts, structural steel supports and other accessories as specified and as required.
A-MH-36	**VI/A**	**IIA-16**	11 of 18	**1.01.08 (v)**	Sixteen (16) nos. of manually operated plate valves at the slurry disposal pipeline outlets in mine void area as specified and as required.	**Deleted**
A-MH-37	**VI/A**	**IIA-16**	13 of 18	1.03.00	**ASH WATER RECIRCULATION SYSTEM** The scope of these specifications shall…… ……. In any case, scope shall not be less than that detailed below.	**ASH WATER RECIRCULATION SYSTEM** The scope of these specifications shall…… ……. In any case, scope shall not be less than that detailed below.

A-MH-38	**VI/A**	**IIA-16**	13 of 18	1.03.01 (a)	Three (3) Nos (2 W + 1 S) Horizontal centrifugal type Ash Water Recirculation pumps, each of capacity 1000 m^3/hr and head as required, located in the mine void end pump house, complete with drive motors, base plate , foundation plates and accessories as specified and as required. Provisions shall be there for locating another Pump in the Pump House, for future use.	**Deleted**
A-MH-39	**VI/A**	**IIA-16**	13 of 18	1.03.01 (b)	One (1) No. Electric operated Hoist for handling of above pumps, motors etc. for the above pump house complete with runway rails, with necessary clamps, bolts, slice bars and end stops for each of the runway.	**Deleted**
A-MH-40	**VI/A**	**IIA-16**	13 of 18	1.03.01 (c)	Six (6) Nos (4W + 2S), Pontoon/ Barge floatable into…….Pontoon/Barge shall be complete with all structural, electrical, instrumentation etc requirement.	**Deleted**
A-MH-41	**VI/A**	**IIA-16**	13 of 18	1.03.01 (d)	Following pipelines complete with……. as specified and as required. (i) There shall be two (1W+1S) lengths of …….. the header by Flexible Hoses. (ii) There shall be one pipeline from decanted ash water recirculation pump house to ash water sump inside Plant. The length of Pipe from AWRS pump house to Plant end shall be 12,500 m. (iii) All the interconnecting pipes …….. to common header. (iv) Recirculation line to suction sump. (v) All the necessary clamping arrangements along with guides, bolts, nuts etc. In addition to major pipelines…… in the scope of the Bidder.	Following pipelines complete with……. as specified and as required. (i) Deleted (ii) There shall be one pipeline of **Diameter 650 NB** from **5 m inside plant boundary** to ash water sump inside Plant. (iii) Deleted (iv) Deleted (v) All the necessary clamping arrangements along with guides, bolts, nuts etc.
A-MH-42	**VI/A**	**IIA-16**	13 of 18	1.03.01 (e)	All necessary valves, fittings, specialties etc for various equipments, pumps piping etc. Necessary piping, valves, specialties etc for inter-connection of associated equipment. Size of valves shall be same as respective pipelines size.	All necessary valves, fittings, specialties etc Size of valves shall be same as respective pipelines size.

A-MH-43	**VI/A**	**IIA-16**	13 of 18	1.03.01 (f)	All necessary instrumentation for safe, reliable and auto operation of the whole system as required and as specified.	All necessary instrumentation for safe, reliable and auto operation of the whole system as required and as specified.
A-MH-44	**VI/A**	**IIA-16**	13 of 18	1.03.01 (h)	Thermal stress and transient analysis for…… …… transient analysis study shall be implemented by bidder.	Not applicable
A-MH-45	**VI/A**	**Chapter -03**	11 of 13	10.01.00	**Horizontal Centrifugal Pumps (Each Type & Model)** (1) ……. to ……. (6)	Deleted
A-MH-46	**VI/B**	**A-01**	89 of 101	4.01.02 (M)	(i) Pumping distance to be considered for arriving of Ash Slurry Pump head is 12.5 K.M. (ii) Pumping distance to be considered for arriving of AWRS Pump head is 11.75 K.M. Static lift to be considered for Pontoon/Barge mounted Pumps- 30 meters Static lift to be considered for Ash Slurry Pump - 80 meters.	(i) Pumping distance to be considered for arriving of Ash Slurry Pump head is 12.5 K.M. (ii) Pumping distance to be considered for arriving of AWRS Pump head is 11.75 K.M. Static lift to be considered for Pontoon/Barge mounted Pumps- Not applicable Static lift to be considered for Ash Slurry Pump – Not applicable.
A-MH-47	**VI/B**	**A-01**	89 of 101	4.01.02 (J)	iv) AWRS Sump:- Thirty (30) minutes	Not applicable
A-MH-48	**VI/A**	**III**	18 of 18 Terminal Point & exclusion & owners' input	1.03.00	Employers' cross-country conveyor shall be routed along the Ash slurry disposal corridor from plant end towards mine void where corridor space is limited. Bidder has to ensure that there shall not be any hindrance due to Ash slurry & AWRS corridor for supporting structures of Employers' pipe Conveyor. Employers' pipe conveyor may be taken-up in parallel or in near future.	Terminal Point for Ash slurry disposal piping and AWRS piping shall be 5 m inside plant boundary. Ash slurry piping & AWRS after 5 m from plant boundary towards Mine Void shall be excluded from the Bidders' scope.

A-MH-49	**VI/A**	**IIA-16**	15 of 18	**1.04.06**	Eight (8) nos. Pump tanks/Air lock tank for each coarse ash hopper and four (4) nos. of pump tanks/air locks tank for fine ash hopper for transportation of coarse fly ash and fine fly ash respectively, to silos provided for dry fly ash storage silos meant for Road and Rail loading.	Eight (8) nos. Pump tanks/Air lock tank for each coarse ash hopper and four (4) nos. of pump tanks/air locks tank for fine ash hopper for transportation of coarse fly ash and fine fly ash respectively, to silos provided for dry fly ash storage silos meant for Road and Rail loading. **Provisions shall be provided to convey & store Fine Ash to another Coarse Fly ash Silo in addition to Fine Fly Ash Silo.**
A-MH-50	**VI/A**	**IIA-16**	15 of 18	**1.04.07**	Additionally, the fine ash shall be pneumatically conveyed to **another** fine ash silo, located in Fly ash silo complex with the provision of bagging plant……..	Additionally, the fine ash shall be pneumatically conveyed to fine ash silo, located in Fly ash silo complex with the provision of bagging plant……
A-MH-51	**VI/B**	**A-21**	26 of 40	**3.07.00**	**Sump Drainage Pumps** Design requirement- To transfer silo (**BA & FA**) area (with 30% ash by weight) upto HCSD system mixing tanks.	**Sump Drainage Pumps** Design requirement- To transfer silo area (with 30% ash by weight) upto **Ash slurry Sump**
A-MH-52	**VI/B**	**A-21**	32 of 40	**5.01.02**	DATA SHEET FOR COMBINED / BOTTOM ASH SLURRY DISPOSAL LINE VALVES AT MINE VOID / DYKE END	**Not applicable**
A-MH-53	**VI/B**	**A-21**	33 of 40	**6.00.00**	**-** DATA SHEET FOR AWRS PUMPS -MATERIAL OF CONSTRUCTION FOR VERTICAL CENTRIFUGAL PUMPS-AWRS	**Not applicable**
A-MH-54	**VI/B**	**A-21**	35 of 40	**7.12.00**	**E) AWRS PUMP HOUSE**	**Not applicable**

A-MH-55	**VI/A**	**IIA-16**	15 of 18	**1.04.14**	The bags shall be stored in suitable closed storage area having a provision to store bags filled in 8 hours. Mechanized transportation of fly ash bags from bagging machine up to the storage shed and from bagging machine to load into Truck directly. Adjustment to load bags in all types of Trucks shall be provided.	The bags shall be stored in suitable closed storage area having a provision to store bags filled in 8 hours. Mechanized transportation (without manual intervention) of fly ash bags from bagging machine up to the storage shed and from storage shed to load into the Trucks, by suitable conveying system along with associated arrangements. Provisions for direct loading of bags into trucks without storing shall also be there. Adjustment to load bags in all types of Trucks shall be provided.
A-MH-56	**VI/ Part E**			Tender Drws.	4540-001-POM-A-040 (option-01), Rev-B 4540-001-POM-A-040 (option-02), Rev-B 4540-001-POM-A-030, Rev-A 4540-001-POM-A-031, Rev-A	4540-001-POM-A-040 (option-01), Rev-C 4540-001-POM-A-040 (option-02), Rev-C 4540-001-POM-A-030, Rev-B 4540-001-POM-A-031, Rev-B
A-MH-57	**VI/A**	**Sub-section IV** **FUNCTIONAL GUARANTEES**	23 of 73	1.01.07.01 (e)	**Ash Handling Plant** List of drives with corresponding weightage factors thereof for which power consumption is to be guaranteed is as follows: …… …… …… 10. Ash Water Recirculation Pumps: 1 11. Barge mounted Recirculation Pumps: 1 …… ……	**Ash Handling Plant** List of drives with corresponding weightage factors thereof for which power consumption is to be guaranteed is as follows: …… …… …… 10. Ash Water Recirculation Pumps: Not applicable 11. Barge mounted Recirculation Pumps: Not applicable …… ……
A-MH-58	**VI/B**	**A-20**	37 of 101	4.29.00	All equipment furnished by the Contractor ……following standard, rules, acts. …….. …… IE (Indian Electricity) Rules and Acts	All equipment & system, furnished by the Contractor shall be complete in every respect and shall comply 'Safety Module' as per 'ANNEXURE- I TO SUB-SECTION A-20'
A-MH-59	**VI/A**	**SS-I** Intent of specification	3 of 8	1.02.00	Ash Handling system with AWRS	Ash Handling system with AWRS (Inside Plant)

QUARRY NO.8

QUARRY NO.7

QUARRY NO.4

QUARRY NO.2

PILOT QUARRY

QUARRY NO.2

QUARRY NO.3A

QUARRY NO.2

QUARRY NO.3B

AWRS PH 3 ELECTRICAL ROOM

4 NOS SLURRY LINE + 1 NO. AWRS

BARGE MOUNTED PUMPS

BARGE MOUNTED PUMPS

PROPOSED ASH SLURRY AWRS PIPE ROUTE 4NOS SLURRY LINE 1NO. AWRS

EXISTING RAIL CROSSING TENTATIVE

EXISTING CROSS COUNTRY CONVEYOR ROUTING

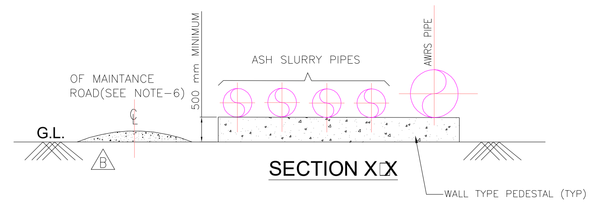
CENTRAL COLONY

CENTRAL COLONY

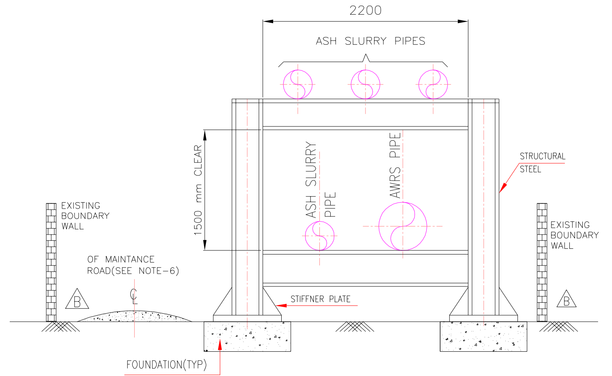
FROM TTPS PLANT END

DIAHARAN

MATCH LINE A-A



SECTION X-X



SECTION Y-Y

PIPE SECTION BETWEEN PLANT BOUNDARY & LINE A-B

NOTES

1. TENTATIVE ROUTING OF ASH SLURRY PIPES AND AWRS ARE SHOWN. BIDDER TO SIZE SLURRY PUMP HEAD BASED ON THE ROUTING AND OTHER INPUTS AS PROVIDED IN TECHNICAL SPECIFICATION. OTHER INPUTS (IF REQUIRED) SHALL BE PROVIDED DURING DETAIL ENGG.
2. THE LAYOUT SHOWN IS TENTATIVE AND SHALL BE FINALISED DURING DETAILED ENGG.
3. SCOPE OF ASH SLURRY PIPING AND AWRS, OUTSIDE PLANT BOUNDARY SHALL NOT BE IN BIDDER'S SCOPE. BIDDER TO REFER TERMINAL POINT FOR THIS.

ASH SLURRY PIPE

AWRS PIPE

FOR TENDER PURPOSE ONLY

LEGEND :

SYMBOL	DESCRIPTION
	ROAD
	RAILWAY TRACK
	CULVERT
	NALLAH
	POND

REV.	DESCRIPTION	DRAWN	DESIGN	CHKD.	CLEARED BY C	M	E	C&I	APPD.	DATE
B	REVISED AS PER BIDDER'S QUERES	PRAVINNA	KM	AN					AG	
A	RELEASED FOR TENDER									

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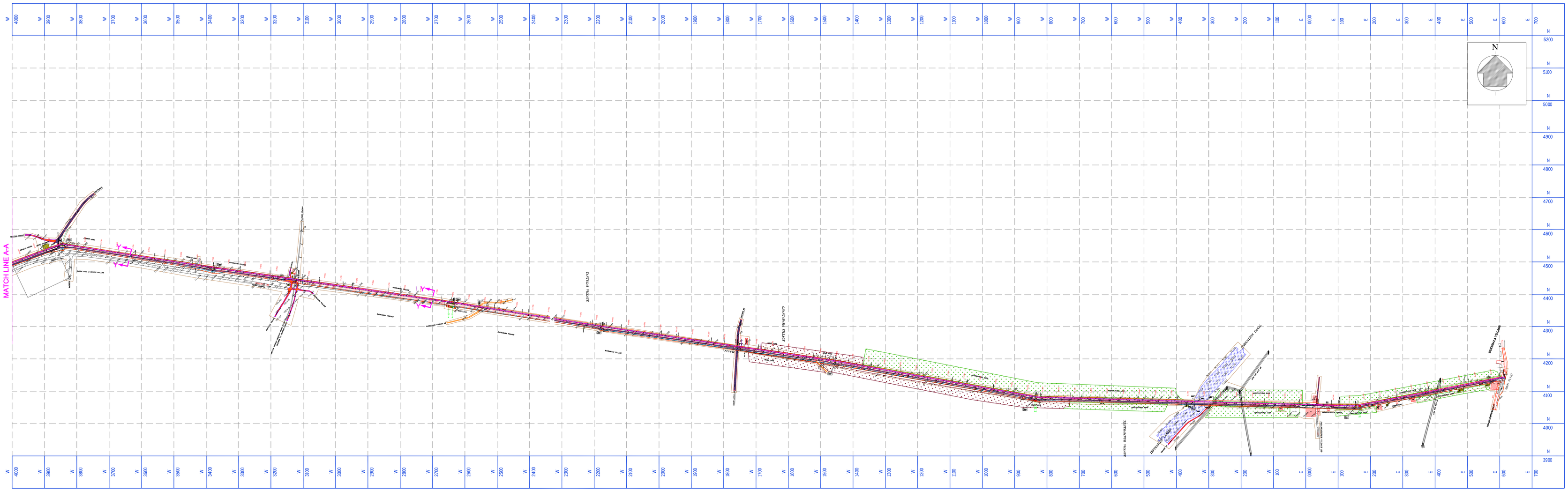
NTPC Limited
A GOVT. OF INDIA ENTERPRISE
ENGINEERING DIVISION

PROJECT: TALCHER THERMAL POWER PROJECT
STAGE-III (2x660MW)

TITLE: EPC PACKAGE-ASH HANDLING SYSTEM
PROPOSED ROUTING OF ASH SLURRY DISPOSAL & ASRS PIPING AND ASSOCIATED FACILITIES

SIZE: A0 | SCALE: | DRG.NO.: 4540-001-POM-A-030 (SHEET-1 OF 2) | REV.: B

cad file name : 4540-001-POM-A-030.dwg



LEGENDS

SL.NO.	DESCRIPTION	SYMBOL
01.	Survey Boundary Shown As.	
02.	Bituminous Road Shown As.	
03.	Moram Road Shown As.	
04.	Cart Track Road Shown As.	
05.	Concrete Road Shown As.	
06.	Irrigation Canal Shown As.	
07.	Concrete Drain Shown As.	
08.	Hutment Shown As.	
09.	Pucca Building Shown As.	
10.	Semi Pucca Building Shown As.	
11.	Shed Point Shown As.	
12.	Electric Post Shown As.	
13.	Electric Line Shown As.	
14.	Rail Line Shown As.	
15.	Rail Most Shown As.	
16.	H.T.Tower Shown As.	
17.	Light Post Shown As.	
18.	Transformer Shown As.	
19.	Water Pipe Line Shown As.	
20.	Water Tank Shown As.	
21.	Ash Pipe Line Shown As.	
22.	Temple Shown As.	
23.	Tree Shown As.	
24.	Padistal Shown As.	
25.	Conveyor Line Shown As.	
26.	Sign Bord Shown As.	
27.	Gate Shown As.	
28.	O.F.C Pillar Shown As.	
29.	Agricultural Land Shown As.	
30.	Abadi Land Shown As.	
31.	Water Tap Shown As.	
32.	Hand Pump Shown As.	
33.	Bridge Shown As.	
34.	Hume Pipe Shown As.	
35.	Fencing Shown As.	
36.	Boundary Shown As.	
37.	Pillar Shown As.	
38.	TBM Shown As.	
39.	Major Contour Shown As.	70.0
40.	Minor Contour Shown As.	71.0
41.	Grid RL Shown As.	121.300
42.	Nallah Shown As.	
43.	Chainage Shown As.	0+400
44.	Chainage Line Shown As.	
45.	Conveyor Minor Tick Shown As.	
46.	Conveyor Mijor Tick Shown As.	

Note :-

1. All Dimensions are in meter unless otherwise stated.
2. Grid Lines are oriented to Plant Grid.
3. Reference Co-Ordinates area based on Local Co-Ordinate.
4. Bench mark is considered from the pillar P1 which is situated in the compound of Township gate no-1 security office building. The Value of Pillar P1 is 69.891 M
5. Horizontal control is Considered from the Pillar P-1 & P-2
   P1::N-3915.082-E-1952.988-RL-69.891M.
   P2::N-3914.951-E-1956.003-RL-69.722M.
   Pillar P1 & P2 is situated in the compound of To-nship gate no-1 security office building.
6. Total Surveyed Area:-44.244 ACRE.
7. Some Abbreviation.
   i- HTLX-High Tension Line Crossing.
   ii- ELEX-Electric Line Crossing.
   iii- BL-Bottom Level.
   iv- TL-Top Level.
   v- OHWPL-Over Head Water Pipe Line.
   vi- OHPR-Over Head Pipe Rack.
   vii- CTR-Conveyor Top RL.

Client :-

NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)
Talcher Thermal Power Station,
Post.-Talcher Thermal,
District.-Angul,
Odisha-759101, India.

Contractor :-

SAN SURVEY ENGINEERING
A Group of Surveyors
465, JIBAN PAL BAGAN, KARBALA (W)
POST & DIST-HOOGHLY, PIN- 712103
WEST BENGAL,INDIA

PILLAR COORDINATE

SL.NO.	NORTHING	EASTING	RL	REMARKS
A-46	4054.488	168.155	75.258	-AGANNATHPUR VILLAGE BESIDE THE TP-9.
A-47	4052.942	164.808	75.548	-AGANNATHPUR VILLAGE BESIDE THE TP-9.
A-48	4070.236	-833.861	79.539	TEHERAMPUR VILLAGE BESIDE THE TP-8.
A-49	4070.767	-837.707	79.533	TEHERAMPUR VILLAGE BESIDE THE TP-8.
A-50	4361.555	-2650.243	99.172	BAGHAMARA VILLAGE BESIDE THE TP-5.
A-51	4364.959	-2649.747	99.107	BAGHAMARA VILLAGE BESIDE THE TP-5.
A-52	4419.645	-4291.267	109.018	BESIDE THE D.HOUSE SUB STATION.
A-53	4420.562	-4295.069	109.084	BESIDE THE D.HOUSE SUB STATION.
A-54	4962.545	-6200.808	126.027	NEAR BY R1-R2 DISTURB PILLAR -NEAR ELECTRIC POLE.
A-55	4963.684	-6204.550	125.908	NEAR BY R1-R2 DISTURB PILLAR -NEAR ELECTRIC POLE.
A-56	4914.676	-6350.088	122.397	NTPC ASH DIPOSIT AREA NEAR ELECTRIC TRANSFORMER.
A-57	4910.643	-6348.265	122.537	NTPC ASH DIPOSIT AREA NEAR ELECTRIC TRANSFORMER.

Project :- TOPOGRAPHICAL SURVEY OF LAND BANKS OF TTPS.
-TALCHER THERMAL POWER STATION-

Title : TOPOGRAPHICAL SURVEY DETAIL & GRID RL DRAWING OF CONVEYOR LINE .

PREPBY	APPROVE BY		
GOPAL SARKAR	AVI-IT CHAUDHURI	Scale - 1:2000	Date : -AN-2017

SL.NO.	DESCRIPTION	CHKD. BY	APPVD.BY	REV.

STATUS OF REVISION

D-g. No. -NTPC -TALCHER -CONVEYOR LINE -TOPO & GRID RL-002

FOR TENDER PURPOSE ONLY

REV.	DESCRIPTION	DRAWN	DESIGN	CHKD.	CLEARED BY C	CLEARED BY M	CLEARED BY E	CLEARED BY C&I	APPD	DATE
A	RELEASED FOR TENDER		KM	AN				AG		

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NTPC Limited
{ A GOVT. OF INDIA ENTERPRISE }
ENGINEERING DIVISION

PROJECT: TALCHER THERMAL POWER PRO-ECT
STAGE-III (2x660MW)

TITLE: EPC PACKAGE-ASH HANDLING SYSTEM
PROPOSED ROUTING OF ASH SLURR - DISPOSAL -
A-RS PIPING AND ASSOCIATED FACILITIES

SIZE	SCALE	DRG.NO.	REV.
A0		4540-001-POM-A-030 (SHEET-2 OF 2)	A

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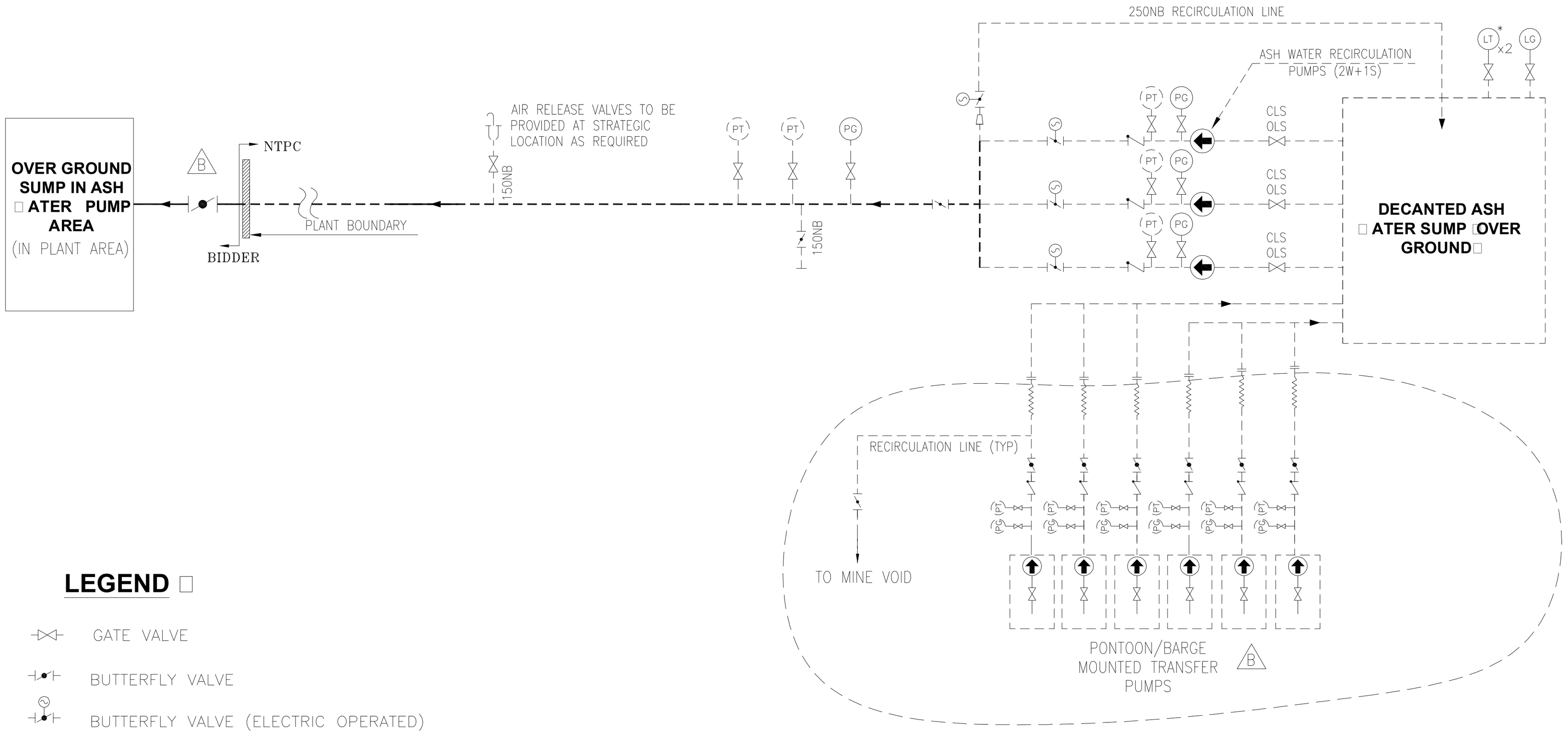

LEGEND □

- GATE VALVE
- BUTTERFLY VALVE
- BUTTERFLY VALVE (ELECTRIC OPERATED)
- CHECK VALVE
- AIR RELEASE VALVE
- OLS — OPEN LIMIT SWITCH
- CLS — CLOSE LIMIT SWITCH
- (PT) — PRESSURE TRANSMITTER
- (PG) — PRESSURE GAUGE
- (LT)* — LEVEL TRANSMITTER (ULTRASONIC TYPE)
- (LG) — LEVEL GAUGE
- FLEXIBLE PIPE WITH QUICK DISCONNECT COUPLINGS & FITTINGS

NOTE:

1. SKETCH IS INDICATIVE ONLY AND SHOULD READ IN CONJUNCTION WITH TECHNICAL SPECIFICATION AND OTHER CONTRACT DOCUMENTS.

FOR TENDER PURPOSE ONLY

REV.	DESCRIPTION	DRAWN	DESIGN	CHKD.	CLEARED BY C	CLEARED BY M	CLEARED BY E	CLEARED BY C&I	APPD	DATE
B	REVISED AS PER BIDDER'S QUERIES									
A	RELEASED FOR TENDER	Priyanka	KM	AN					AG	

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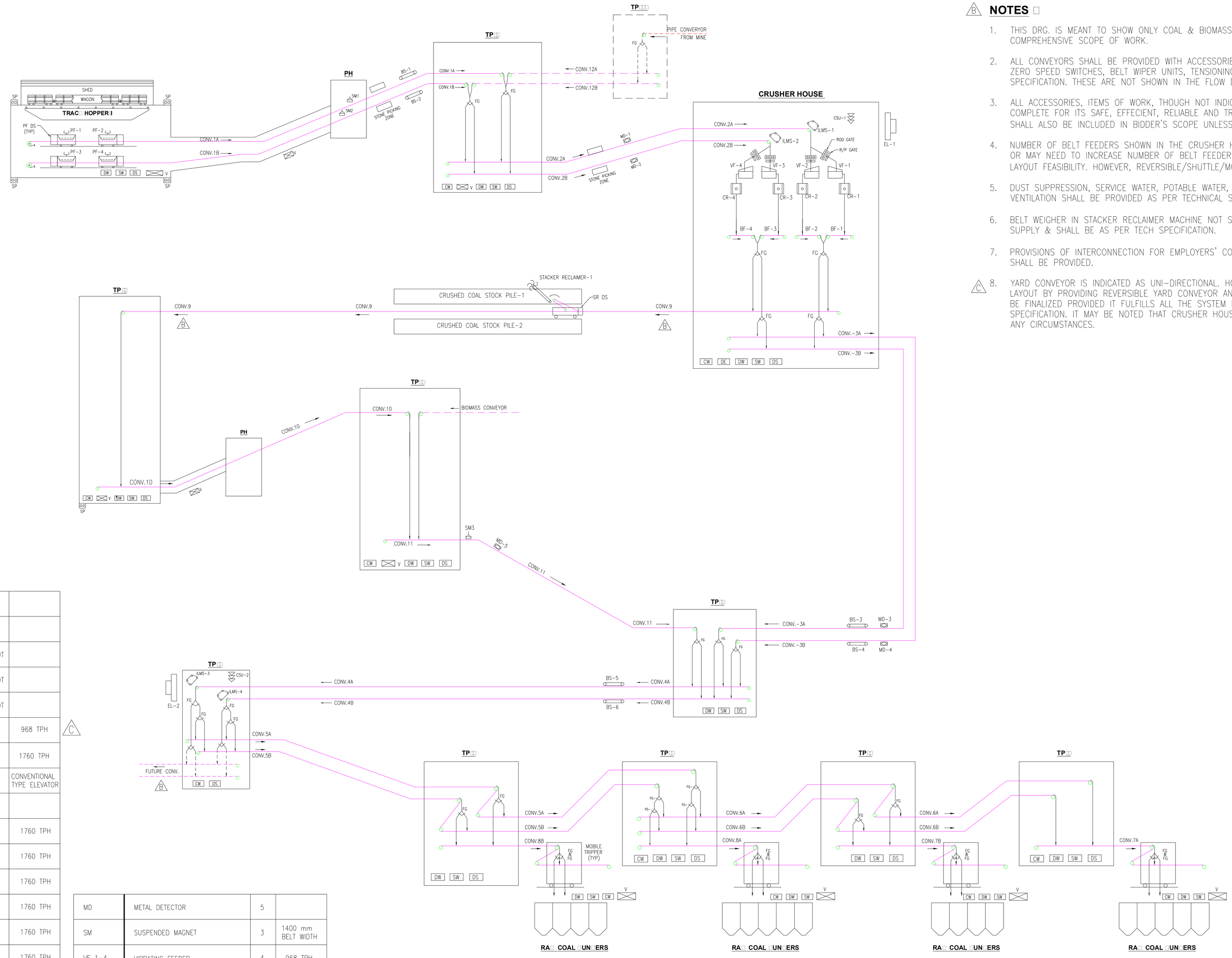
NTPC Limited
(A GOVT. OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TALCHER THERMAL PO□ ER PRO□ECT
STAGE-III(2X660MW)

TITLE: EPC PACKAGE-ASH HANDLING SYSTEM & AWRS PACKAGE
SINGLE LINE FLO□ □ INSTRUMENTATION DIAGRAM FOR ASH □ATER RECIRCULATION S□STEM

SIZE	SCALE	DRG.NO.	REV.
A2		□□□□□□□□POM□A□□□□	B

CAD FILE NAME : 4540-001-POM-A-031dwg



NOTES

1. THIS DRG. IS MEANT TO SHOW ONLY COAL & BIOMASS FLOW PATH AND DOES NOT INDICATE COMPREHENSIVE SCOPE OF WORK.
2. ALL CONVEYORS SHALL BE PROVIDED WITH ACCESSORIES SUCH AS PULL CORD, BELT SWAY AND ZERO SPEED SWITCHES, BELT WIPER UNITS, TENSIONING DEVICES ETC. AS PER TECHNICAL SPECIFICATION. THESE ARE NOT SHOWN IN THE FLOW DIAGRAM FOR CLARITY.
3. ALL ACCESSORIES, ITEMS OF WORK, THOUGH NOT INDICATED BUT REQUIRED TO MAKE THE SYSTEM COMPLETE FOR ITS SAFE, EFFECIENT, RELIABLE AND TROUBLE FREE OPERATION AND MAINTENANCE SHALL ALSO BE INCLUDED IN BIDDER'S SCOPE UNLESS SPECIFICALLY EXCLUDED.
4. NUMBER OF BELT FEEDERS SHOWN IN THE CRUSHER HOUSE ARE TENTATIVE. BIDDER MAY OPTIMIZE OR MAY NEED TO INCREASE NUMBER OF BELT FEEDERS IN THE CRUSHER HOUSE BASED ON THE LAYOUT FEASIBILITY. HOWEVER, REVERSIBLE/SHUTTLE/MOVABLE BELT FEEDER SHALL NOT BE ALLOWED.
5. DUST SUPPRESSION, SERVICE WATER, POTABLE WATER, COOLING WATER, DUST EXTRACTION & VENTILATION SHALL BE PROVIDED AS PER TECHNICAL SPECIFICATION REQUIREMENT.
6. BELT WEIGHER IN STACKER RECLAIMER MACHINE NOT SHOWN FOR CLARITY IS IN BIDDER'S SCOPE OF SUPPLY & SHALL BE AS PER TECH SPECIFICATION.
7. PROVISIONS OF INTERCONNECTION FOR EMPLOYERS' COAL & BIOMASS CONVEYORS AT TP-1 & TP-9 SHALL BE PROVIDED.
8. YARD CONVEYOR IS INDICATED AS UNI-DIRECTIONAL. HOWEVER, FURTHER OPTIMIZATION OF THE CHP LAYOUT BY PROVIDING REVERSIBLE YARD CONVEYOR AND REVERSIBLE STACKER CUM RECLAIMER MAY BE FINALIZED PROVIDED IT FULFILLS ALL THE SYSTEM REQUIREMENT AS PER THE TENDER SPECIFICATION. IT MAY BE NOTED THAT CRUSHER HOUSE SHALL NOT BE LOCATED UNDER-GROUND IN ANY CIRCUMSTANCES.

EQUIPT DESIGN	EQUIPMENT	QTY	RATED CAPACITY
RPG	RACK AND PINION GATE	4	
RG	ROD GATE	4	
DE	DUST EXTRACTION SYSTEM	LOT	
DS	DUST SUPPRESSION SYSTEM	LOT	
SP	SUMP PUMP	LOT	
BF-1,2,3,4	BELT FEEDER	4	968 TPH
SR	STACKER RECLAIMER	1	1760 TPH
EL	PASSENGER CUM GOODS ELEVATOR	2	CONVENTIONAL TYPE ELEVATOR
PH	PENT HOUSE	2	
12A/12B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
11A/11B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
10A/10B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
CONV.9	CONVEYOR 1400 mm BELT WIDTH	1	1760 TPH
8A/8B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
7A/7B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
6A/6B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
5A/5B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
4A/4B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
3A/3B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
2A/2B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
1A/1B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH

EQUPT DESIGN	EQUIPMENT	QTY	RATED CAPACITY
MD	METAL DETECTOR	5	
SM	SUSPENDED MAGNET	3	1400 mm BELT WIDTH
VF 1-4	VIBRATING FEEDER	4	968 TPH
CSU-1	COAL SAMPLING UNIT (-)250mm SIZE	1	
CSU-2	COAL SAMPLING UNIT (-)20mm SIZE	1	
CR	CRUSHER	4	968 TPH
FG	FLAP GATE	LOT	
BS	BELT WEIGH SCALE	6	
ILMS 1-4	IN LINE MAGNETIC SEPARATOR ALONG WITH TRAMP IRON CHUTE	4	FOR 1400 mm BELT WIDTH
PF 1-4	PADDLE FEEDER	4	1320 TPH

LEGEND	
	BELT FEEDER
DS	DUST SUPRRESSION SYSTEM
SW	SERVICE WATER SYSTEM
DW	DRINKING WATER SYSTEM
DE	DUST EXTRACTION SYSTEM
SP	SUMP & SUMP DRAINAGE PUMPS
	BELT CONVEYOR
	PIPE CONVEYOR
CA	ON LINE COAL ANALYSER
	FUTURE PROVISION
BS	BELT SCALE
CSU	COAL SAMPLING UNIT
DS	DUST SUPPRESSION-PF/SR
ILMS	MAGNETIC SEPARATOR (IN LINE)
MD	METAL DETECTOR
PF	PADDLE FEEDER
V	VENTILATION
FG	FLAP GATE
	ROD GATE
	RACK & PINION GATE
CR	CRUSHER
VF	VIBRATING SCREENING FEEDER
SM	SUSPENDED MAGNET
EL	CONVENTIONAL TYPE ELEVATOR

FOR TENDER PURPOSE ONLY

REV.	DESCRIPTION	DRAWN	DESIGN	CHKD.	C	M	E	C&I	APPD	DATE
C	REVISED AS PER BIDDER'S QUERIES	PRIYANKA	KM	AN	CLEARED BY			AG		
B	REVISED AS PER BIDDER'S QUERIES									
A	RELEASED FOR TENDER									

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NTPC Limited
(A GOVT. OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: **TALCHAR THERMAL POWER PROJECT**
STAGE-III (2x660MW)

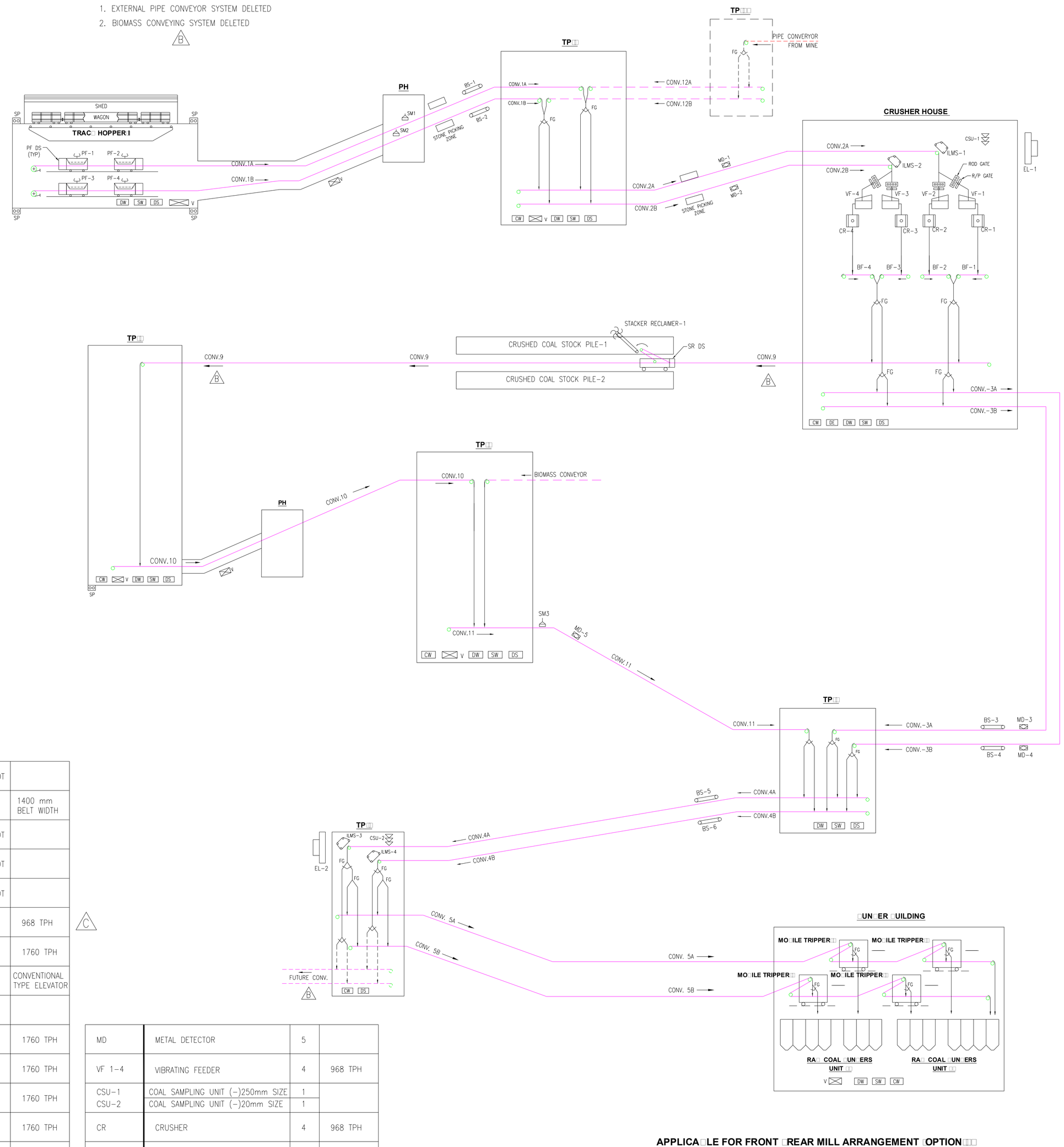
TITLE: EPC PACKAGE-COAL HANDLING SYSTEM
COAL FLOW DIAGRAM

SIZE A1 | SCALE -- | DRG.NO. PROMPT-A-040 (OPTION-II) | REV. C

CAD FILE NAME : 4540-001-POM-A-040 (OP.-01).dwg

1. EXTERNAL PIPE CONVEYOR SYSTEM DELETED
2. BIOMASS CONVEYING SYSTEM DELETED

B



APPLICABLE FOR FRONT REAR MILL ARRANGEMENT OPTION

NOTES

1. THIS DRG. IS MEANT TO SHOW ONLY COAL & BIOMASS FLOW PATH AND DOES NOT INDICATE COMPREHENSIVE SCOPE OF WORK.
2. ALL CONVEYORS SHALL BE PROVIDED WITH ACCESSORIES SUCH AS PULL CORD, BELT SWAY AND ZERO SPEED SWITCHES, BELT WIPER UNITS, TENSIONING DEVICES ETC. AS PER TECHNICAL SPECIFICATION. THESE ARE NOT SHOWN IN THE FLOW DIAGRAM FOR CLARITY.
3. ALL ACCESSORIES, ITEMS OF WORK, THOUGH NOT INDICATED BUT REQUIRED TO MAKE THE SYSTEM COMPLETE FOR ITS SAFE, EFFECIENT, RELIABLE AND TROUBLE FREE OPERATION AND MAINTENANCE SHALL ALSO BE INCLUDED IN BIDDER'S SCOPE UNLESS SPECIFICALLY EXCLUDED.
4. NUMBER OF BELT FEEDERS SHOWN IN THE CRUSHER HOUSE ARE TENTATIVE. BIDDER MAY OPTIMIZE OR MAY NEED TO INCREASE NUMBER OF BELT FEEDERS IN THE CRUSHER HOUSE BASED ON THE LAYOUT FEASIBILITY. HOWEVER, REVERSIBLE/SHUTTLE/MOVABLE BELT FEEDER SHALL NOT BE ALLOWED.
5. DUST SUPPRESSION, SERVICE WATER, POTABLE WATER, COOLING WATER, DUST EXTRACTION & VENTILATION SHALL BE PROVIDED AS PER TECHNICAL SPECIFICATION REQUIREMENT.
6. BELT WEIGHER IN STACKER RECLAIMER MACHINE NOT SHOWN FOR CLARITY IS IN BIDDER'S SCOPE OF SUPPLY & SHALL BE AS PER TECH SPECIFICATION.
7. PROVISIONS OF INTERCONNECTION FOR EMPLOYERS' COAL & BIOMASS CONVEYORS AT TP-1 & TP-9 SHALL BE PROVIDED.
8. C YARD CONVEYOR IS INDICATED AS UNI-DIRECTIONAL. HOWEVER, FURTHER OPTIMIZATION OF THE CHP LAYOUT BY PROVIDING REVERSIBLE YARD CONVEYOR AND REVERSIBLE STACKER CUM RECLAIMER MAY BE FINALIZED PROVIDED IT FULFILLS ALL THE SYSTEM REQUIREMENT AS PER THE TENDER SPECIFICATION. IT MAY BE NOTED THAT CRUSHER HOUSE SHALL NOT BE LOCATED UNDER-GROUND IN ANY CIRCUMSTANCES.

LEGEND	
	BELT FEEDER
DS	DUST SUPPRESSION SYSTEM
SW	SERVICE WATER SYSTEM
DW	DRINKING WATER SYSTEM
DE	DUST EXTRACTION SYSTEM
SP	SUMP & SUMP DRAINAGE PUMPS
	BELT CONVEYOR
	PIPE CONVEYOR
CA	ON LINE COAL ANALYSER
	FUTURE PROVISION
BS	BELT SCALE
CSU	COAL SAMPLING UNIT
DS	DUST SUPPRESSION-PF/SR
ILMS	MAGNETIC SEPARATOR (IN LINE)
MD	METAL DETECTOR
PF	PADDLE FEEDER
V	VENTILATION
FG	FLAP GATE
	ROD GATE
	RACK & PINION GATE
CR	CRUSHER
VF	VIBRATING SCREENING FEEDER
SM	SUSPENDED MAGNET
EL	CONVENTIONAL TYPE ELEVATOR

EQPT DESIGN	EQUIPMENT	QTY	RATED CAPACITY
FG	FLAP GATE	LOT	
SM	SUSPENDED MAGNET	3	1400 mm BELT WIDTH
DE	DUST EXTRACTION SYSTEM	LOT	
DS	DUST SUPPRESSION SYSTEM	LOT	
SP	SUMP PUMP	LOT	
BF-1,2,3,4	BELT FEEDER	4	968 TPH
SR	STACKER RECLAIMER	1	1760 TPH
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CONV.9	CONVEYOR 1400 mm BELT WIDTH	1	1760 TPH
5A/5B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
4A/4B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
3A/3B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
2A/2B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH
1A/1B	CONVEYOR 1400 mm BELT WIDTH	2	1760 TPH

C

EQPT DESIGN	EQUIPMENT	QTY	RATED CAPACITY
MD	METAL DETECTOR	5	
VF 1-4	VIBRATING FEEDER	4	968 TPH
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CSU-2	COAL SAMPLING UNIT (-)20mm SIZE	1	
CR	CRUSHER	4	968 TPH
BS	BELT WEIGH SCALE	6	
RPG	RACK AND PINION GATE	4	
RG	ROD GATE	4	
ILMS 1-4	IN LINE MAGNETIC SEPARATOR ALONG WITH TRAMP IRON CHUTE	4	FOR 1400 mm BELT WIDTH
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FOR TENDER PURPOSE ONLY

REV.	DESCRIPTION	DRAWN	DESIGN	CHKD.	C	M	E	C&I	APPD	DATE
C	REVISED AS PER BIDDER'S QUERIES									
B	REVISED AS PER BIDDER'S QUERIES									
A	RELEASED FOR TENDER	PRIYANKA	KM	AN					AG	

CLEARED BY

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NTPC Limited
(A GOVT. OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: **TALCHAR THERMAL POWER PROJECT**
STAGE-III (2x660MW)

TITLE: EPC PACKAGE-COAL HANDLING SYSTEM
COAL FLOW DIAGRAM

SIZE	SCALE	DRG.NO.	REV.
A1	--	4540-001-POM-A-040 (OPTION)	C

CAD FILE NAME : 4540-001-POM-A-040 (OP.-02).dwg

SAFETY MODULE

1.00.00 GENERAL

1.01.00 All equipment furnished by the Contractor shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, commissioning and safe operation of the equipment and for the safety of the operating personnel, as required by applicable codes.

All equipment shall be 'fail safe' in any conditions.

1.02.00 CODES AND STANDARDS

Technical specification stipulates compliance to applicable statutory regulations and safety codes of India as well as of the locality where those will be installed. In particular, the CHP shall conform to the latest edition of the following standards, rules, acts.

- NTPC Safety Rules for Construction and Erection
- NTPC Safety Policy
- IS:7155 : Codes of Practice for Conveyor Safety.
- ASME B20.1 "Safety Standard for Conveyors and Related Equipment".
- ASME Standard B15.1 "Safety Standard for Mechanical Power Transmission Apparatus"
- ISO 7149, " Continuous handling Equipment-Safety Code-Special Rule"
- ISO 12944 - Corrosion protection of steel structures
- IS:3764 EXCAVATION WORK CODE OF SAFETY
- Occupational Safety and Health Administration- Guidelines
- CEMA Publication No. 201, " Safety Label Brochure"
- IE (Indian Electricity) Rules and Acts

2.00.00 GENERAL SAFETY REQUIREMNT FOR COAL/LIMESTONE/GYPSUM HANDLING PLANT

2.01.00 **CONVEYING SYSTEM**

Belt conveyors' safety generally begins with sound design that, as far as is practical, avoids foreseeable dangers and hazards. Diligence in safety considerations must be applied during the course of design, engineering, manufacture, installation, and establishment of operation and maintenance policies and procedures. Important aspects of conveyor safety are elaborated as follows:

2.01.01 Safety devices- Pull cord switches, belt sway switches, zero speed switches, and plugged chute switches are to be provided on conveyors to provide maximum protection to both personnel and equipment.

2.01.02 Conveyor Take up- Two (2) meter safety fencing along with suitable gate and locking arrangement shall be provided around gravity take-up at the base level / ground level. In case of double stream conveyors, a partition of 3.15 mm steel plate shall be provided between the

	two take-up pulleys along entire travel zone of take-up pulleys. Intermediate platforms shall be provided in the take-up zone for maintenance of take - up pulleys / counter weight.
2.01.03	Pulleys- Suitable guards shall be provided for all tail pulleys and bend pulleys for safety of operating personnel.
2.01.04	Conveyor Bridges- Seal plates throughout the length of the conveyor gallery to be provided in such a way that complete gallery's bottom surface area forms a single water proof floor and no water / coal/Limestone falls down from conveyor gallery. Safety Handrails to be provided all along walkways along with toe guard. In case of conveyor angle is more than 10 deg, stepped walkways are to be provided along the conveyor.
2.01.05	Fire Fighting- Structures and floors shall be so designed as to provide suitable space for routing of firefighting pipe with water, cables and conduits. Firefighting arrangement is to be provided as specified elsewhere in technical specification. Fire Escape provision along with cage ladder to be provided on each trestle.
2.01.06	Movable discharge pulleys and movable belt feeders- The complete discharge pulley movement area shall be covered with proper sealing arrangement. The discharge chute opening shall be provided with proper handrails for the safety purpose. Suitable rotating strobe lights and siren on mobile equipment shall be provided to warn personnel at the time of operation.
2.01.07	Hooter alarm is to be activated before the start of conveyor/ equipment. The operating staff is cautioned and would stay away from the vicinity of conveyor. The beacon lamp is activated simultaneously with the starting of conveyor. The same is to be incorporated in control philosophy.
2.01.08	Manual Stone Picking arrangement at a suitable location in the conveyor gallery before the crusher house shall be provided complete with platforms, overhead lighting, handrailings, suitable seating with good ergonomic arrangement, safety hook & holding arrangement/ safety belt for manual pickers, disposal chutes to ground level etc. Suitable provision of alarm in conveyor gallery to be provided for non-compliance with applying of safety hook and safety belts by stone pickers.
2.01.09	All movable parts giving access through mechanical handling equipment shall be designed so that they cannot be opened whilst the equipment is working.
2.01.10	All the lubrication points used frequently shall be accessible without it being necessary to remove the guards.
2.01.11	It is recommended that equipment be so designed that cleaning is facilitated.
2.01.12	Overhead gantry portion of road and rail crossings, walkways, galleries, work places under the overhead conveyors used by the personnel, shall be protected by means of suitable covering such as plates/steel sheet covers to prevent falling of the material/objects over such areas/personnel.

2.01.13 Gangways, hand-rails, staircases, ladders, guards, etc shall be erected before the installation is put into service.

2.01.14 The gallery should as far as possible be erected as a box section keeping all the vertical and horizontal bracing tied in proper position. The gallery should be checked for all erection stresses that are likely to develop during handling and erection and if required, temporary strengthening of gallery members during erection shall be made.

2.01.15 Coal conveying tunnels shall be provided with fire escape at every 50 m in case of tunnel length length exceeds 100m.

2.02.00 CHP BUILDINGS

2.02.01 The design and construction of CHP Buildings shall comply with all the currently applicable statutes, regulations and safety codes in the locality where the equipment is to be installed.

2.02.02 All CHP buildings shall have sufficient space to accommodate all equipment and ample space shall be provided for maintenance purposes. The clear space around equipment to be maintained minimum 1200 mm for ease of maintenance and man movement safely.

2.02.03 Openings and edges in the floors of CHP buildings (i.e. TPs/CH etc.) shall be provided with curb of 100 mm high along **with top of handrails and toe guard** at 1200 mm for safety purpose.

2.02.04 Necessary facilities for ventilation of track hopper, tunnels, underground buildings, control/MCC rooms, WT control room and Bunker bay shall be provided as specified elsewhere.

2.02.05 External fire escape stair case along with internal staircase shall be provided for all MCC/ control rooms & Crusher house. External staircases shall be provided for all transfer points. All buildings shall have the fire protection provisions to meet TAC and IS – 3034 regulations.

2.02.06 All stairs of over and underground portion of transfer houses & crusher house shall be of minimum 1200 mm wide and maximum rise should not be more than 180 mm with safety Handrails of 1200 mm all along the flight to protect fall protection. Numbers and arrangement (including enclosures etc.) of stair cases shall be such as to meet the fire safety requirement as per guide lines of statutory regulatory bodies. Minimum headroom in all staircases and all levels shall be 2200 mm from floor finish level.

2.02.07 Staircase with minimum width of 1200 mm shall be provided for approach to elevated structures at 5m height from the nearest platform. Below this height a vertical cage ladder with minimum clear width of 600 mm may also be acceptable. Proper Clear headroom of 2200 mm on all maintenance platforms to be provided. Handrails of minimum 1500 mm height, are to be provided around all maintenance platforms.

2.02.08 Safety chain or handrails or side sheeting to be provided up to working safe level near Monorail doors at sides of Transfer towers/VGTU's.

2.02.09 Monorail Hoist for handling of equipment weighing more than 500 kg is to be provided.

2.02.10 Extent of the RCC floor in CHP buildings (i.e. TPs/CH etc.) shall flush with the cladding.

2.02.11 Deck sheet should be placed in such a way so that deck sheet profile should be along shorter direction.

2.02.11 Loading/ Unloading zones in CHP buildings (TPs/CHs) shall be marked permanently for identification of zone and capacity.

2.02.12 Erection shall be done as per approved erection scheme. Erection of bracing/ties elements simultaneously along with column/beam elements is very essential for stability of structure and transfer of lateral load both at the completed and under erection stage.

2.02.13 Any excavation greater than 1.5 m shall be planned as per 'IS 3764 - *Excavation Work Code Of Safety*'.

2.03.00 WAGON TIPPLER & ASSOCIATED SYSTEM-Not applicable

2.04.00 TRACK HOPPER & ASSOCIATE SYSTEM

2.04.01 **Safety requirement above ground Track Hopper area:**

a. Proper walkway and handrail all along the Track Hopper length shall be provided as per the specification.
b. Steel grating (as specified elsewhere) shall be provided securely at Hopper top.
c. Proper barricading of the Crane/Hoist floor opening shall be provided.
d. Proper illumination shall be provided throughout the entire area of Track Hopper Complex.
e. Track Hopper walkway area shall be free from any intermediate crossing of utility pipes, structures, cables etc.

2.04.05 **Safety requirement underground Track Hopper area & equipment:**

a. Direct Communication from track Hopper (inside) & Paddle Feeder with the Control Room shall be provided.
b. Side walkway inside Track Hopper shall be of adequate width & free from any intermediate crossing of utility pipes, structures, cables etc. Width/height of central walkway shall be sufficient for ease working of maintenance people.
c. Proper illumination shall be provided inside Track Hopper area so that Side walkways & central portions between two Track hopper conveyors and Hopper table shall be clearly visible. Emergency lighting shall also be provided in case of tripping of regular lighting supply.
d. Staircase inside Track Hopper shall be with minimum 1200 width with proper Hand railing & toe guards.
e. All drains and sump pump pit inside hoppers shall be covered with gratings.
f. Underground area shall be well ventilated as specified elsewhere.

2.04.06 Deep excavation for Track Hopper shall be done as per approved excavation and dewatering scheme. It shall adhere IS: 3764 safety code for excavation work. Due care for dewatering shall be taken care while excavation and construction.

2.05.00 STOCKYARD AREA

2.05.01 **Stacker Reclaimer:-**

Protective guards to be provided on all the drives. A maintenance platform to be provided for the drives with combination of handrail and dog chain all around it.

The lowering and raising system shall be fitted with a safety device to prevent accidental lowering or lifting of the boom, and to prevent any collision of boom structure with the Stock Pile.

Operator's cabin to be located as to enable the operator to get clear vision of both sides of the track and the cutting of coal by buckets. The cabin shall be suitable for operation in monsoon and tropical conditions and the inside ambient temperature shall be maintained at 27^0C. For operation in winter/rainy conditions, fog lights, in addition to normal lighting, outside cabin for clear view of stockpiles from cabin to be provided. The cabin shall be provided with toughened glasses with **wipers** and the arrangement shall be such that glasses can be cleaned from outside without any scaffolding, Cabin door shall be provided with hydraulic door closers. The cabin shall be kept in horizontal position through hydraulic cylinders irrespective of the angle of inclination of the boom conveyor.

2.06.00 Tripper Floor

2.06.01 Provision shall be kept for automatic tripping of bunker bay conveyor in the event of travelling tripper getting dragged (i.e. travel speed in excess of rated speed). Emergency push button to be provided on tripper floor.

2.06.02 Wheels or rollers of travelling conveyors and of additional travelling equipment shall be guarded at points accessible to personnel under normal working conditions.

2.06.03 Whenever an operator remains on the travelling equipment, a platform shall be provided and be so designed as to prevent any accidental contact with mobile components or any part of the fixed installation.

2.06.04 When mobile appliances or equipment travel, warning devices, audio as well as visual, shall be provided.

3.00.00 Electrical Safety

1. Electrical Insulation mats in front of every switchgear/MCC shall be provided as per relevant Indian standards.
2. All trailing cables/festooning arrangement in trippers, hoists etc., shall be easily accessible with proper approach for operation & maintenance people.
3. All electrical/switchgear buildings shall have necessary electrical and general safety instruction charts, Caution/Danger safety labels, properly insulated tools and accessories for handling electrical equipment.

4. Earthing and Lightning protection of all buildings/equipment shall be as per latest electrical acts / rules/ amendments / guidelines.
5. All lighting fixtures in TPs, Crusher house shall be wall mounted type and shall be easily accessible with proper approach for operation & maintenance people.
6. "Earth mat of CHP area" shall be connected to nearest "main plant area earth mat" at minimum of two locations. All buildings/structures shall be interconnected together by minimum two parallel conductors.
7. Minimum Safety clearances for electrical apparatus as per BIS (Bureau of Indian Standard) shall be maintained so that sufficient space is available for easy operation and maintenance without any hazard to the operating and maintenance personnel working near the equipment and for ensuring adequate ventilation. However, any additional stringent requirement for clearance specified elsewhere in the specifications shall prevail.
8. Where a transformer or transformers are used, suitable provision shall be made, either by connecting with earth, a point of the circuit at the lower voltage or otherwise, to guard against the danger by reason of the said circuit becoming accidentally charged above its normal voltage by leakage from or contact with the circuit at the higher voltage.
9. Where the oil filled transformers with capacity more than 2000litres are installed, suitable baffle walls of four hours fire rating shall be provided.
10. Only dry type transformers shall be used inside the buildings.
11. Transformers having capacity more than 10MVA capacity and more than 2000 liters of oil are to be provided with firefighting system as per IS-3034:1993 or with Nitrogen Injection Fire Protection System.
12. All switchgear /MCC shall be "Closed door" operation type.
13. Metallic frame of all electrical equipment shall be earthed by two separate and distinct connections to earthing system, each of 100% capacity. Crane rails, tracks, metal pipes and conduits shall also be effectively earthed at two points. Steel RCC columns, metallic stairs and rails etc., of the building housing electrical equipment shall be connected to the nearby earthing grid conductor by one earthing ensured by bonding the different sections of hand rails and metallic stairs.
14. All switchgear room shall have minimum two exit doors suitable for two hours of fire rating.
15. All cable shall be Fire Retardant Low Smoke (FRLS) type having minimum two hours of fire rating.
16. All cable trestles and trenches shall have a minimum of clear 600mm walkway for ease of accessibility.
17. All cables shall be segregated by voltage wise as HV/MV/LV/Control/ instrumentation type and a minimum of 300mm clearances shall be maintained between cable trays of each type.
18. Fire buckets filled with clean dry sand and ready for immediate use for extinguishing fires, in addition to fire extinguishers suitable for dealing with fires, shall be conspicuously marked and kept in convenient locations in the electrical buildings.
19. First aid boxes or cup boards conspicuously marked and equipped with such contents as the state government may specify shall be provided and maintained in each electrical building.
20. Instruction chart for resuscitation of persons suffering from electric shock in English or Hindi and the local language of the district shall be affixed in a conspicuous location in electrical buildings. (where Hindi is local language it shall be in English and Hindi).

21. Adequate number of gas masks shall be provided in each electrical building.
22. Adequate precautions shall be taken to ensure that no live parts are so exposed as to cause danger.
23. All equipment shall be conspicuously marked and identified.
24. Permanent metallic (MS) ladders shall be provided to access walkway at every 100 meters of cable trestle.
25. Suitable Earth flat shall be laid along the cable trays and connected to nearest earth riser at every 50 meters.
26. All push button stations in CHP area shall be IP65 degree of ingress protection.
27. Lighting fixtures and lamps shall meet the illumination lux levels of different areas as specified elsewhere and all areas shall have aesthetically pleasing and glare free illumination.
28. Minimum twelve (12) nos of lighting masts shall be provided for coal stockyard and Wagon Tippler area illumination.
29. Battery rooms shall have relevant acid/alkali resistant flooring and skirting. Ventilation fans in battery rooms shall be flame proof type. An easily accessible wash basin with mirror shall be provided in the battery room.
30. All outgoing feeders of lighting panels shall have suitable earth fault protection devices (ELCB/RCCB)
31. All welding receptacles shall have suitable ELCB/RCCB.
32. CHP 220V DC system shall be separate and independent from other DC systems of plant. The DC emergency lighting fixtures shall be fed from bidder's 220 V LDBs through DC lighting panels so that tracing and isolation of DC earth fault is convenient. Each switchgear/MCC room shall have a DC LDB and corresponding LPs.
33. The DC emergency lighting fixtures shall be mounted suitably on wall/columns at strategic locations for safe movement of operating personnel and access to important control points during an emergency, when the normal AC lighting system fails. The supply to the DC lighting panels shall be automatically switched on in case of loss of AC supply. The DC supply will be automatically switched off after about 3 minutes following the restoration of AC lighting system.
34. 100W,220V incandescent (or equivalent LED) DC Emergency lighting shall be provided as follows:

    One (1) no. in each local control area

    Three (3) nos. in each MCC/ Switchgear room and control room

    One (1) no in each office room and each pump house

    Six (6) nos. in Track hopper shed

    Twelve (12) nos in track hopper tunnels

    Two (2) nos in each underground portion of TPs

    0ne (1) no at every 5.0m height interval in the staircases of various TPs and buildings under contractor's scope

    One (1) no in each drive floor in each TP under contractor's scope

Eight (8) nos in wagon tippler tunnel

35. Four (4) nos. 240V AC lighting fixtures fed from UPS shall be provided on each stacker re-claimer machine as emergency lighting.
36. MCCs located on the Stacker re-claimer, paddle feeders, travelling trippers shall be fixed type, compartmentalized, single front and suitable for the system fault level.
37. Degree of protection for the MCCs mounted on paddle feeders and travelling trippers shall be IP-65.
38. All motors shall be provided with coupling guards.

4.00.00 Control & Instrumentation Safety

a. Area classification should be done for CHP to identify Hazardous area if any and instrumentation to be upgraded accordingly.
b. All the instruments and actuators mounting shall be reachable for maintenance or suitable platform/ arrangement shall be provided for maintenance.
c. Contractor shall comply all AERB requirements for nucleonic instruments like Coal Analysers (if applicable) and provide suitable symbols/ sign boards in all the relevant locations.
d. In this package unmanned operation of Stacker/ Reclaimer has been envisaged. Contractor shall provide all the safety systems for safe operation of un-manned operation of Stacker / Reclamer considering the safety of man and machine.
e. Contractor shall provide specific marking on the protective devices like EPBs in field.
f. CCTV analytics shall be suitably utilised for safe operation of planned and human safety.
g. In CHP DDCMIS fail safe single command philosophy is implemented. Therefore, in case of failure of DDCMIS in any set of controller, set of power supply, set of communication modules, set of RIO link then complete CHP conveying system should take safe shutdown.
h. In case of Fire Alarm Panel Sensing Fire in any area of CHP, Emergency shutdown is activated from Controller End for complete system
i. Draw out console containing Emergency Stop Push Button for all major drives shall be used for complete system shutdown in case of DDCMIS failure.

5.00.00 Safety Labels:

Safety Labels and Placement Guidelines to be provided Prior to operating the conveyor or any of the associated accessories or equipment, all safety markings, guards and warnings must be in place in accordance with governmental regulations and site specific requirements. All safety labels should be bilingual. Some of safety labels are indicated below:

To be placed on removable guards to warn that operation of the machinery with guards removed would expose chains, belts, gears, shafts, pulleys, couplings, etc. which create hazards

To be located on conveyors where there are exposed moving parts which must be unguarded to facilitate function, i.e. rollers, pulleys, shafts, chains, etc.

LOCATE ON INSPECTION DOOR (S)

General warning to personnel that a conveyor's moving parts, which operate unguarded by necessity of function, i.e. belts, rollers, terminal pulleys, etc., create hazards to be avoided; in particular, conveyors which stop and start by automatic control near operator work stations would use this label.

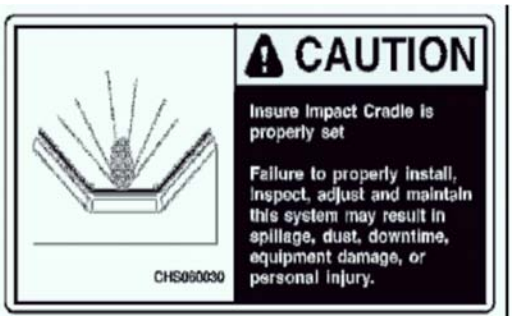
LOCATE AT ENTREACE TO CONVEYOR WALKWAY

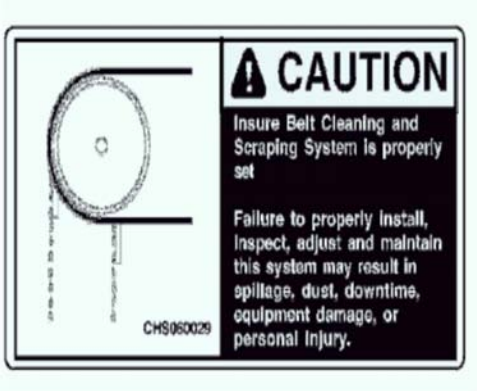
To be placed on removable guards to warn that operation of the machinery with guards removed would expose chains, belts, gears, shafts, pulleys, couplings, etc. which create hazards.

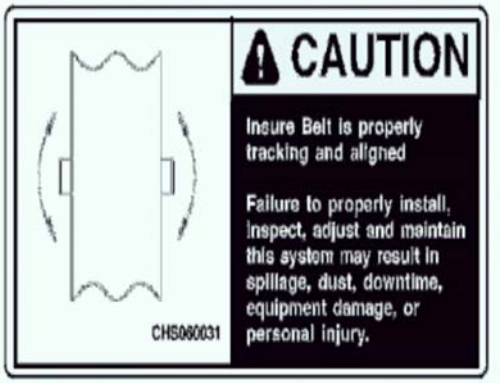
To be placed up to a maximum of 50' centers along the walkway side.

SPACE UP TO A MAXIMUM OF 50 FT CENTERS (WALKWAY SIDES)

To be placed at entrances to enclosed areas which would expose personnel to operational or environmental hazards which should only be entered by trained and authorized personnel under specific conditions; Examples, lifting conveyors, transfer car aisleways, confined spaces, etc.







The above list is not exhaustive and suitable safety labels to be provided for all equipment and hazardous locations in line with international practice for material handling equipment.

6.00.00 Training:

After the design and installation are developed and supervised by qualified engineers familiar with recognized safety features and requirements, the next priority should be personnel training. Operating and maintenance personnel and their supervisors should be initially and then periodically retrained in safe operating procedures, recognizable hazards, precautions, and the maintenance of a safe work place. Accordingly, Contractor to provide the list of proper tools and tackles to operate and maintain the conveyor in an adequately safe condition. Employees should be made aware of, and forbidden to enter, hazardous areas. The training proposal by contractor must include safety training module for site personnel.

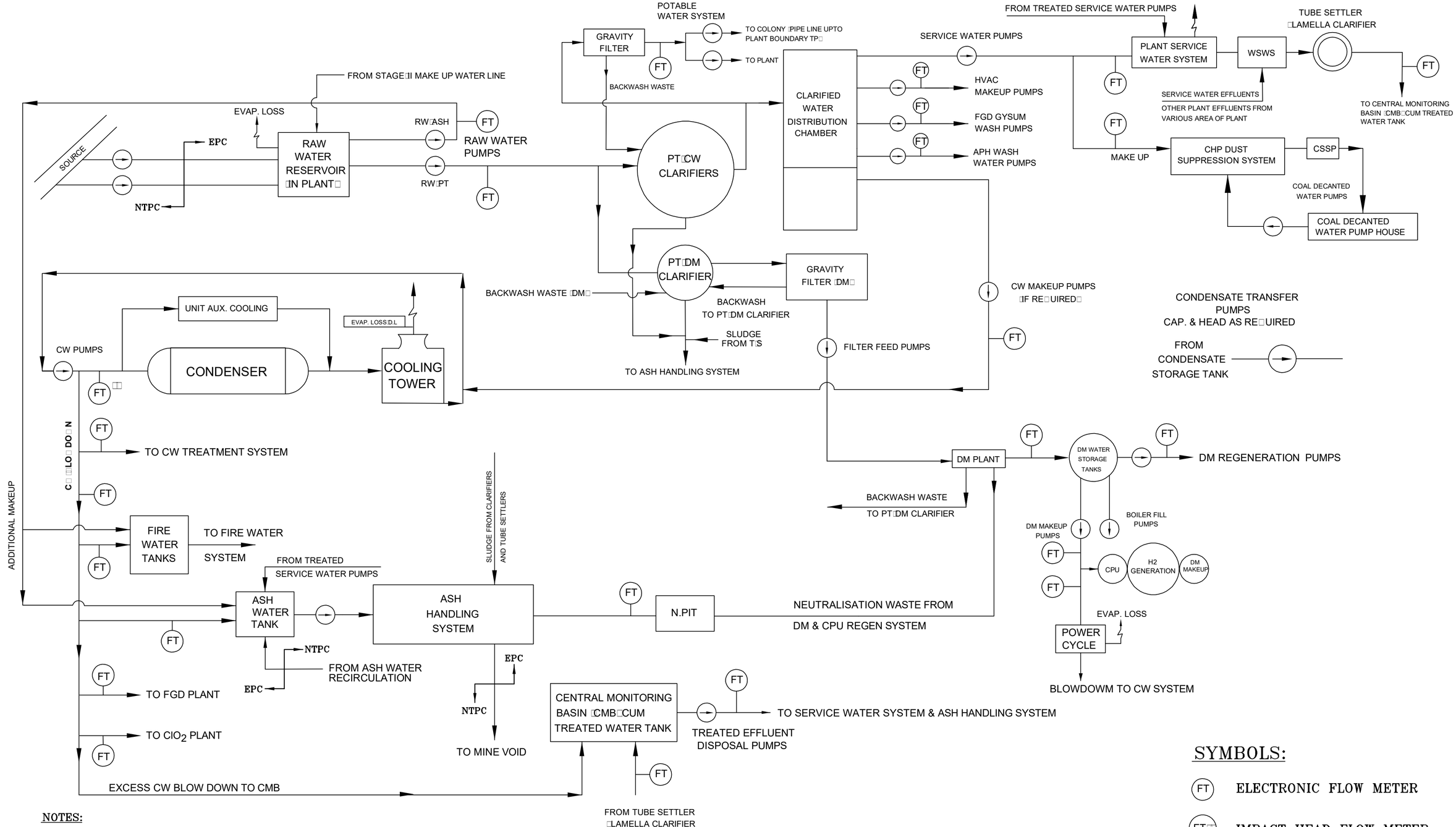
	Specification Reference				Existing	Read As
Sl. No	**Sec/Part**	**Sub Sec**	**Page No.**	**Clause No.**		
A-PU-8	VI/A	A-12	5 of 12	4.00.00, b)	19) Any other area/building required to be protected with hydrant system.	19) Any other area/building **in the scope of the Bidder and** required to be protected with hydrant system.
A-PU-9	VI/A	A-12	6 of 12	4.00.00, c)	8) Apart from the above any other equipment/system which requires HVW spray protection.	8) Apart from the above any other equipment/system **in the scope of the Bidder and** which requires HVW spray protection.
A-PU-10	VI/A	A-12	6 of 12	4.00.00, d)	8) Any other equipment/system which requires MVW spray protection.	8) Any other equipment/system **in the scope of the Bidder and** which requires MVW spray protection.
A-PU-11	VI/A	A-12	7 of 12	4.00.00, g)	**Nitrogen injection system for transformers located outside plant boundary:** Automatic Nitrogen injection system for all transformers located outside plant boundary where water-based fire protection system not envisaged (of rating 10 MVA and above or in case of oil filled transformers with oil capacity of more than 2000 liters) as detailed out in relevant electrical chapters.	**DELETED**
A-PU-12	VI/A	A-12	7 of 12	4.00.00, h)	(e) Switchgear/MCC rooms/Battery Rooms/control rooms of make-up water pump house/AWRS pump house/any other pump house (as applicable) located outside plant boundary.	**DELETED**
A-PU-13	VI/A	A-12	9 of 12	4.00.00, h)	xiii) For fire detection of Switchgear/MCC rooms/Battery Rooms/control rooms of Makeup water/AWRS pump house/other pump house (as applicable) located outside plant boundary, local fire alarm panels shall be provided separately. The fire alarm panel shall be interconnected with panel of Nitrogen Injection system of transformers for annunciation.	**DELETED**
A-PU-14	VI/A	A-12	11 of 12	4.00.00, i)	i) Fire extinguishers shall be installed in all the buildings including make-up water pump house area, AWRS pump house area, as per TAC requirement.	i) Fire extinguishers shall be installed in all the buildings **in the scope of the Bidder** as per TAC requirement.

A-PU-15	VI/B	A-18	1 of 15	1.01.00	A comprehensive fire detection and protection system covering all the equipments/system/ buildings/areas of entire power plant including make-up water pump house, AWRS pump house under scope of the Bidder.	A comprehensive fire detection and protection system covering all the equipments/system/ buildings/areas of entire power plant under scope of the Bidder.

Specification Reference				Existing	Read As
Sec/Part	Sub Sec	Page No.	Clause No.		
VI	SUB SECTION-A-02, STEAM GENERATOR & AUXILIARIES INCLUDING ESP	6 of 65	3.02.01	Water/steam walls shall be of membrane wall construction and shall be made of seamless cold drawn tubes. Furnace / evaporator shall be formed using spiral wound / inclined tubing or vertical plain / rifled tubing as per the proven practice of the manufacturer for boilers of similar capacity.	Water/steam walls shall be of membrane wall construction and shall be made of seamless cold drawn tubes. Furnace / evaporator shall be formed using spiral wound / inclined tubing or vertical plain / rifled tubing as per the proven practice of the manufacturer for boilers of similar capacity **Irrespective of the type of water wall tubing offered for the evaporator, the design offered shall ensure that no readjustment of tube mass flow is required during entire operating regime of the Steam Generator for complete range of specified coals. In case such readjustment becomes necessary over a period of five years from the date of successful completion of initial operation of respective Steam Generator, the cost of carrying out such flow readjustment/modifications including cost towards rectifying any damages to the Steam Generator tubing resulting from the inappropriate mass flow in the tubes shall be borne by the Contractor. Contractor in his proposal shall indicate the approximate time required for such readjustment of tube mass flow and the period of unit shut down.** **The thermo-hydraulic design of the offered evaporator shall be stable under varying heat flux and mass flux conditions as well as other system disturbance that the evaporator may encounter during operation. The stability of the thermo-hydraulic design of the evaporator shall demonstrated by the contractor by conducting stability analysis (both static and dynamic) of the finalized evaporator design. As a part of the static stability, interalia, the outlet temperature profile for each tube at the intermediate header inlet (if applicable) and vertical wall outlet header be calculated. The variance of tube outlet temperature shall be validated by carrying out site demonstration for the first boiler during commissioning by affixing metal temperature thermocouples at each evaporator outlet tube (at intermediate header inlet, if applicable, and vertical wall outlet). These thermocouples shall be over and above the requirements for metal temperature thermocouples specified elsewhere. In case the temperature variance in the evaporator tubing temperature during such demonstration is found to exceed the design considerations necessary modifications to the evaporator flow circuits shall be done by the contractor to control the tube temperatures.** **The mechanical design of the evaporator shall be carried out considering its primary stresses due to internal pressure as well as secondary stresses due to loads like weight membrane panel, buckstays, ash, and other elements loaded on evaporator, differential stresses restrained thermal expansion be-tween evaporator tubes and the evaporator support elements etc. The calculations in support of the same shall be submitted by the contractor.**
			3.02.04	Not Used	**Flame impingement on steam/water walls is not permitted.Suitable provisions, including the extent of combustion staging, shall be made to minimize the water wall corrosion. The bidder shall demonstrate that the average thinning of tubes in the burner zone due to corrosion, erosion etc. shall not be more than 0.1 mm/per year.**

S. No.		Specification Reference				Existing	Read As
	Sl. No	Sec/Part	Sub Sec	Page No.	Clause No.		
A-WS-08	8	VI/A	-	INDEX	IIA-09	MAKE-UP WATER SYSTEM	Deleted
A-WS-09	9	VI/A	I	3 of 8	1.02.00	This enquiry concerns two (2) power generating units each having a rated output of 660 MW, including but not limited to: -------- Cooling Water System including, - Equipment Cooling water system including ACW pumps. - Circulating water system including CW pumps - Cooling towers for circulating water system - Aux water system including Raw water pumps □ Make- up water system - Make up water system including make-up water pumps & piping Plant Utilities including, ----------	This enquiry concerns two (2) power generating units each having a rated output of 660 MW, including but not limited to: -------- Cooling Water System including, - Equipment Cooling water system including ACW pumps. - Circulating water system including CW pumps - Cooling towers for circulating water system - Aux water system including Raw water pumps Plant Utilities including, ----------
A-WS-10	10	VI/A	I	11 of 36	4.17	MUW/Cross country Pipe System The Bidder/ its sub vendor…….completion of its application.	Deleted
A-WS-11	11	VI/A	I-A	257 to 258 of 411		ATTACHMENT - 3K (257 to 258 of 411)	Deleted
A-WS-12	12	VI/A	IIA-09	1 to 3 of 3	Entire Sub-section	MAKE-UP WATER SYSTEM	Sub-Section IIA-09 Deleted From Tender Document
A-WS-13	13	VI/A	IV	22 of 73	1.01.07.02 d (xiii)	Auxiliary Water System Pumps (Working Pump) …….. (xiii) Make-up Water Pumps	Auxiliary Water System Pumps (Working Pump) …….. (xiii) deleted
A-WS-14	14	VI/A	IV	38 of 73	1.03.13.03	Make-up Water Piping Bidder shall perform the field hydro testing of all erected piping system in accordance of provisions of IS-5822 and AWAA-M11 (latest edition).	Deleted
A-WS-15	15	VI/A	IV	43 of 73	1.03.19	Pumps (Equipment Cooling Water system, Auxiliary Water system, **Make-up water** system, Pre-treatment plant, DM Plant & Condensate Polishing Plant)	Pumps (Equipment Cooling Water system, Auxiliary Water system, Pre-treatment plant, DM Plant & Condensate Polishing Plant)
A-WS-16	16	VI/A	VI	1 of 27	1.00.00	MANDATORY SPARES FOR WATER SYSTEM AREA (CW, ACW, ECW, MUW, RAW WATER, CT , WTP AREA ETC.)	MANDATORY SPARES FOR WATER SYSTEM AREA (CW, ACW, ECW, RAW WATER, CT , WTP AREA ETC.)
A-WS-17	17	VI/A	VI	3 of 27	1.00.00 (8)	ARV's for CW, MuW system & Raw water system	ARV's for CW system & Raw water system
A-WS-18	18	VI/A	VI	3 of 27	1.00.00 (9)	Lubrication Water Pumps (CW/Raw Water/MuW as applicable)	Lubrication Water Pumps (CW/Raw Water as applicable)
A-WS-19	19	VI/A	VI	8 of 27	1.00.00 (18)	Auxiliary Water Pumps & MuW Pump	Auxiliary Water Pumps
A-WS-20	20	VI/B		-	A -10	MAKE UP WATER SYSTEM	Deleted
A-WS-21	21	VI/B	G-04	60 of 224	TABLE-2 C (8)	LIST OF EQUIPMENT'S CONSIDERED FOR STATION AUXILIARY POWER CONSUMPTION c) (8) Make up water pumps at river end	LIST OF EQUIPMENT'S CONSIDERED FOR STATION AUXILIARY POWER CONSUMPTION c) (8) deleted

A-WS-22	22	VI/B	G-04	176 of 224	10.3	Readings of Individual Pump during test (frequency of readings – 15 minutes) MuW/RW (PT & ASH)/ ECW/DMCW/ ACW) PUMP #	Readings of Individual Pump during test (frequency of readings – 15 minutes) RW (PT & ASH)/ ECW/DMCW/ ACW) PUMP #
A-WS-23	23	VI/B	G-07	54 & 55 of 75	3712 to 3762	Tentative MDL List SL No 3712 (xxxx-xxx-PVM-F-001) to 3762 (xxxx-xxx-PVM-Y-036)	Deleted
A-WS-24	24	VI/B	A-01	68 of 101	3.10.00	Make Up Water (MUW) System	Deleted
A-WS-25	25	VI/B	A-01	69 of 101	3.11.00	Common Technical Requirement for systems like CW System, MuW, ECW, WTP, Auxiliary Water pumps, etc	Common Technical Requirement for systems like CW System, ECW, WTP, Auxiliary Water pumps, etc
A-WS-26	26	VI/B	A-10	-	Entire Sub-section	MAKE UP WATER SYSTEM	Deleted
A-WS-27	27	VI/B	A-15	25 of 31	1.01.00	This specification covers general requirements..... commissioning of Makeup Water & Raw Water Pumps. The minimum technical requirements and equipment shall include, but not be limited to the following:	This specification covers general requirements..... commissioning of Raw Water Pumps. The minimum technical requirements and equipment shall include, but not be limited to the following:
A-WS-28	28	VI/B	A-15	31 of 31	1.00.0	Control philosophy for CW System, MuW, ECW and Auxiliary Water Pumps etc.	Control philosophy for CW System, ECW and Auxiliary Water Pumps etc.
A-WS-29	29	VI/B	A-15	31 of 31	2.00.00	Instrumentation for CW System, MuW, ECW and Auxiliary Water Pumps.	Instrumentation for CW System,ECW and Auxiliary Water Pumps.
A-WS-30	30	VI/E			SL No- 83	Scheme of Makeup Water System 4540-001-POM-A-061	Deleted
A-WS-31	31	VI/E			SL No- 63	Plant Water Scheme 4540-001-POM-A-037 Rev-A	Plant Water Scheme 4540-001-POM-A-037 Rev-B



SYMBOLS:

(FT) ELECTRONIC FLOW METER

(FT((IMPACT HEAD FLOW METER

NOTES:

1. THE BIDDER SHALL INDICATE THE WATER USAGES IN CUM/HR TO AND FROM VARIOUS SYSTEMS IN THEIR SCOPE.
2. MAXIMUM MAKE UP WATER FROM MAKE UP WATER PUMPS SHALL BE 5200M3/HR WITH OUT AWRS & 3900M3/HR WITH AWRS. BIDDER TO DESIGN / SIZE ALL THE SUB-SYSTEMS ACCORDINGLY.
3. MINIMUM CYCLES OF CONCENTRATION (C.O.C.) FOR CW SYSTEM SHALL BE 5.
4. THE SCHEME SHOWN IS INDICATIVE ONLY. CONTRACTOR SHOULD FURNISH COMPLETE SCHEME IN ALL RESPECTS DURING DETAILED ENGINEERING BASED ON TECHNICAL SPECIFICATION AND SYSTEM REQUIREMENTS. CONTRACTOR SHOULD FURNISH COMPLETE SCHEME IN ALL RESPECTS INCLUDING ALL INSTRUMENTS, VALVES ETC. FOR SMOOTH, SAFE, EFFICIENT, TROUBLE FREE OPERATION OF PLANT.
5. FLOW MEASUREMENTS AS INDICATED IN THIS PLANT WATER SCHEME ARE TO BE SUPPLIED FOR ACHIEVING COMPLETE WATER ACCOUNTING.HOWEVER IT IS TO BE NOTED THAT REQUIREMENT OF SOME OF THESE FLOW MEASUREMENTS ARE ALREADY.
6. NTPC : EPC : IN EPC SCOPE
   NTPC : IN OWNER / NTPC SCOPE

PREPARED FOR TENDER PURPOSE

REV.NO	DESCRIPTION	DRAWN / DESIGN	REVIEWED BY		APPRVD BY
A	FOR TENDER PURPOSE	AV	AK	LKN	DB
		WS	WS	WS	WS

CLEARED BY

DRN	DGN	CHKD	APPD	DATE
				22.4.22

एनटीपीसी NTPC

NTPC Ltd.

(A Government of India Enterprise)

PROJECT: TALCHER THERMAL POWER PROJECT (STAGE-III 2 x 660 MW)

TITLE: PLANT WATER SCHEME

SCALE | DRG NO. 4540(001(POM(A(037 | REV B

S. No.	Specification Reference				Existing	Read As
	Sec/Part	Sub Sec	Page No.	Clause No.		
B-19	PART-A	IIB-ELECTRICAL SYSTEM / EQUIPMENTS	4 OF 17	1.06.00	1.06.00 DC System Battery and Battery Charger Lead acid plante type/ Nickel Cadmium batteries and Float cum boost chargers for main plant, switchyard and all other areas in the scope of the contractor, as per system requirement. Following DC systems (Battery and Charger) shall be supplied to cater to various DC loads in the plant. The design and sizing criteria shall be as detailed out in the chapter B-0, Part-B of Technical specifications. 220 V DC System for Main Plant 220 V or 110 V DC System for AWRS/Seepage Pump House 220 V or 110 V DC System for Ash silos 220 V or 110 V DC System for MUWPH 220 V DC System for CHP 220V DC System for External CHP 48 V DC System for Switchyard 220 V DC System for Switchyard 110V DC system for water system area Any other DC system as per system requirement It is preferable to supply dc system from one/ two manufacturers. One set of variable metallic resistor and shunt for each battery rating & location suitable for carrying out the discharge test on the batteries under Contractor's scope shall also be supplied.	1.06.00 DC System Battery and Battery Charger Lead acid plante type/ Nickel Cadmium batteries and Float cum boost chargers for main plant, switchyard and all other areas in the scope of the contractor, as per system requirement. Following DC systems (Battery and Charger) shall be supplied to cater to various DC loads in the plant. The design and sizing criteria shall be as detailed out in the chapter B-0, Part-B of Technical specifications. 220 V DC System for Main Plant 220 V or 110 V DC System for Ash silos 220 V DC System for CHP 48 V DC System for Switchyard 220 V DC System for Switchyard 110V DC system for water system area Any other DC system as per system requirement It is preferable to supply dc system from one/ two manufacturers. One set of variable metallic resistor and shunt for each battery rating & location suitable for carrying out the discharge test on the batteries under Contractor's scope shall also be supplied.
B-20	Amendment-1			B-13	3. Requirement of employer's load of 2 MVA on each colony feeder and 5 MVA on each ext. CHP feeder to be considered for ST sizing and associated systems.	3. Requirement of employer's load of 2 MVA on each colony feeder, 5 MVA on each ext. CHP feeder, 1.5 MVA on each MUW trf feeder and 1 MVA on each AWRS feeder to be considered for ST sizing and associated systems.
B-21	PART-A	IIB-ELECTRICAL SYSTEM / EQUIPMENTS	9 OF 17	1.16.02 (IV)	IV. 33kV Transmission Line: 33 kV Transmission Line of 28 Km length (approx.) with (2nos) Single Circuit towers (narrow based lattice towers with fully galvanised structure) from TTPS plant boundary to Make Up water pump house . The route is along the Make up water pipe corridor.	DELETED
B-22	PART-A	IIB-ELECTRICAL SYSTEM / EQUIPMENTS	9 OF 17	1.16.05	**1.16.05 33Kv Trannsmission line:**	DELETED
B-23	PART-A	IIB-ELECTRICAL SYSTEM / EQUIPMENTS	9 OF 17	1.21.00	OVERHEAD LINES: Transmission line to AWRS Pumphouse: Two number 11kV or 33kV single circuit transmission line on poles for supplying power from plant to AWRS pumphouse The overhead lines for AWRS Pump house shall generally be laid along the AWRS route. However, exact routing shall be decided during detailed engineering. Scope of work includes route survey for line, civil works, design, supply, erection and commissioning of poles.	DELETED
					Complete DC system,..... Bidder may supply additional DC systems at offsite load centers as per system requirement:	Complete DC system,..... Bidder may supply additional DC systems at offsite load centers as per system requirement:

Area	DC Voltage	Load	Minimum Battery Bank Rating

Area	DC Voltage	Load	Minimum Battery Bank Rating

B-24	PART-B	B0- GENERAL ELECTRICAL SPECIFCIATION	11 OF 15	3.08.00		

Unit	220 V	Total DC load of the unit at an acceptable voltage for at least 30 minutes	As per system requirement
CHP and external CHP	220 V	total CHP DC load at an acceptable voltage for at least 30 minutes and DC lighting for at least one hour	150AH for lead acid Plante type /90 AH for Ni-Cd High Discharge (KPH) type batteries
AWRS/Seepage water system, Ash silos/ /Makeup water PH etc	220 V/ 110 V	supply total DC load of the associated area at an acceptable voltage for at least 30 minutes	150AH for lead acid Plante type /90 AH for Ni-Cd High Discharge (KPH) type batteries
switchyard	220 V batteries	(a) Emergency lighting in Switchyard control room for a period of 1 hour plus (b) All continuous DC loads of relay & control panels/PLCC panels for a duration of 3 hours plus (c) Interlocking coils of isolators/earth switches shall be considered including requirement of three future line bays for a duration of 3 hours plus (d) loads in worst of the following conditions (i) simultaneous operation of the maximum number of breakers & associated equipments in case of bus fault in the switchyard. (ii) Operation of Breaker failure relay (LBB relay)	625AH lead acid Plante type/410 AH Ni-Cd (KPH type)
PLCC System for Switchyard	48 V	supply total DC load of the PLCC system at an acceptable voltage for at least 3 hours	425AH lead acid Plante type/390 AH Ni-Cd (KPL type)

DC Health Monitoring Systems for Main Plant (220 V) and switchyard (220V and 48V) shall be provided to monitor the condition of each battery cell of 220V battery banks on-line on 24x7 basis. With DC Health Monitoring System it shall be possible to measure & analyze the individual cell and battery parameters so that any damage to battery shall be prevented by proactive maintenance.

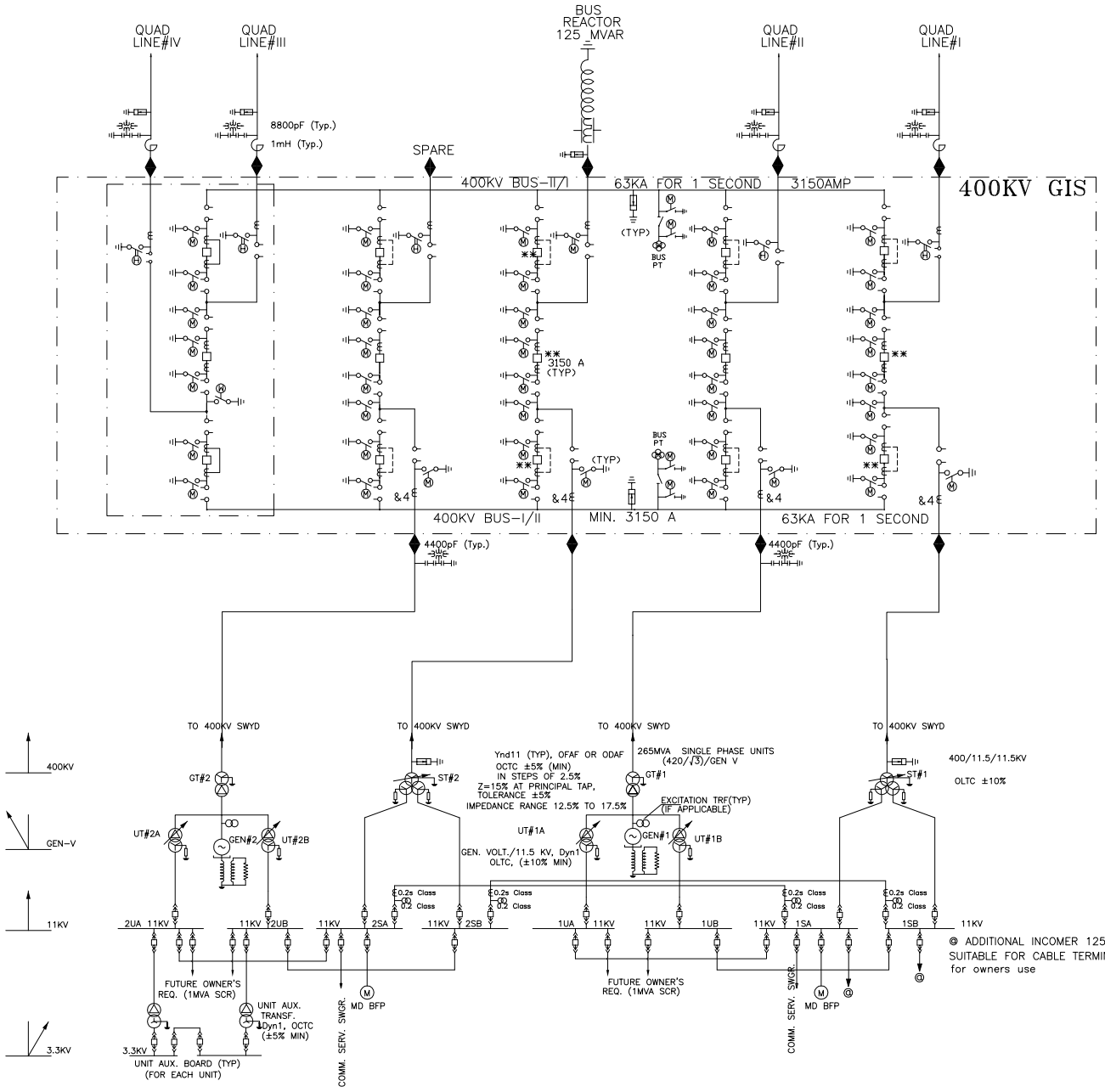
Unit	220 V	Total DC load of the unit at an acceptable voltage for at least 30 minutes	As per system requirement
CHP	220 V	total CHP DC load at an acceptable voltage for at least 30 minutes and DC lighting for at least one hour	150AH for lead acid Plante type /90 AH for Ni-Cd High Discharge (KPH) type batteries
Ash silos etc	220 V/ 110 V	supply total DC load of the associated area at an acceptable voltage for at least 30 minutes	150AH for lead acid Plante type /90 AH for Ni-Cd High Discharge (KPH) type batteries
switchyard	220 V batteries	(a) Emergency lighting in Switchyard control room for a period of 1 hour plus (b) All continuous DC loads of relay & control panels/PLCC panels for a duration of 3 hours plus (c) Interlocking coils of isolators/earth switches shall be considered including requirement of three future line bays for a duration of 3 hours plus (d) loads in worst of the following conditions (i) simultaneous operation of the maximum number of breakers & associated equipments in case of bus fault in the switchyard. (ii) Operation of Breaker failure relay (LBB relay)	625AH lead acid Plante type/410 AH Ni-Cd (KPH type)
PLCC System for Switchyard	48 V	supply total DC load of the PLCC system at an acceptable voltage for at least 3 hours	425AH lead acid Plante type/390 AH Ni-Cd (KPL type)

DC Health Monitoring Systems for Main Plant (220 V) and switchyard (220V and 48V) shall be provided to monitor the condition of each battery cell of 220V battery banks on-line on 24x7 basis. With DC Health Monitoring System it shall be possible to measure & analyze the individual cell and battery parameters so that any damage to battery shall be prevented by proactive maintenance.

B-25	VI/ Part-A	Section-IIB ELECTRICAL SYSTEM / EQUIPMENTS	7 of 17	1.16.00	The scope of work is for the Design, supply, erection, testing and commissioning of 400kV SF6 Gas Insulated switchyard including AIS portion, 33kV Transmission line as shown in Single Line diagram associated with Talcher TPP Stage-III (2X660MW).....	The scope of work is for the Design, supply, erection, testing and commissioning of 400kV SF6 Gas Insulated switchyard including AIS portion as shown in Single Line diagram associated with Talcher TPP Stage-III (2X660MW).....

B-26	VI/ Part-A	Sub-Section-III , TERMINAL POINTS & EXCLUSIONS AND OWNER'S INPUT	2 of 3	4.02.00	ELECTRICAL a) Supply erection and commissioning of PLCC, HF cable. b) 400kV transmission lines	ELECTRICAL a) Supply erection and commissioning of PLCC, HF cable. b) 400kV transmission lines c) 11kV O/H line to AWRS, d) 33kV O/H line to MUW Pump house, e) Electrical system and equipments for AWRS pump house, MUW pump house and ext. CHP
B-27	VI/ Part-A	Section-I-A Provenness	Page no 33 of 37	5.16	33kV Transmission Line :	Deleted . Not Applicable
B-28	VI/Part-B	B-17 Switchyard	29 of 60 to 60 of 60	12.00.00 to 24.05.05	**33KV Ssytem : General Information**	Deleted. Not Applicable
B-29	VI/Part-B	B0- GENERAL ELECTRICAL SPECIFCIATION	3 of 15	2.03.00	Loads of AWRS/Seepage water System located outside the plant boundary are in Bidder's scope and shall be suitably fed from 11kV Miscellaneous Switchgear. The basic scheme is shown in the Single Line diagram. The voltage of lines to AWRS and shall be based on system requirement considering starting of AWRS Motors under most onerous conditions AWRS Motors shall have voltage level as per criteria specified elsewhere in the specification. Further distribution for seepage pump house shall be at suitable voltage level meeting system requirement.	Deleted. Not Applicable
B-30	VI/Part-E	Tender Drawings			drawing : 3D isometric (sl no. 92 as per index) , 33kV Line conductor Formation & Clearances drg. No. REC/DDUGJY/33kV/03, (sl.no. 93 as per index), 33KV Lines Arrangement of conductors at Single Pole Support (0o to 10o deviation) drg no. REC/DDUGJY/33kV/03 (sl.no. 94 as per index)	Deleted. Not Applicable
B-31	VI/ Part-E	Tender Drawings		Electrical SLD TTPS-III EPC	Drg. No. 4540-001-POE-J-001	Replaced by Drg. No. 4540-999-POE-J-001
B-32	VI/ Part-A	Section-IIB ELECTRICAL SYSTEM / EQUIPMENTS	7 of 17	1.15.00	CONSTRUCTION POWER To meet the construction power requirement of the project,..... Complete construction power arrangement along with power drawl limits shall comply with respective DISCOM service rules. Supply, erection, testing and commissioning of overhead lines ring mains, single pole /double pole/ four pole structures with switches, fuse, lightening arrestors, LT transformers, 415V switchboards, power and control cables, DC Systems etc. as required for further distribution for meeting the construction power requirements, shall be in the bidder's scope. ....Start-up power shall be made available by Employer at 400 KV level through evacuation lines in the switchyard for plant commissioning purpose as per work schedule for initial operation of the equipments.	CONSTRUCTION POWER To meet the construction power requirement of the project,..... Complete construction power arrangement along with power drawl limits shall comply with respective DISCOM service rules. Some areas are under the scope of this contract but located outside the plant boundary (like area for laydown and pre assembly etc.). Bidder shall make separate arrangement of suitable capacity as necessary for meeting construction power requirement at such locations. Supply, erection, testing and commissioning of overhead lines ring mains, single pole /double pole/ four pole structures with switches, fuse, lightening arrestors, LT transformers, 415V switchboards, power and control cables, DC Systems etc. as required for further distribution for meeting the construction power requirements, shall be in the bidder's scope. ....Start-up power shall be made available by Employer at 400 KV level through evacuation lines in the switchyard for plant commissioning purpose as per work schedule for initial operation of the equipments.
B-33	VI/Part-A	Section-IIB ELECTRICAL SYSTEM / EQUIPMENTS	3 of 17	1.05.02	LV SWITCHGEARS AND LV BUSDUCTS The scope of work..... All Switchgears, Motor Control Centers (MCCs) & AC/DC distribution boards, etc. shall have at least twenty per cent (20%) or minimum two (whichever is higher) fully equipped switch fuse modules of each rating as spares, uniformly distributed over different vertical sections. In addition, all Switchgears, MCCs and AC distribution boards shall have as spares at least twenty per cent (20%) of starter modules/MCCB modules or at least one module (whichever is higher) of each rating range of the selection tables (Clause no.43.00.00,Section-VI, subsection-B06) equipped for the rating of the largest auxiliary fed from that range. .....LT Switchgears in switchgear rooms.	LV SWITCHGEARS AND LV BUSDUCTS The scope of work..... All Switchgears, Motor Control Centers (MCCs) & AC/DC distribution boards, etc. shall have at least twenty per cent (20%) or minimum two (whichever is higher) fully equipped MCCB (less than 100 A) of each rating as spares, uniformly distributed over different vertical sections. In addition, all Switchgears, MCCs and AC distribution boards shall have as spares at least twenty per cent (20%) of starter modules/MCCB modules (100 A to 400 A)/ACB outgoing modules (DM & DAE-OG) or at least one module (whichever is higher) of each rating range of the selection tables (Clause no.43.00.00,Section-VI, subsection-B06) equipped for the rating of the largest auxiliary fed from that range. .....LT Switchgears in switchgear rooms.

B-34	VI/Part A	Section-IIB ELECTRICAL SYSTEM / EQUIPMENTS	13 of 17	19.00.00 (4)	Addition of new clause	4. Shifting of existing LT transformer from old location of RWPH and PT plant of Stage-II to new RWPH and PT plant of Stage-III. Necessary Power and Control cable and cabling from existing power supply source to new location is also in Bidder's scope. This arrangement shall be utilized for feeding of Stage-III RWPH and PT plant until commissioning of Stage-III Auxiliary power Supply system. Bidder shall ensure readiness of LT switchgear associated with RWPH and PT plant of Stage-III in matching time frame.



NOTES FOR SWITCHYARD:

1. NUMBER OF LA/SURGE ARRESTER AND THEIR RATING AND LOACTIONS ARE TENTATIVE AND THE SAME SHALL BE DECIDED BASED ON ON INSULATION CO-ORDINATION/TRANSIENT ANALYSIS STUDIES. HOWEVER THE LA's INDICATED IN THE SLD ARE THE MINIMUM NUMBERS OF LA TO BE PROVIDED BY BIDDER.
2. PIR NOT REQUIRED FOR 400KV GIS CIRCUIT BREAKERS FOR LINE BAYS.
3. DISTRIBUTION OF FEEDERS ON BOTH THE BUSES TO BE MAINTAINED AS PER THIS SLD IRRESPECTIVE OF BUS NOMENCLATURE FOLLOWED.

&4. GIS CT FOR METERING PURPOSE

LEGEND:

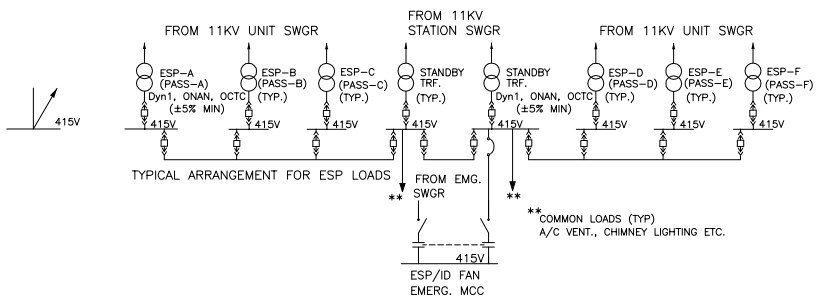
- CIRCUIT BREAKER
- MOTORISED DISCONNECTOR-GIS
- MOTORISED 3 POLE EARTHING SWITCH
- HIGH SPEED MOTORISED EARTH SWITCH
- BUSHING CT
- WAVE TRAP
- LIGHTNING ARESTOR
- CVT
- CT
- SF6/AIR BUSHING
- ** BREAKER HAVING CONTROLLED SWITCHING FACILITY FOR ST AND BR BAYS.

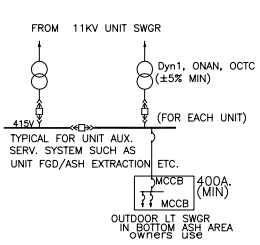
BIDDER SHALL SUITABLY CONSIDER NECESSARY PROVISIONS SUCH AS GIB/GIL, GIS TO AIS TERMINATION, AIS GANTRIES ETC. FOR TRANSMISSION LINE TERMINATION .

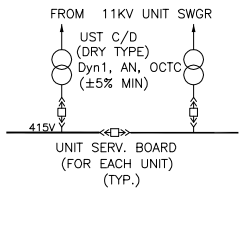
ADDITIONAL METERING CORE WITH SEPARATE JB SHALL BE PROVIDED FOR LINE CT/CVT. REFER TECHNICAL SPECIFICATION FOR DETAILS.

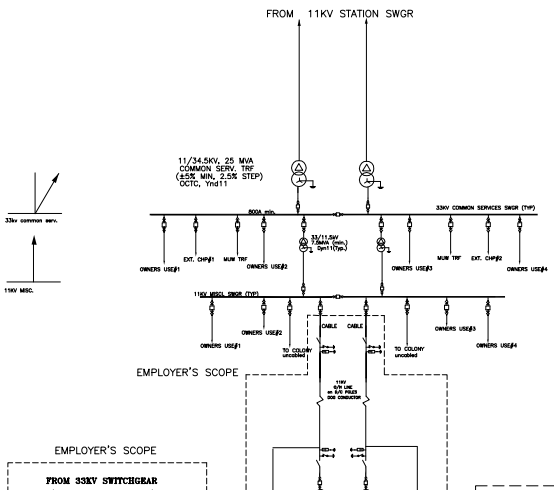
NOTES:

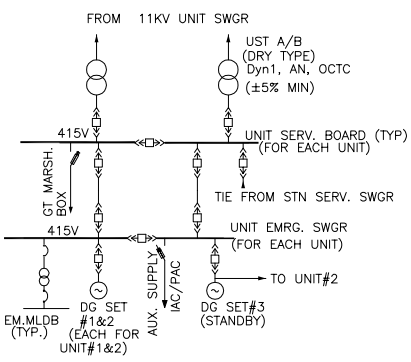
1. ONE DIESEL GENERATOR PROVIDED PER UNIT IS CONNECTED TO THE RESPECTIVE UNIT EMERGENCY BOARD. ONE COMMON STANDBY DG SET IS PROVIDED FOR THE TWO UNITS TO CATER FOR EMERGENCY REQUIREMENT OF ONE UNIT AT A TIME.
2. CHANGEOVER FACILITY
   - A.) 11KV SYSTEM UNIT BUSES EMPLOY FAST BUS TRANSFER SCHEME FOR RESTORATION OF SUPPLY FROM STATION TRANSFORMER IN CASE OF SUPPLY FAILURE FROM THE RESPECTIVE UNIT TRANSFORMER. MANUAL LIVE CHANGEOVER WITH CHECK SYNCHRONISATION AND SLOW AUTO CHANGEOVER FACILITY AS A BACK-UP IS ALSO PROVIDED FOR THESE BUSES. 11KV SYSTEM STATION BUSES EMPLOY MANUAL LIVE CHANGEOVER.
   - B.) 3.3KV UNIT BUSES ARE PROVIDED WITH FAST BUS CHANGEOVER FOR RESTORATION OF SUPPLY IN CASE OF OUTRAGE OF ANY ONE OF THE UNIT AUX. TRANSFORMER. MANUAL LIVE CHANGOVER WITH CHECK SYNCHRONISATION AND SLOW AUTO CHANGEOVER FACILITY AS A BACK-UP IS ALSO PROVIDED FOR THESE BUSES. OTHER 3.3KV & 415V SYSTEM BUSES ARE PROVIDED WITH MANUAL LIVE CHANGEOVER WITH CHECK SYNCHRONISATION AS WELL AS AUTOMATIC SLOW CHANGEOVER.
   - C.) UNIT 415V BUS SECTIONS ARE ADDITIONALLY PROVIDED WITH MANUAL LIVE CHANGEOVER FACILITY WITH CHECK SYNCHRONISATION AND AUTOMATIC CHANGEOVER, WITH THEIR RESPECTIVE DG BUS.
   - D.) 415V EMERGENCY BOARDS ARE NORMALLY FED FROM RESPECTIVE UNIT LV BOARDS. IN THE EVENT OF FAILURE OF NORMAL POWER SUPPLY, MAIN AND STANDBY DG WILL AUTOSTART SIMULTANEOUSLY AND UPON ATTAINING NORMAL VOLTAGE AND FREQUENCY, MAIN DG INCOMERS & UES B/C WILL BE CLOSED TO THE RESPECTIVE UNIT EMERGENCY BOARD AND STANDBY DG INCOMER IF REQUIRED WILL BE CLOSED MANUALLY.
   - E.) STANDARD LT TRANSFORMERS RATING TO BE USED ARE INDICATED BELOW: 2000/1600/1000/630/500/315 kVA.
   - F.) INTERCONNECTION BETWEEN STATION TO STATION BOARDS SHALL HAVE CT/PT OF 0.2 CLASS.
3. ALL BATTERY CHARGERS SHALL HAVE PROVISION FOR RECEIVING 2 INPUT SUPPLIES ALONG WITH SUITABLE AUTOMATIC CHANGEOVER BETWEEN THE SOURCES.
4. CONTROL AND PROTECTION SUPPLIES FOR ALL SWITCHGEARS/DBS/CONTROL PANELS SHALL BE FED FROM TWO DIFFERENT SOURCES/DIFFERENT SECTIONS.
5. THE ARRANGEMENT OF FEEDERS SHOWN IS INDICATIVE IN NATURE SHOWING THE FUNCTIONAL REQUIREMENTS.
6. CW SYSTEM LOADS SHALL BE FED FROM RESPECTIVE UNIT SWGR.
7. CW PUMP AND AIR COMPRESSOR LOADS SHALL BE FED FROM UNIT SWGR.
8. ROOF TOP SOLAR WHEREVER EMPLOYED SHALL BE INTEGRATED IN NEAREST SERVICE SWITCHGEAR ALONG WITH SUITABLE METERING ARRANGEMENT.
9. SELECTION OF LT FEEDERS SHALL BE AS INDICATED BELOW:
   i) UPTO 400Amp- MCCB
   ii) ABOVE 400Amp- BREAKER

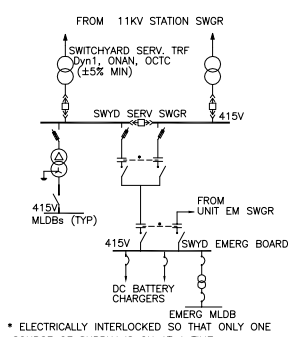


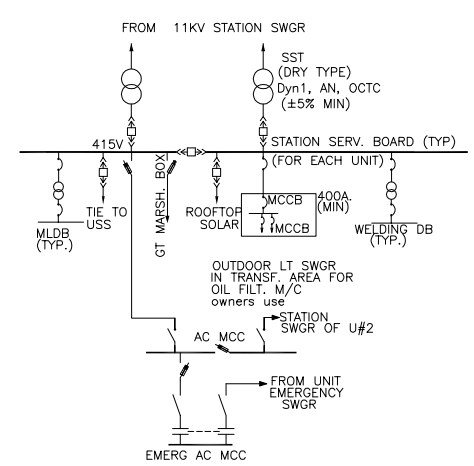


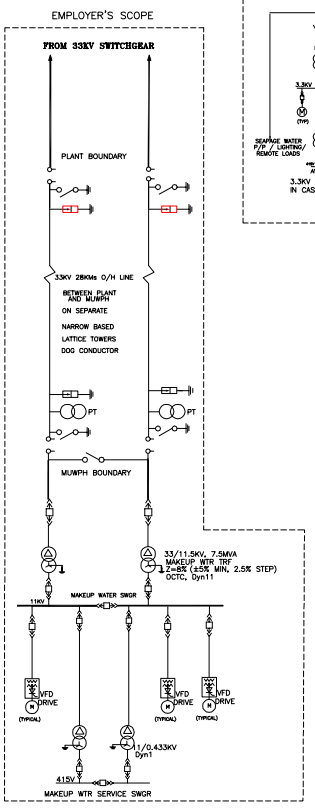


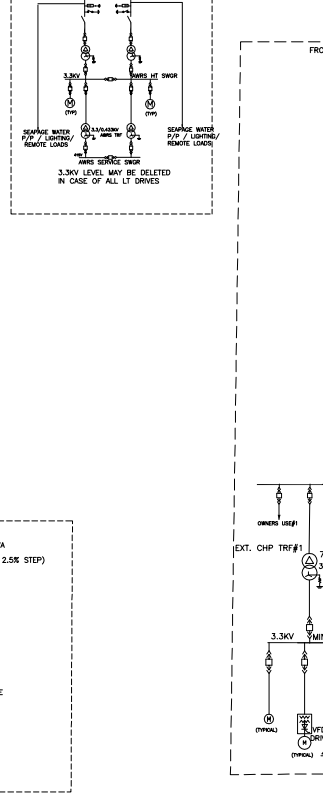


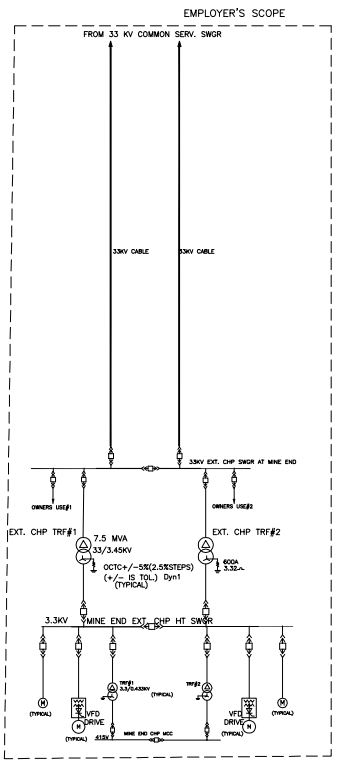


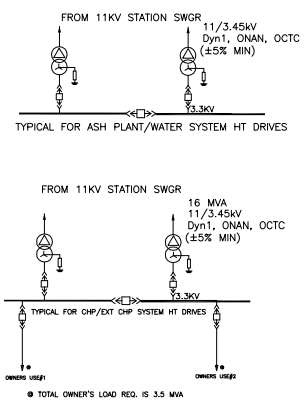


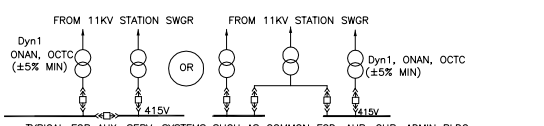












LEGEND

- GENERATOR
- MCCB
- CIRCUIT BREAKER DRAWOUT TYPE
- TRANSFORMER

FOR TENDER PURPOSE

एनटीपीसी लिमिटेड
NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT: TALCHER-III STPP (2X660 MW)

TITLE: SINGLE LINE DIAGRAM

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD	ELECT	APPD	DATE
							21.04.2022

SIZE	SCALE	DRAWING NO.	REV. NO.
A3	NTS	4540-999-POE-J-001	A

EPC PACKAGE FOR TALCHER THERMAL POWER PROJECT, STAGE-III (2x660 MW)
Amendment No. 02 to Technical Specifications Section-VI of Bidding Document No.: CS-4540-001A-2

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
C-04	VI/A	IIC	5 of 18	2.02.00	The DDCMIS system ……. During detailed engineering stage.	The DDCMIS system ……. During detailed engineering stage. **All equipment and systems being supplied in this package shall be monitored and controlled from DDCMIS under this package. Some of the equipments and systems (makeup water system and AWRS system) being procured by Employer in separate package shall also be monitored and controlled by DDCMIS under this package.**

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
C-05	VI/A	IIC	7 of 18	2.04.03, i	**OWS:** 6 Operator Workstations (OWS) per unit (1 SG, 1 TG, 3 BOP, 1 UID), 19 OWS for common (1 SAC, 4 WS in centralized offsite CR, 6 AHP in centralized offsite CR, 2 CHP, 2 FGD in centralized offsite CR, 2 FGD in FGD CR)	**OWS:** 6 Operator Workstations (OWS) per unit (1 SG, 1 TG, 3 BOP, 1 UID), 19 OWS for common (1 SAC, 4 WS in centralized offsite CR, 6 AHP (**4 in centralized offsite CR, 1 in Ash Silo and 1 in AWRS**), 2 CHP, 2 FGD in centralized offsite CR, 2 FGD in FGD CR, **2 for misc purpose**)

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
C-06	VI/A	IIC	8 of 18	2.04.5		**New S. No added** 5. Between AWRS system / DCS , located in AWRS control room and AHP system / DCS for operation and monitoring of AWRS system from HMI of AHP system (Operation & monitoring of AWRS system should be available from OWS located in AWRS control room, even in case of non-availability of wireless link between AWRS system / DCS & AHP system / DCS.
C-07	VI/A	IIC	8 of 18	2.04.5	Wireless connectivity between, make up DDCMIS and Water system DDCMIS, CHP Stacker Reclaimer PLC and Station LAN is to be redundant. Other wireless links are non-redundant. The ……. automation solution as per IEC 62443-2-4	Wireless connectivity between, make up DDCMIS and Water system DDCMIS, CHP Stacker Reclaimer PLC and Station LAN, **AWRS HMI and AHP DDCMIS HMI** is to be redundant. Other wireless links are non-redundant. The …… automation solution as per IEC 62443-2-4
C-08	VI/A	Annexure C to Sub Section IIC	6 of 24	A, 2.06.00 2.07.00	AWRS block (if applicable) Lime handling system stream-A block Lime handling system stream-A block	AWRS block Lime handling system stream-A block Lime handling system stream-**B** block

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
C-09	VI/A	Annexure C to Sub Section IIC	7 of 24	A, 2.14.00		**New Clause added** Refer Appendix-I to this Subsection for IO and Drive count for Employers Makeup water system and AWRS that are to be monitored and controlled by Contractor's Control system.
C-10	VI/A	Annexure C to Sub Section IIC				Appendix-I to Annexure C to Subsection IIC has been attached as "C&I Annexure_Appendix-1 to Annexure C to IIC" to this amendment.
C-11	VI/A	Annexure C to Sub Section IIC	20 of 24	K	Vibration sensors shall be provided ……. per measurement location.	Vibration sensors shall be provided ……per measurement location. **For makeup water system (in Employer scope) and AWRS system (in Employers scope) 12 no. of Vibration sensor for each system are to be provided. Vibration monitor is to be provided on as required basis in Makeup water system CER and AWRS CER.**

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
C-12	VI/A	III	2 of 3	3.00.00	NOT USED	**3.00.00 Control & Instrumentation** **3.01.00 For Makeup water system and AWRS** 3.01.01 TBs of employer's instruments and Local Junction boxes for signals which are being interfaced with the Contractor's control system. All required cables from these TBs to contractors control system shall be supplied, laid and terminated by the Contractor 3.01.02 For Employer's Fieldbus(FF/Profibus) based Devices:-- a. TBs of Fieldbus positioners and instruments. b TBs of Fieldbus based non-intrusive actuators for fieldbus cable. All required cables from these TBs to contractors control system shall be supplied, laid and terminated by the Contractor. 3.01.03 Employer shall provide one (1) number, 415 V, three phase 3-wire, 50 Hz feerder for UPS each at makeup water system and AWRS system. All required Cables from this feeder to Contractor UPS panel will be in contractors scope. 3.01.04 Employer shall provide two (2) number, 415 V, three phase 3-wire, 50 Hz feerder for 24 VDC system each at makeup water system and AWRS system. All required Cables from these feeder to Contractor 24VDC panel will be in contractors scope. **3.02.00 For other system:** NIL

SL. NO.	SPECIFICATION REFERENCE				EXISTING	READ AS
	SEC/ PART	SUB SEC.	PAGE NO.	CLAUSE NO.		
C-13	VI/A	IV	2 of 73	1.00.01 g)	PG test shall be performed by using process instruments envisaged for normal operation and control of unit. Any additional instrument/ item required for PG test shall also be supplied by the contractor. Instruments to be used for PG test shall be indicated in the respective P&IDs. Control system loop tuning required to limit the variation of parameters during performance guarantee testing shall be completed prior to PG Test / initial operation. Test result for PG test is envisaged to be computed in DDCMIS.	**Instruments for PG test and instruments for process control of similar applications shall be of same make and model having same accuracy level.** Instruments to be used for PG test shall be indicated in the respective P&IDs. **PG test equipment being supplied, installed and commissioned for each unit, shall be retained by employer after completion of PG test.** Control system loop tuning required to limit the variation of parameters during performance guarantee testing shall be completed prior to PG Test / initial operation. **All PG test process parameters shall be made available in DDCMIS.**
C-14	VI/A	IIC	17 of 18	21.00.00	2. Bidder is to provide……. The training models shall comprise of dismantling, overhauling, and re-assembling modules up to its last sub-component for major equipment's of Boiler, Turbine, Generator, AHP, CHP. The individual equipment models shall …… finalized during detail engineering.	2. Bidder is to provide……. The training models shall comprise of dismantling, overhauling, and re-assembling modules up to its last sub-component **for the following equipments: Boiler, Turbine, Generator. Crusher House , Dry ash evacuation system, MDBFP, TDBFP, CW pumps, ID fan, FD fan, PA fan**, P**ulverizer, Condenser and Dearato**r The individual equipment models shall …….. finalized during detail engineering.

TABLE IB:

Table-IB- MAKE UP DDCMIS		
I/O types		
Function Block		**Make-up Water Block**
Function Block location		**Make up Water system Control room**
Brief Application /service/area		**Make up Water system**
Signal Type		
AI (Control)	AI (4-20mA)	10
	AI (4-20mA) Galvanic	30
AI (Field Bus)	AI (Field Bus)	70
AI (Information)	AI (4-20mA)	
	AI (4-20mA) Galvanic	
AO	AO (4-20mA)	10
	AO (4-20mA) Galvanic	
DI	DI (COC)	
	DI (NO/NC)	300
DO	DO (Contact)	10
	DO(24V DC)	120
Relays		10
Power Supply	24 V DC Power Supply	

TABLE IIB:

Table-IIB- MAKE UP DDCMIS		
Type of control	**Function Block**	**Make-up Water Block**
	Function Block location	**Make up water system Control room**
	Brief Application /service/area	**Make up Water system**
OLCS	HT	**3**
	LT	**5**
	VFD-O	
	MOD/MOV	
	MOD/MOV (Field bus)	11
	MOVI/MODI	
	AC-MOV1	
	AC-MOV2	
	DSOV	
	SSOV, SOV/O/L, SOV/C/L, SOV1	
	SOV2, SOV/O, SOV/C	**7**
	Elect Breakers (Non-Synch)	**25**
	Elect Breakers (Synch)	
CLCS	CLCS-M	
	CLCS-5 (VFD)	
Power Supply	**24 V DC Power Supply**	

TABLE IB:

Table-IB- AWRS (Part of AHP DDCMIS)		
I/O types		
Function Block		
Function Block location		**AWRS CONTROL ROOM**
Brief Application /service/area		**AWRS**
Signal Type		
AI (Control)	AI (4-20mA)	**7**
	AI (4-20mA) Galvanic	
AI (Field Bus)	AI (Field Bus)	**15**
AI (Information)	AI (4-20mA)	
	AI (4-20mA) Galvanic	**5**
AO	AO (4-20mA)	
	AO (4-20mA) Galvanic	
DI	DI (COC)	
	DI (NO/NC)	**158**
DO	DO (Contact)	
	DO(24V DC)	**90**
Relays		
Power Supply	**24 V DC Power Supply**	

TABLE IIB:

Table-IIB- AWRS (Part of AHP DDCMIS)		
Type of control	**Function Block**	
	Function Block location	**AWRS Control room**
	Brief Application /service/area	**AWRS**
OLCS	HT	**3**
	LT	**4**
	VFD-O	
	MOD/MOV	
	MOD/MOV (Field bus)	8
	MOVI/MODI	
	AC-MOV1	
	AC-MOV2	
	DSOV	
	SSOV, SOV/O/L, SOV/C/L, SOV1	
	SOV2, SOV/O, SOV/C	
	Elect Breakers (Non-Synch)	
	Elect Breakers (Synch)	**10**
CLCS	CLCS-M	
	CLCS-5 (VFD)	5
Power Supply	**24 V DC Power Supply**	

Notes:

1. Table IB - Quantity of Inputs/Outputs (Process I/Os as well as drive I/Os). The I/Os related to Drive I/Os mentioned in table IIB are already covered in counts of Table-IB.
2. Table IIB - Quantity of Drives controlled by Control System. Drive types & drive quantities have also been indicated for reference at Table-IIB. These quantities are to be used for estimating software blocks capacity in controllers.
3. The 10% I/O spare channels in each functional group for each type of input/output has been included in the Table-IB and are not to be reconsidered.

AMENDMENT - D2						
	Specification Reference				Existing	Read As
S. No.	Sec/Part	Sub Sec	Page No.	Clause No.		
D2-1	VI/A	IID	2 of 13	1.00.00	.....In addition to above, dismantling of existing structures (both below ground and above ground) in ash pipeline **and external CHP corridor**, dismantling of existing railway siding **(both inside and outside plant boundary)** is also in the scope of the bidder. Dismantling of all existing facilities and disposal of dismantled material is in the scope of the bidder. The bidder has to take care this aspect while bidding. Bidder shall be responsible for safe disposal of all such materials outside the plant boundary in environmentally friendly manner meeting all statutory requirements.....	.....In addition to above, dismantling of existing structures (both below ground and above ground) in ash pipeline **inside plant boundary**, dismantling of existing railway siding **including OHE, Signaling System and S&T Building** (inside plant boundary) is also in the scope of the bidder. **Since construction drawings of existing underground structures/foundations are not available. A Ground Penetration Radar (GPR) study has been carried out some selected areas, wherever it was possible, for underground structures/foundations.** **Sub-surface survey has been carried out using Ground Penetrating Radar (GPR) comprising the 200 MHz & 500 MHz Antenna. Though the Ground penetrating radar (GPR) technology is yet to reach the level of maturity, and has its limitations, still GPR is now-a-days popularly used for the detection of subsurface structures and utilities.** **The details/report given by GPR agency is attached as Annexure-Q. The details provided are purely for information purpose, for preliminary assessment by the bidder, and is indicative within the limitations of the equipment deployed and the method adopted. Actual underground structure / foundation shape, size, depth, thickness etc. may vary from that shown in Annexure-Q. Accordingly, the bidder must use this report judiciously with due discretion. Bidder's scope of work would remain as defined / necessary for full completion of work. No additional claim from bidder for variation, from GPR report, of shape, size, depth thickness etc. of underground structures/ foundations shall be entertained.** Dismantling of all existing facilities and disposal of dismantled material is in the scope of the bidder. The bidder has to take care this aspect while bidding. Bidder shall be responsible for safe disposal of all such materials outside the plant boundary in environmentally friendly manner meeting all statutory requirements. **The liability for any payment w.r.t. removal / disposal of dismentled material including the applicable taxes/duties shall be that of the Bidder. .....** .....
D2-2	VI/A	IID	4 of 13	1.00.00	6 d.Patrol/inspection road along Ash Slurry pipe corridor as shown in tender drawings.	6 d. **Deleted**
D2-3	VI/A	IID	5 of 13	1.00.00	11.Civil, Structural, Architectural works for all buildings/ structures/ facilities for ash handling **and ash water recirculation system** along with switchgear building & control room including the following: ....if required as per system.	11.Civil, Structural, Architectural works for all buildings/ structures/ facilities for ash handling along with switchgear building & control room including the following: ....if required as per system.
D2-4	VI/A	IID	5 of 13	1.00.00	**11. c. Ash Water Recirculation Pump House complex including switchgear room, transformer yard, control room, battery room, Disaster management room, boundary wall etc.**	**11. c. Deleted**
D2-5	VI/A	IID	6 of 13	1.00.00	11. j.RCC pedestals for ash slurry disposal pipes lines upto mine voids including garlanding pedestal for mine voids	**11. j. RCC pedestals for ash slurry disposal pipes lines upto terminal point as per Cl 1.03.00 of VI/A Sub Section-III**

D2-6	VI/A	IID	6 of 13	1.00.00	11. k.RCC pedestals for supporting ash water recirculation pipe	11.k.RCC pedestals for supporting ash water recirculation pipe **from terminal point as per Cl 1.03.00 of VI/A Sub Section-III to ash water PH**.
D2-7	VI/A	IID	6 of 13	1.00.00	11.p.Entire ash pipeline corridor road from plant boundary to mine voids including garlanding road on mine voids and connecting road for Ash Water Recirculation Pump House Complex.	**11.p. Deleted**
D2-8	VI/A	IID	7 of 13	1.00.00	**19. Makeup water System** All Civil, structural & architectural works……. …….and paving around all the facilities.	**19. Deleted**
D2-9	VI/A	IID	8 of 13	1.00.00	30.Civil, structural, architectural works for SOLAR PV plant on **'A-Row' elevation for main power house and** roof top of building/facilities in the bidder's scope.	30.Civil, structural, architectural works for SOLAR PV plant on roof top of building/facilities in the bidder's scope.
D2-10	VI/A	IID	9 & 10 of 13	1.00.00	**34.Railway Siding** NTPC has undertaken……. If any on the same basis.	**34. Deleted**
D2-11	VI/B	D-1-5	65 of 127	5.18.00	CW SYSTEM, RAW WATER SYSTEM AND **MAKE-UP WATER SYSTEM CIVIL WORKS**	CW SYSTEM **AND** RAW WATER SYSTEM CIVIL WORKS
D2-12	VI/B	D-1-5	65 of 127	5.18.01	Circulating Water Pump House (CWPH), Raw Water Pump House (RWPH) **and Make-up water Pump House (MUWPH)**	Circulating Water Pump House (CWPH) **AND** Raw Water Pump House (RWPH)
D2-13	VI/B	D-1-5	66 of 127	5.18.01.02	The Make-up water pump house (MUWPH) shall ……. …….the stoplog and trash rack area.	**Deleted**
D2-14	VI/B	D-1-5	66 of 127	5.18.01.04	Design requirement for CWPH, RWPH and MUWPH	Design requirement for CWPH and RWPH
D2-15	VI/B	D-1-5	70 of 127	5.18.01.06	**Para 5** **MUWPH Inlet Channel** The channel shall……. …….thickness shall be 250 mm.	**Deleted**
D2-16	VI/B	D-1-5	71 of 127	5.18.01.08	Stop-logs and Trash Racks for CWPH, RWPH **and MUWPH**	Stop-logs and Trash Racks for CWPH **and** RWPH
D2-17	VI/B	D-1-5	73 of 127	5.18.01.10	Switch Gear / Control Room/ Remote IO room for CWPH, RWPH **and MUWPH** It shall be single storied building, framed RCC structure with beams, columns, floor and roof. It shall have non-load bearing brick wall cladding. It shall house the switch gear and MCC of respective Pump house & associated cable trenches. The architectural features shall be as specified elsewhere in the specification. **Bio Toilet shall be opted for make up water facility area outside the plant boundary. Specifications of same shall be as mentioned elsewhere in technical specifications.**	Switch Gear / Control Room/ Remote IO room for CWPH **and** RWPH It shall be single storied building, framed RCC structure with beams, columns, floor and roof. It shall have non-load bearing brick wall cladding. It shall house the switch gear and MCC of respective Pump house & associated cable trenches. The architectural features shall be as specified elsewhere in the specification.
D2-18	VI/B	D-1-5	73 to 82 of 127	**5.18.02.00** Sub Clause 5.18.02.01 to 5.18.02.15	MUWPH Piping Works ……	Deleted

D2-19	VI/B	D-1-5	82 to 83 of 127	**5.18.03** Sub Clause 5.18.03.01 to 5.18.03.04	Clean-Up And Restoration Of Work Areas …….	Deleted
D2-20	VI/B	D-1-5	83 to 84 of 127	**5.18.04** Sub Clause 5.18.04.01 to 5.18.04.03	Cutting And Removal Of Paving/ Water Bound Macadam Road …….	Deleted
D2-21	VI/B	D-1-5	84 to 85 of 127	5.18.05	**Structural Steel Bridges For Make-Up Water Pipes Crossing At Irrigation Canal/Nallah/ Samal Barrage Reservoir Submergence Area ……..**	**Deleted**
D2-22	VI/B	D-1-5	85 to 86 of 127	5.18.06	**Make-Up Water Pipe Crossings At National Highway / State Highway / Railway ……..**	**Deleted**

D2-23	VI/B	D-1-5	35 of 127	5.05.01	The civil works for Ash handling system (both wet and dry) shall comprise of bottom ash and fly ash handling systems, which includes Combined Ash slurry pump house and their related sumps/tanks, Ash water pump house, Bottom Ash (BA) slurry transportation pump pit and their related sumps/tanks (In case of SCC system), Transport/instrument Air Compressor house, Conveying air compressor house, Switchgear /Control/RIO rooms, **Ash Water Recirculation System (AWRS) pump house complex and their related sumps/tanks,** supporting structures and foundations for Bottom ash hopper, Buffer hoppers/Collector tanks, bottom ash overflow tank, Settling tanks and Surge tanks, Seal water tank, Ash Classifier, Bagging plant Complex, Silo Utility Building complex with Fly & Bottom Ash Silos, including development of silo area (i.e. paving, fencing/boundary-wall, access roads, office block and watchman cabin), miscellaneous equipment foundations, trenches, pipe racks, pedestals/thrust blocks for BA / AWR pipe supports **(both inside and outside the plant boundary)** including bridges/ culverts for road/rail/drain/nallah as required.	The civil works for Ash handling system (both wet and dry) shall comprise of bottom ash and fly ash handling systems, which includes Combined Ash slurry pump house and their related sumps/tanks, Ash water pump house, Bottom Ash (BA) slurry transportation pump pit and their related sumps/tanks (In case of SCC system), Transport/instrument Air Compressor house, Conveying air compressor house, Switchgear /Control/RIO rooms, supporting structures and foundations for Bottom ash hopper, Buffer hoppers/Collector tanks, bottom ash overflow tank, Settling tanks and Surge tanks, Seal water tank, Ash Classifier, Bagging plant Complex, Silo Utility Building complex with Fly & Bottom Ash Silos, including development of silo area (i.e. paving, fencing/boundary-wall, access roads, office block and watchman cabin), miscellaneous equipment foundations, trenches, pipe racks, pedestals/thrust blocks for BA / AWR pipe supports including bridges/ culverts for road/rail/drain/nallah as required. **For the ballast-less rail track under silo area complex a 4.0m wide area (2.0 m either side of centre line of railway track) shall be left unpaved along the rail track in complete silo area complex same shall be constructed by railway siding agency. RCC peripheral drains, crossing rail track shall be covered with permanent RCC slab (minimum 150 mm thk.) & construction of these RCC drains such that it will not create any hindrance in construction of rail track. Top of paving level in balance silo area complex shall be governed by the top level of rail track in silo area complex. Steel gates of minimum 6.0m width for entry & exit of railway wagons in silo area complex shall be provided in boundary wall/ fencing of silo area complex. For the hindrance free movement of railway rack on the rail track under Silo following shall be provided however necessary approval shall be taken from the railway authority by successful bidder.** ***Horizontal clearance: A minimum clearance of 3.5m shall be maintained between centre line of the Railway track to face of the crossing structure.** ***Vertical clearance: A minimum vertical clearance of 8.5m shall be maintained between Rail top level and bottom of structure.**
D2-24	VI/B	D-1-5	35 of 127	5.05.02	Transport air compressor houses, Conveying air compressor houses, Ash slurry Pump House shall have steel shed building with side sheeting and Silo utility building, **& Ash Water Recirculation pump houses** shall have RCC framed structure, with RCC columns and profiled metal deck sheet roofing (filled with RCC) supported on steel purlins & truss / girders. Other buildings like MCC /switchgear rooms, control room, **Disaster management room** etc. shall have RCC framed structure with cast-in-situ RCC roof slabs. Bagging plant Complex building shall be closed steel shed. All RCC buildings shall have brick cladding. Crane girders or monorails shall be provided as per requirement and the same shall be of structural steel construction.	Transport air compressor houses, Conveying air compressor houses, Ash slurry Pump House shall have steel shed building with side sheeting and Silo utility building shall have RCC framed structure, with RCC columns and profiled metal deck sheet roofing (filled with RCC) supported on steel purlins & truss / girders. Other buildings like MCC /switchgear rooms, control room etc. shall have RCC framed structure with cast-in-situ RCC roof slabs. Bagging plant Complex building shall be closed steel shed. All RCC buildings shall have brick cladding. Crane girders or monorails shall be provided as per requirement and the same shall be of structural steel construction.

D2-25	VI/B	D-1-5	36 of 127	5.05.04	The finished floor level (FFL) of Ash Water Recirculation (AWR) pump house complex shall be 500 mm above FGL. However, in order to facilitate approach/connection to the road on top of mine void with AWR pump house complex, if required FGL may be fixed at higher level than 1.5 m above HFL. AWR System shall include Ash water recirculation pump house complex near mine void along with related sumps/tanks, MCC/Switchgear building, maintenance room, control room, disaster management room (single storey room of approx. size 15 m x 7.5 m and 1.5m wide verandah along the larger dimension), transformer yard, miscellaneous equipment foundations, trenches inside roads/RCC paving and area drainage etc. The peripheral drain inside the complex of suitable capacity & slope shall be suitably connected to the natural drain available outside the complex. The AWRPH complex shall be confined with boundary wall and a security gate. The complex shall be suitably connected to the road to plant and road on mine voids. Since the complex is situated outside the plant boundary, an Independent sewerage system including soak pit/ inspection chamber shall be provided.	**Deleted**
D2-26	VI/B	D-1-5	36 of 127	5.05.06	For AWR system, the pedestals/thrust blocks for pipe supports **from mine voids to AWR sump & AWRPH** to ash water PH including bridges/ culverts for road/rail/drain/nallah etc, shall be provided as per the system requirement. The pedestals for AWR pipes may be combined with the pedestals for Bottom ash pipes in the corridor common for pipes. Pipe supports shall be provided for bottom ash slurry pipes, ash slurry pipes, AWR pipes, dust suppression pipes, dry fly ash(FA) pipes including RCC thrust blocks and any other supports required to complete the system. Over-ground pipes shall be supported on RCC pedestals except for FA pipes which shall be on elevated steel trestles. Unless noted otherwise, the top of concrete pedestals shall be minimum 500 mm above surrounding ground level/paving level. Pipes shall be suitably anchored with RCC pedestals to resist lateral and vertical movements as per system requirement. B.A. slurry disposal pipe line pedestals and thrust block/culverts **including garlanding of bottom ash slurry mine voids.** **If the layout requires the pipes to cross the road on**	For AWR system, the pedestals/thrust blocks for pipe supports **from terminal point as per Cl 1.03.00 of VI/A Sub Section-III** to ash water PH including bridges/ culverts for road/rail/drain/nallah etc, shall be provided as per the system requirement. The pedestals for AWR pipes may be combined with the pedestals for Bottom ash pipes in the corridor common for pipes. Pipe supports shall be provided for bottom ash slurry pipes, ash slurry pipes, AWR pipes, dust suppression pipes, dry fly ash(FA) pipes including RCC thrust blocks and any other supports required to complete the system. Over-ground pipes shall be supported on RCC pedestals except for FA pipes which shall be on elevated steel trestles. Unless noted otherwise, the top of concrete pedestals shall be minimum 500 mm above surrounding ground level/paving level. Pipes shall be suitably anchored with RCC pedestals to resist lateral and vertical movements as per system requirement. B.A. slurry disposal pipe line pedestals and thrust block/culverts **from terminal point as per Cl 1.03.00 of VI/A Sub Section-III to ash water PH**.

					top of mine voids, all ash pipes shall be laid in hume pipes of suitable diameter (NP-3 class) encased in RCC(minimum 200 mm thick) forming a hump on the road. The road shall be modified such that the slope of road along the length, at hump section, shall not be steeper than 1:20.	
D2-27	VI/B	D-1-5	36 & 37 of 127	5.05.07	**Single lane maintenance / Inspection ……. ……..road top shall be increased.**	**Deleted**
D2-28	VI/B	D-1-5	37 of 127	5.05.10	**Survey inside and outside plant boundary, required for finalization of layout for maintenance road, FA transportation pipe trestles, pipe pedestals up to mine voids including mine voids, is in the bidder's scope. The survey shall include the longitudinal section of the entire corridor**	Deleted
D2-29	VI/B	D-1-5	38 of 127	5.05.15	**g. Ash water recirculation building shall have Bio toilet as mentioned else where in the specification.**	Deleted
D2-30	VI/E	Tender Drawings			4540-001-POC-A-009 4540-001-POC-A-010 4540-001-POC-A-010 (AutoCAD) 4540-001-POC-A-011 4540-001-POC-A-012 4540-001-POC-A-013 4540-001-POC-A-014	Deleted
D2-31	VI/B	D-1-12(P)			Annexure-P	Annexure-P(R2)
D2-32	VI/B	D-1-7	1 of 12 to 12 of 12	FULL CHAPTER	Foundation System and Geotechnical Data	**Refer revised D-1-7**
D2-33	VI/B	D-1-12(C)			Annexure-C	**Refer revised Annexure-C**
D2-34	VI/A	IID	1 of 13	1.00.00	3. Site clearance including cutting of trees of girth less than 30 centimeters.	3. Site clearance including cutting of trees of girth less than 30 centimeters. **Cutting of trees of girth more than 30 cm shall be done by the Owner, however, removal and disposal of roots, trees of girth less than 30 cm and other vegetation is in Bidder's scope.**
D2-35	VI/E	Tender Drawings			4540-999-POC-F-001	Revised
D2-36	VI/E	Tender Drawings			4540-001-POC-A-007	4540-001-POC-A-007 Rev-C
D2-37	VI/A		3 of 13	1.00.00	5. Construction of Raw Water Reservoir and dismantling, removal, disposal of waste material of existing reservoirs and levelling to FGL.	5.Construction of **New Raw Water Reservoir and all associated facilities including supply and laying of Make up water pipe from the terminal point as per Cl 3.00.00 of VI/A Sub Section-III inside the plant boundary to raw water reservoir inlet structure and as indicated in the Tender Drawing No. Drg No. 4540-001-POC-A-007 Rev-C** **The interconnection of Stage -III reservoir inlet pipe with existing MUW pipeline of Stage-II & I shall be under Bidder's scope and dismantling, removal, disposal of waste material of existing reservoirs and levelling to FGL.**

D2-38	VI/A	III	2 of 3	3.00.00	NOT USED	**Terminal point for Stage -III Inlet Make up water pipe line**- The terminal point of Inlet Make-up water pipe shall be at a distance of 8m from the plant boundary as indicated in the Tender Drawing No. Drg No. 4540-001-POC-A-007 Rev-C

AMENDMENT - D2						
	Specification Reference				Existing	Read As
S. No.	Sec/Part	Sub Sec	Page No.	Clause No.		
D2-39	VI/A	**I-A**	**8 OF 136**	**CLAUSE 4.3**	4.3.1 The Bidder / its sub-vendor should have designed/got designed, constructed and commissioned at least one (1) number of Natural Draught Cooling Tower in RCC construction with splash/modular/trickle type fill of capacity not less than 30000 Cu.M/Hr and which should have been in successful operation for at least one (1) year. 4.3.2 Bidder / its Sub Vendor who fulfills the requirements in Clause 4.3.1 above with fill type other than splash/modular/trickle type fill, can also participate provided Bidder associates/collaborates with a cooling tower designer who has independently designed a Natural Draught Cooling Tower in RCC construction with splash/modular/trickle type fill, of capacity not less than 30000 Cu.M/ Hr and which should have been in successful operation for at least one (1) year. In such a case, the Bidder/its Sub vendor should furnish a letter of technical support jointly executed by it and its Cooling Tower Designer for the satisfactory performance of Cooling Towers as per the format enclosed in the bidding document. This letter of technical support should be submitted to Employer prior to the placement of order on approved sub-vendor. 4.3.3 In case the reference cooling tower was designed by a party other than the Bidder himself /its sub vendor, the Bidder/ its sub vendor shall employ a cooling tower designer who has independently designed a Natural Draught Cooling Tower in RCC construction with splash/modular/trickle type fill, of capacity not less than 30000 Cu.M/ Hr and which should have been in successful operation for at least one(1) year. In such a case, the Bidder/its Sub vendor should furnish a letter of technical support jointly executed by it and its Cooling Tower Designer for the satisfactory performance of Cooling Towers as per the format enclosed in the bidding document. This letter of technical support should be submitted to Employer prior to the placement of order on approved sub-vendor	4.3.1 The Bidder / its sub-vendor should have designed/got designed, constructed and commissioned at least one (1) number of Natural Draught Cooling Tower in RCC construction with splash/modular/trickle type fill of capacity not less than 30000 Cu.M/Hr and which should have been in successful operation for at least one (1) year. 4.3.2 Bidder / its Sub Vendor who fulfills the requirements in Clause 4.3.1 above with fill type other than splash/modular/trickle type fill, can also participate provided Bidder associates/collaborates with a cooling tower designer who has independently designed a Natural Draught Cooling Tower in RCC construction with splash/modular/trickle type fill, of capacity not less than 30000 Cu.M/ Hr and which should have been in successful operation for at least one (1) year. In such a case, the Bidder/its Sub vendor should furnish a letter of technical support jointly executed by it and its Cooling Tower Designer for the satisfactory performance of Cooling Towers as per the format enclosed in the bidding document. This letter of technical support should be submitted to Employer prior to the placement of order on approved sub-vendor. **NOTE** **A). In case the reference cooling tower was designed by a party other than the Bidder himself /its sub vendor, the Bidder/ its sub vendor shall employ a cooling tower designer who has independently designed a Natural Draught Cooling Tower in RCC construction with splash/modular/trickle type fill, of capacity not less than 30000 Cu.M/ Hr and which should have been in successful operation for at least one(1) year.** **In such a case, the Bidder/its Sub vendor should furnish a letter of technical support jointly executed by it and its Cooling Tower Designer for the satisfactory performance of Cooling Towers as per the format enclosed in the bidding document. This letter of technical support should be submitted to Employer prior to the placement of order on approved sub-vendor.** **B). In case the reference cooling tower was constructed by a party other than the Bidder himself /its sub vendor, the Bidder/ its sub vendor shall employ a construction agency who has independently executed the construction works of RCC Natural Draught Cooling Tower of capacity not less than 30000 Cu.M/ Hr or has constructed minimum 100m tall RCC Chimney using slipform/ jumpform , and which should have been in successful operation for at least one(1) year.** **In such a case, the Bidder/its Sub vendor should furnish a letter of technical support jointly executed by it and the agency which is qualified for construction of Cooling Tower for the satisfactory execution of Cooling Towers construction work as per the format enclosed in the bidding document. This letter of technical support for providing special construction equipment and expert supervision during construction should be submitted to Employer prior to the placement of order on approved sub-vendor.**

ATTACHMENT - 3K

I. (D) Details of RCC Natural draught Cooling Towers (as per clause 4.3 of Sub-Section-IA, Part-A, Section-VI of Bidding Documents

In support of Sub-Qualifying Requirements of Clause 4.3 of Sub-Section-IA, Part-A, Section-VI of Bidding Document, we confirm that We/our Sub-vendor shall employ a cooling tower construction agency who has independently executed the construction works of RCC Natural Draught Cooling Tower of capacity not less than 30000 Cu.M/ Hr or has constructed minimum 100m tall RCC Chimney using slipform/ jumpform , and which should have been in successful operation for at least one(1) year.

We/our Sub-vendor furnish a letter of technical support jointly executed by it, its Cooling Tower Designer and construction agency for the satisfactory performance of Cooling Towers.

The details of the reference cooling tower is furnished below:

Sl. No.	**Description/Details**	**Plant**
1.	Description of Work and Name of Client	.....
2.	Location/Address of the Plant/works	.....
3.	Address of the Client (including Contact Person Name, Telephone No, e-mail etc.)	.....
4.	No. of Cooling Towers/Chimney	.....
5.	Capacity of each Cooling Tower (Cu.M/hr.)/ height of chimney	.....
6.	Type of Fill (splash/modular/trickletype)	.....
7.	Type of Construction	.....
8.	Whether scope of works included	
	(a) Construction of Cooling Towers/chimney By Bidder/its Sub-vendor	YES*/NO*
	Name of the construction agency	.....
	(b) Construction of cooling towers/ Chimney by Bidder/its Sub-vendor	YES*/NO*
	(c) Commissioning of cooling towers/ chimney	YES*/NO*

Signature of authorized signatory.....

9.	Date of Commissioning of the Cooling tower/Chimney	
10.	Certificate from client to substantiate Bidder's QR data is enclosed at Annexure ..... to this Attachment-3K	YES*/NO*
11.	Whether the reference cooling tower/Chimney at sl. No. 1 is constructed by the bidder/ sub vendor	YES*/NO*
12.	Whether the reference cooling tower/Chimney at sl. No. 1 is constructed by Sub-vendor's own engineers	YES*/NO*
13.	Whether Documentary evidence/ certificate(s) from client enclosed for the above data	Yes* / No*

- * Strike off whichever is not applicable.

Date :

Place :

(Signature).....

(Printed Name).....

(Designation).....

(Common Seal).....

(Designation).....

(Common Seal).....

(Bidder / Sub vendor / Designer / Construction Agency)

Signature of authorized signatory.....

ATTACHMENT - 3K

(On Company's Letter Head)

LETTER OF SUPPORT FOR SATISFACTORY EXECUTION of NATURAL DRAUGHT COOLING TOWERS CONSTRUCTION WORK for Talcher-III Power Project Package

TO,

[EMPLOYER'S NAME & ADDRESS]

Sub: Letter of Technical Support submitted From …….. (name of the Construction/Erection Agency) undertaking the responsibility for satisfactory execution and completion of Natural Draught Cooling Towers Construction Work.

Dear Sirs,

1. In accordance with the Award of the Contract by …… (Name of the Contractor) to M/s. ……. (Name of the sub-vendor), we, the aforesaid Construction/Erection agency shall be fully responsible for the satisfactory execution and completion of Natural Draught Cooling Towers (NDCT) Construction Work.

2. Further, the manner of achieving the objective set forth in point 1 above shall be as follows for Natural Draught Cooling Towers Construction Work.

    a. We shall be fully responsible for construction/erection of NDCT as per the construction drawings/design and extend all necessary support for putting into satisfactory operation, the NDCT, to the satisfaction of the Employer.

    b. We shall provide special construction equipment and expert supervision during construction of the NDCT.

    c. We shall promptly carry out all the corrective measures and shall promptly undertake replacements, rectifications or modifications to the NDCT as and when required by Employer in case the NDCT fails to demonstrate successful performance as per contract at site.

    d. We shall participate in Technical Co-ordination meetings (TCMs) from time to time, as and when required by the Employer.

3. We, the Construction/Erection Agency do hereby undertake and confirm that this Letter of Technical Support shall be valid until the end of defect liability period of the contract.

Signature of authorized signatory..... .

ATTACHMENT - 3K

Signature of the Authorised Representative…

For M/s ……..

(Associate*/Collaborator*/Technology provider*/Licensor*)

Address ……

Name ……

Designation …….

Date:……

Common Seal of the Company

***: Strike off whichever is not applicable.**

Signature of authorized signatory..... .

Annexure (Q)

GPR Report

Aimil Ltd.

Instrumentation & Technologies

Report on GPR Survey –"Exploration and Mapping of Underground Utility Services"

Client Name: NTPC (TTPS PLANT)

LOA No. : CS-4540-710W-9-CY-LOA-7162 Dated 15.02.2022

Report No. : AIMIL/ATES/NTPC-TTPS-01

	AIMIL Representative
Signature	

PRINCIPLE OF GROUND PENETRATING RADAR

Ground Penetrating Radar (commonly called GPR) is a high resolution electromagnetic technique that is designed primarily to investigate the shallow subsurface of the earth, Utility, Building materials, and Roads and Bridges. GPR is a time-dependent geophysical technique that can provide a 3-D pseudo image of the subsurface. Under favorable conditions, GPR can provide precise information concerning the nature of buried objects.

GPR is a method that is commonly used for Utility Survey, Environmental, Engineering, Archeological, and other shallow investigations. The fundamental principles that are described in the following text applies to all of these applications.

The electromagnetic wave is radiated from a transmitting antenna, travels through the material at a velocity which is determined primarily by the permittivity of the material. The wave spreads out and travels downward until it hits an object that has different electrical properties from the surrounding medium, is scattered from the object, and is detected by a receiving antenna. The surface surrounding the advancing wave is called a wave-front. A straight line drawn from the transmitter to the edge of the wave front is called aray. Rays are used to show the direction of travel of the wave front in any direction away from the transmitting antenna. If the wave hits a buried object, then part of the waves energy is “reflected” back to the surface, while part of its energy continues to travel down ward. The wave that is reflected back to the surface is captured by a receive antenna, and recorded on a digital storage device for later interpretation. Antennas can be considered to be transducers that convert electric currents on the metallic antenna elements to transmit electromagnetic waves that propagate into a material. Antennas radiate electromagnetic energy

when there is a change in the acceleration of the current on the antenna. The acceleration that causes radiation may be either linear,(e.g., time-varying electromagnetic wave traveling on the antenna), or angular acceleration. Radiation occurs along a curved path, and radiation occurs anytime that the current changes direction (e.g. at the end of the antenna element). Controlling and directing the radiation from an antenna is the purpose of antenna design. Antennas also convert electromagnetic waves to currents on an antenna element, acting as a receiver of the electromagnetic radiation by capturing part of the electromagnetic wave.

The transmit and receive antennas are moved independently in the fixed mode of operation. This allows more flexibility of field operation than when the transmit and receive antennas are contained in a single box. For example, different polarization components can be recorded easily when the transmit and receive antennas are separate. In the fixed-mode of operation, a trace is recorded at each discreet position of the transmit and receive antennas through the following sequence of events in the GPR system: **1)** a wave is transmitted, **2)** the receiver is turned on to receive and record the received signals, and **3)** after a certain period of time the receiver is turned off. The resulting measurements that are recorded during the period of time that the receiver is turned on is called a trace, as described earlier. The idealized trace for this simple case consists of a direct pulse, and a single reflection from the layer. In the moving mode of operation, a radar wave is transmitted, received and recorded each time that the antenna has been moved a fixed distance across the surface of the ground, or material that is being investigated. Since a single record of a transmitted pulse is called a trace, the spacing between measurement points is called the trace spacing. The tranche objective of GPR data presentation is to provide a display of the processed data that is closely approximates an image of the subsurface, with the anomalies that are associated with the objects of interest located in their proper spatial positions. Data display is central to data interpretation. In fact, producing a good display is an integral part of interpretation.

➢ There are three types of displays of surface data, including:-

1) A one dimensional trace,

2) A two dimensional cross section, and

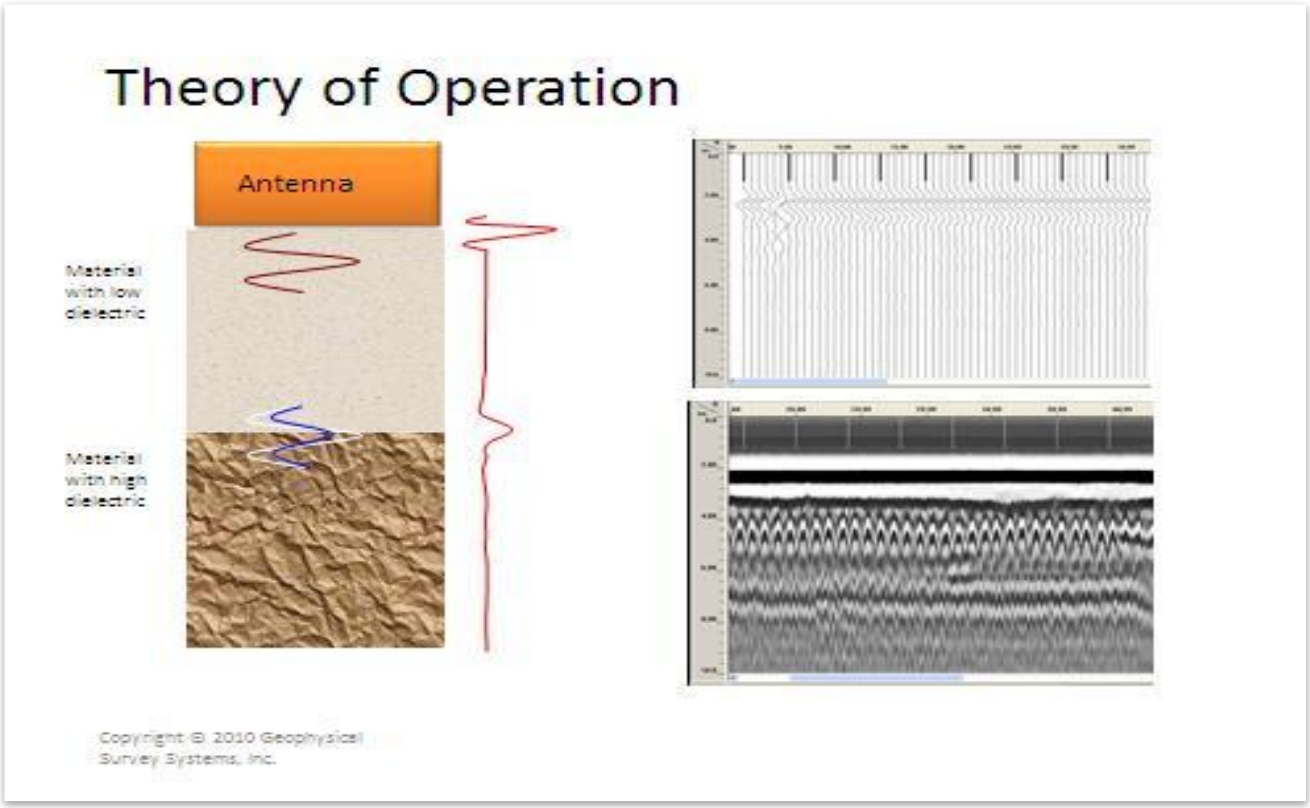
3) A three dimensional display.

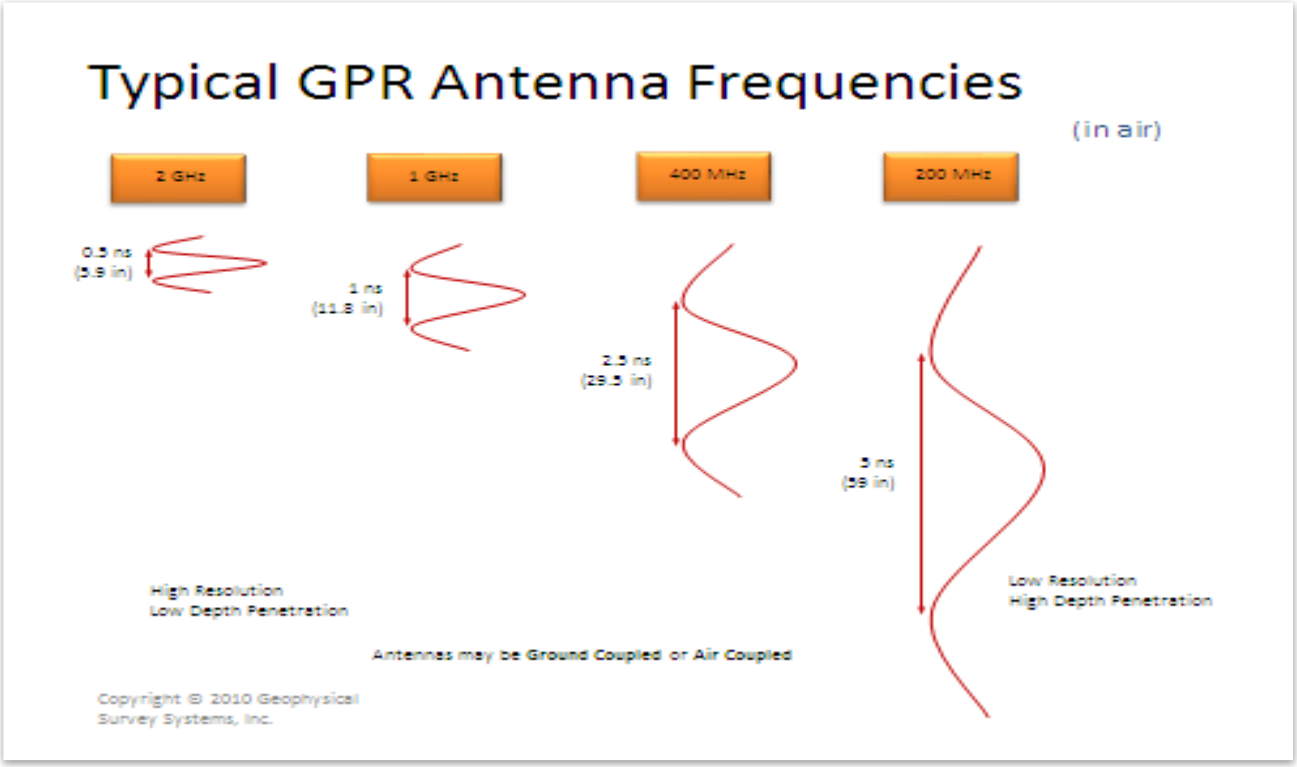
Borehole data can be displayed as a two dimensional cross section, or processed to be displayed as a velocity tomogram. A one-dimensional trace is not of very much value until several traces are placed side-by-side to produce a two dimensional cross section, or placed in a three dimensional block view. The wiggle trace (or scan) is the building block of all displays. A single trace can be used to detect objects (and determine their depth) below a spot on the surface.

By towing the antenna over the surface and recording traces at a fixed spacing, a record section of traces is obtained. The horizontal axis of the record section is surface position, and the vertical axis is round-trip travel time of the electromagnetic wave.

A GPR record section is very similar to the display for an acoustic sonogram, or the display for a fish finder. Wiggle trace displays are a natural connection to other common displays used in engineering (e.g., and oscilloscope display), but it is often impractical to display the numerous traces that are measured along a GPR transect in wiggle-trace form. Therefore, scan displays have become the normal mode of two dimensional data presentation for GPR data.

HOW GPR WORK (With Diagram)


Theory of Operation
Antenna
Material with low dielectric
Material with high dielectric
Copyright © 2010 Geophysical Survey Systems, Inc.


Typical GPR Antenna Frequencies
(in air)
2 GHz
1 GHz
400 MHz
200 MHz
0.5 ns
(5.9 in)
1 ns
(11.8 in)
2.5 ns
(29.5 in)
5 ns
(59 in)
High Resolution
Low Depth Penetration
Low Resolution
High Depth Penetration
Antennas may be Ground Coupled or Air Coupled
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1.0 Introduction:-

AIMIL Limited has carried out a sub-surface survey with a Ground Penetrating Radar (GPR) comprising the **200 MHz & 500 MHz** Antenna. The intension of this survey was to search foundation location and utility inside and outside area of NTPC-TTPS PLANT, TALCHER

Discussion it was found that amongst the available existing non-destructive testing methods, the most suitable for the said Survey is GPR survey. Though the Ground penetrating radar (GPR) technology is yet to reach the level of maturity, still GPR is now-a-days popularly used for the detection of sub-surface structures and utilities.

In this present investigation, sub-surface non-destructive GPR surveying is carried out with the help of a **200 MHz & 500 MHz** antenna and results are analyzed and reported here.

2.0 Study Area :-

- **The GPR survey has been carried out at following locations –**

1. Administrative Building 2. Ash Brick Manufacturing Plant. 3. Badminton Hall 4. Boiler Tube Shed. 5. Carshed-1 & Bike Stand. 6. Car Shed-2 7. Central Store Office 8. CISF Barrack. 9. Club Auditorium. 10. Club Dinning Hall. 11. Conveyor-16. 12. Crasher House 13. Cycle Stand 14. Diesel Dispensing Unit. 15. Dozer Shed.	16. Heavy Machineri Shed. 17. Kalyani Mandap. 18. Market Complex. 19. Mine End Area. 20. OAT Stage. 21. Old Finance Building. 22. Water Demolished Area. 23. RC Building. 24. Rejected Shed(Near Scarp Yard)	25. Store Shed: 4, 7, 8, 9, 10, 11, 16, 17, 18, 20, 21, 22, 23.. 26. Sludge PIT. 27. Stage-II PT Plant Clarifier 1 & 2. 28. Stage-II PT Sludge Sump & Pump House. 29. Tower(WT8). 30. Waste Storage Shed. 31. Waste Water Sump & Pump House. 32. Water tank & Pump House. 33. Weigh Bridge.

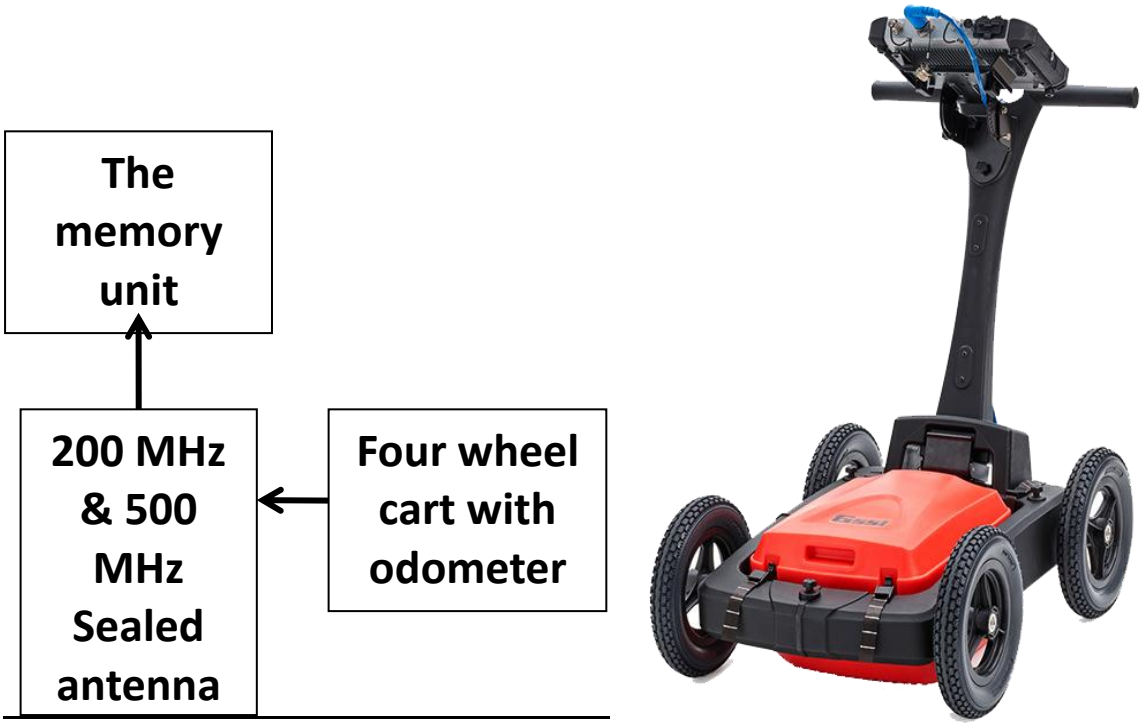
➢ Surveying were carried out as advised by representative of **NTPC Limited..**

➢ The space availability for the surveying was the greatest constraint for all the sites where the study has been conducted.

3.0 GPR Surveying

3.1 Instrumentation: -

The GPR surveying carried out for this sub surface structure detection comprises the following sets of instrumentation:-



➢ Photographs of GPR Scanning:-

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➢ Instrumentation scheme for GPR Survey

The data stored in the SIR 3000 was analyzed using the RADAN7 software for the structure identification processing. The heart of the GPR surveying is always its antenna, which essentially comprises of a source transmitter and receiver.

The details of the **270MHz** antenna used in this survey is given below –

➢ Table 1 – Details of the 200 MHz /500MHz Antenna.

Center frequency: 200 MHz
Depth of penetration: 0-8mtr depending on dielectric permittivity
Setup Mode: Manual
System Run Mode: Survey Wheel (recommended) or Continuous
Number of Gain Points: 7
Samples per Scan: 1024
Bits per Sample: 32

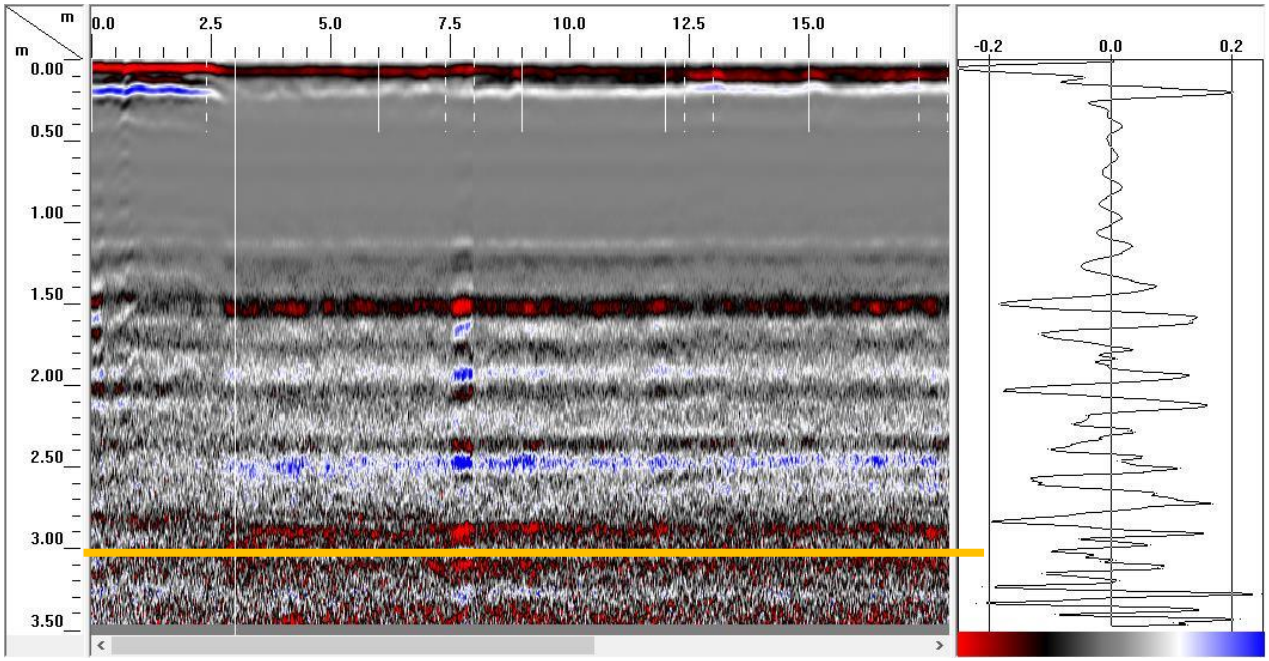
Center frequency: 500 MHz
Depth of penetration: 0-5mtr depending on dielectric permittivity
Setup Mode: Manual
System Run Mode: Survey Wheel (recommended) or Continuous
Number of Gain Points: 7
Samples per Scan: 1024
Bits per Sample: 32

It is appropriate to mention here that the GPR surveying is an indicative surveying for the search of utilities. There may be a slight variation in the depth of the utilities. The dimension of the utilities also can be detected for the large utilities.

3.2 GPR Surveying and Data Generation :-

The GPR Surveying was carried out in said area as mention in Para under study area. The distance mode of surveying was carried out for all the areas. The raw data comprising the signature of the waves were collected for further processing and analyzing.

Validation of GPR Data by Scanning of known foundation depth:



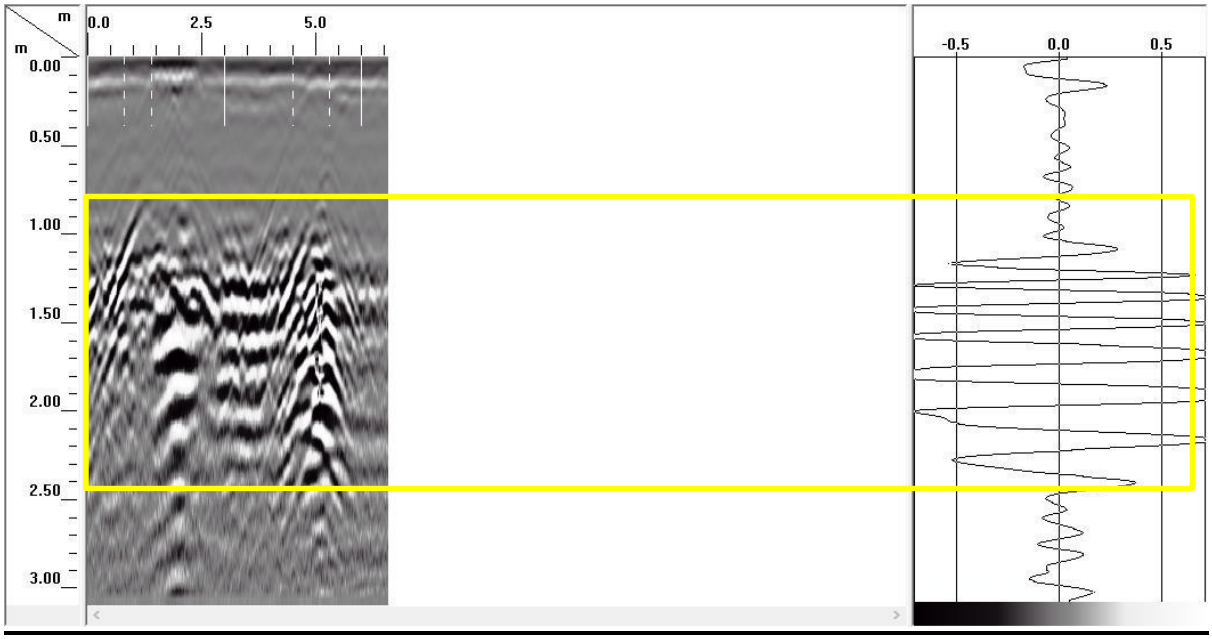
Foundation depth found by survey approximately 2.9m to 3m.

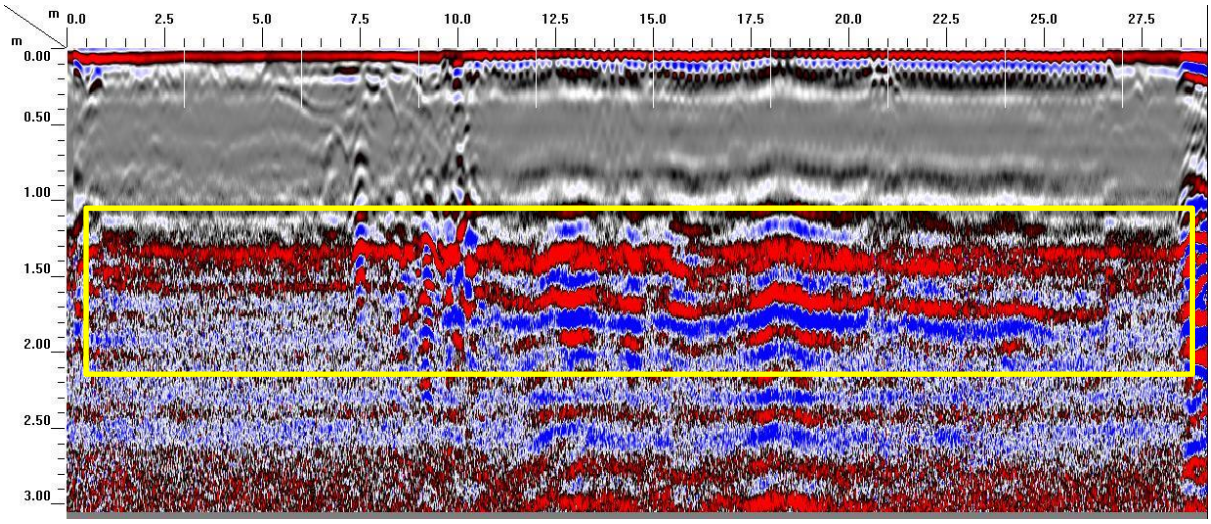
Remarks:

The actual Foundation depth was 3 m depth, where we found the foundation depth within 2.9m to 3m from GPR survey data. The approximate dimension was found approximately 3m X 2.2m.

Field Survey Data:

ADMIN BUILDING:





RAW DATA

Foundation depth found by survey approximately 2.37m to 2.4m.

Remarks:

i. We found the foundation depth within 2.37m to 2.4m from GPR survey data. The approximate dimension was found approximately 2.4m X 2.0m.

ii. No utility found at this location.

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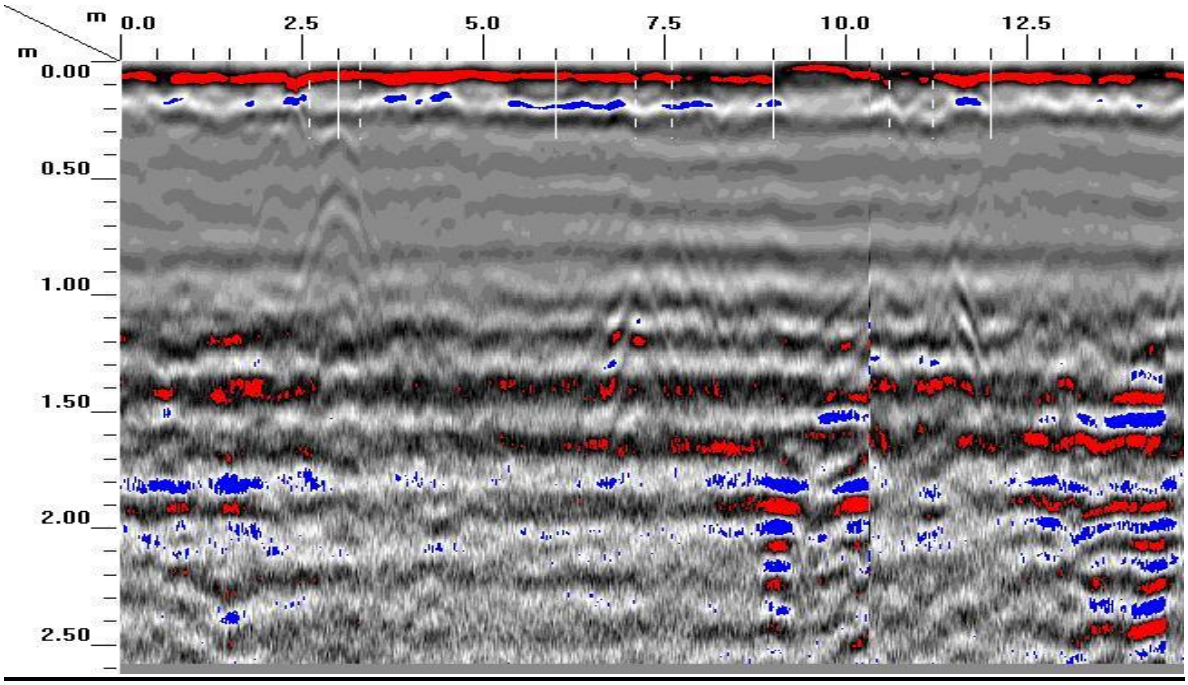
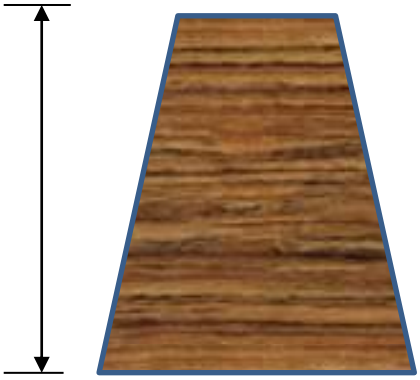
ASH BRICK MANUFACTURING UNIT:

SHED 1



RAW DATA

Foundation depth found by survey approximately 2.1m to 2.2m.

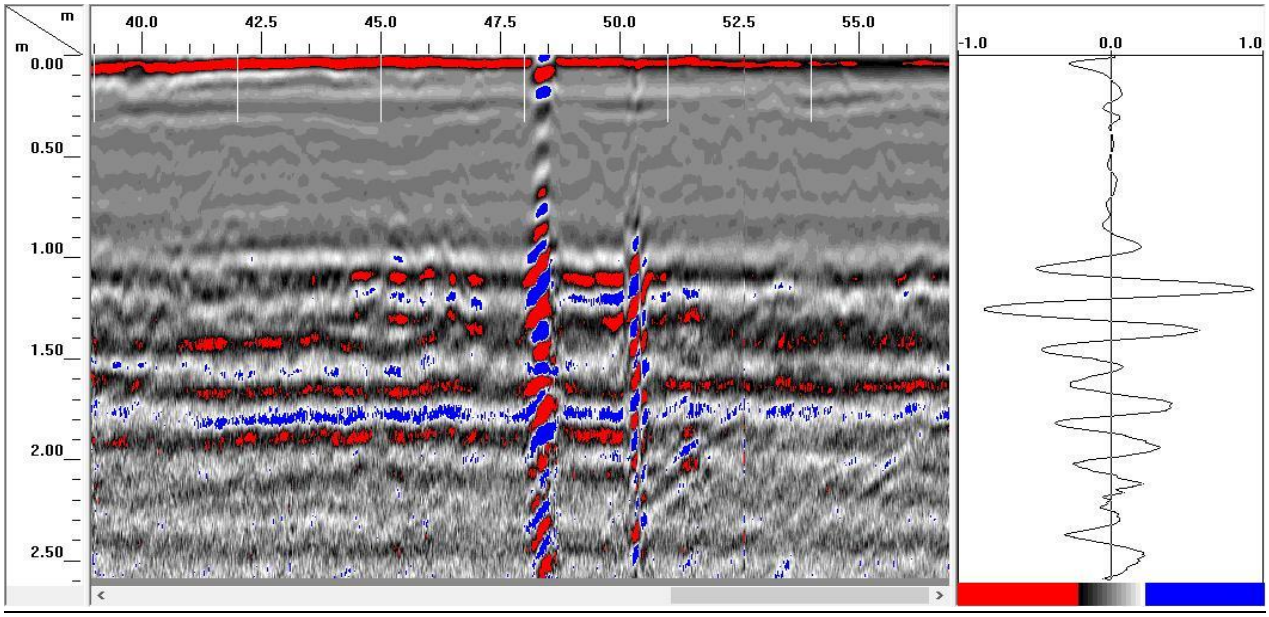


Remarks:

i. We found the foundation depth within 2.1m to 2.2m from GPR survey data. The approximate dimension was found approximately 2.2m X 2.0m.

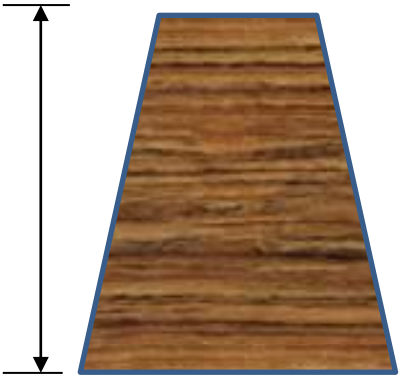
ii. **Metallic utility found at 3.025 m distance from starting point with 0.3 m depth.**

SHED 2



RAW DATA

Foundation depth found by survey approximately 1.65 m to 1.75 m.



Remarks:

i. We found the foundation depth within 1.65m to 1.75m from GPR survey data. The approximate dimension was found approximately 1.75m X 1.5m.

ii. No utility found at this location.

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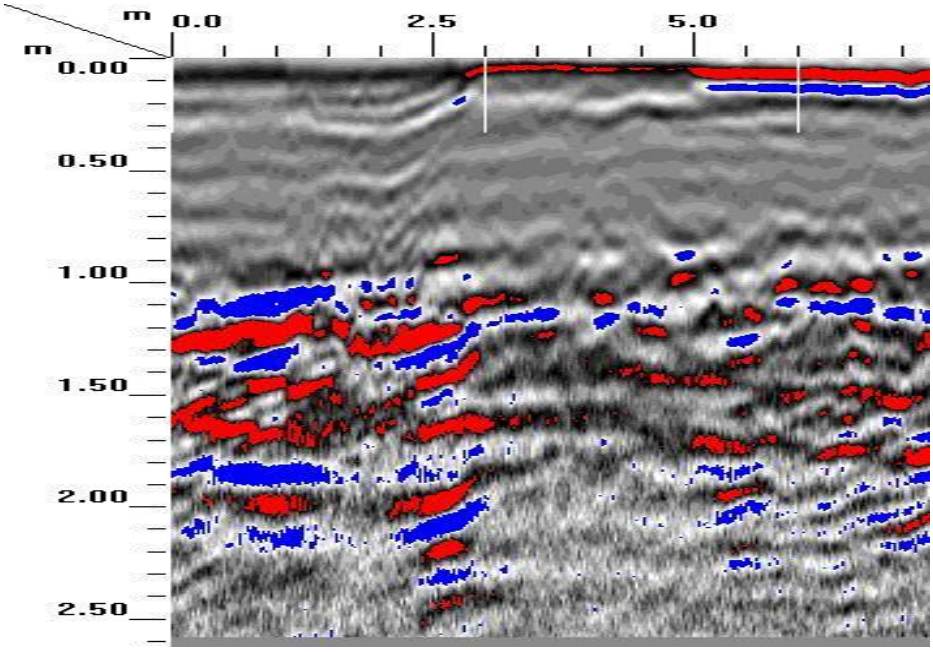
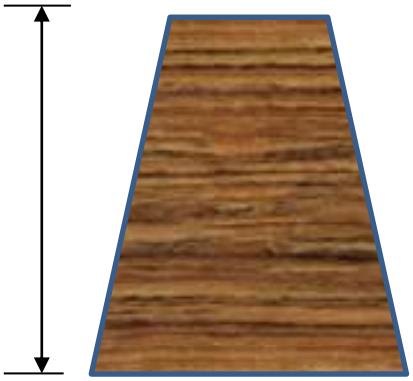
WATER TANK



RAW DATA

Foundation depth found by survey approximately 2.8m to 2.9 m.



Remarks:

i. We found the foundation depth within 2.8 to 2.9 from GPR survey data.

ii. No utility found at this location.

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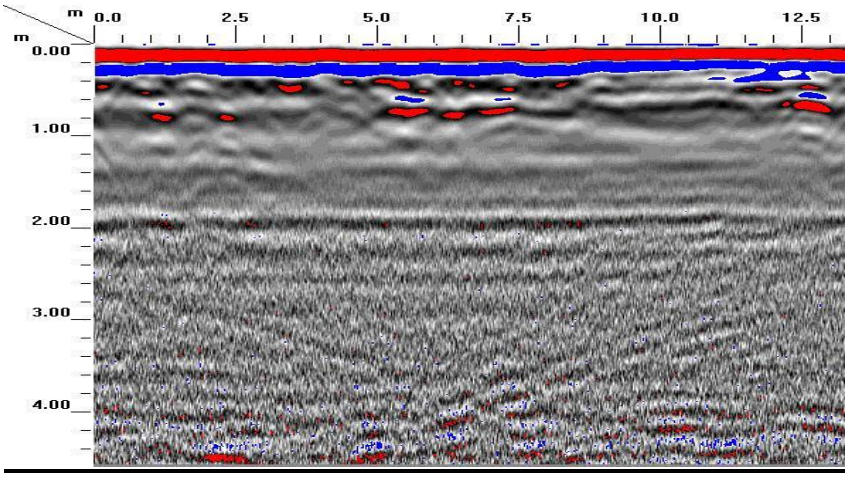
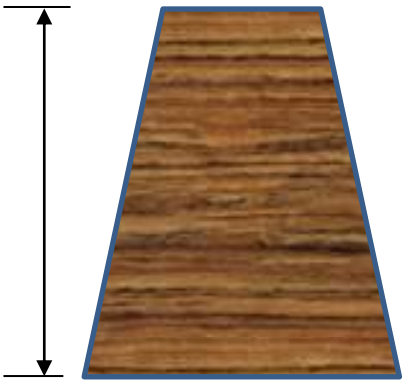
BADMINTON PLAY HALL:



RAW DATA

Foundation depth found by survey approximately 2.0m to 2.1 m.

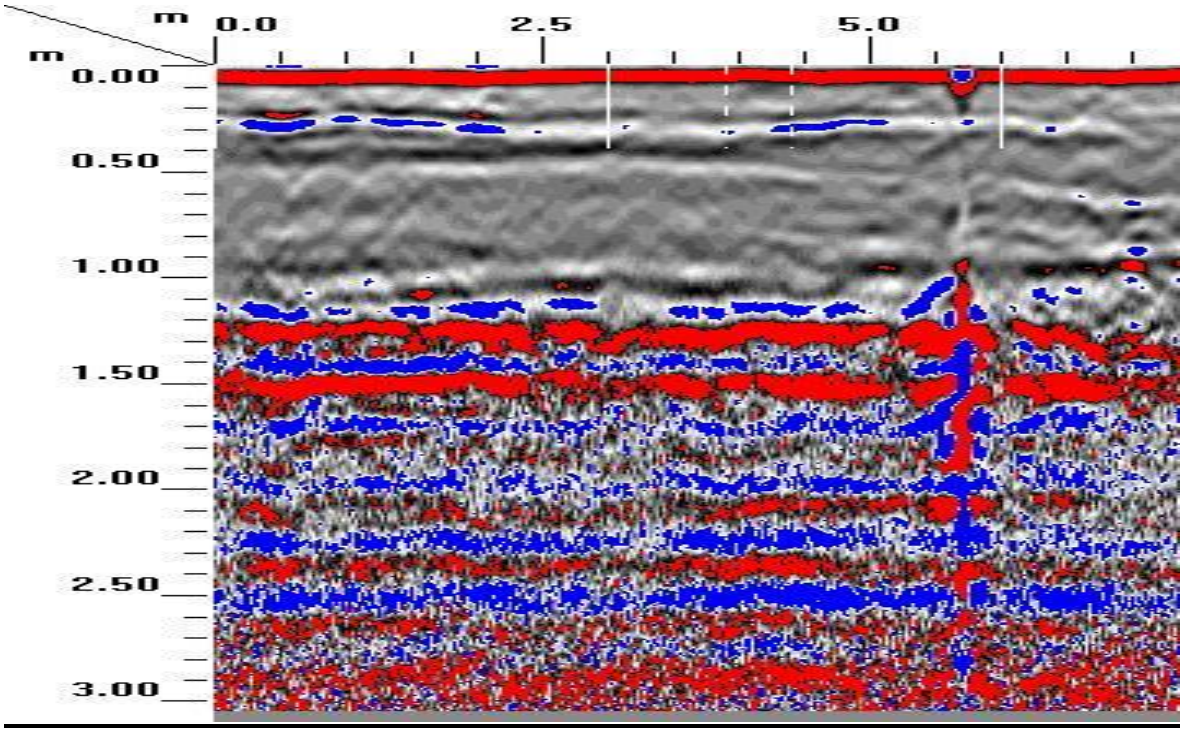


Remarks:

i. We found the foundation depth within 2.0 to 2.1 from GPR survey data. The approximate dimension was found approximately 2.1m X 1.5m

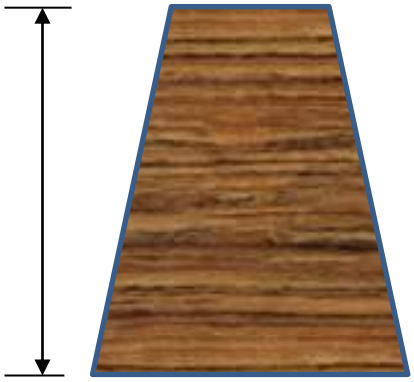
ii. No utility found at this location.

BOILER TUBE SHED:



RAW DATA

Foundation depth found by survey approximately 2.0m to 2.1 m.

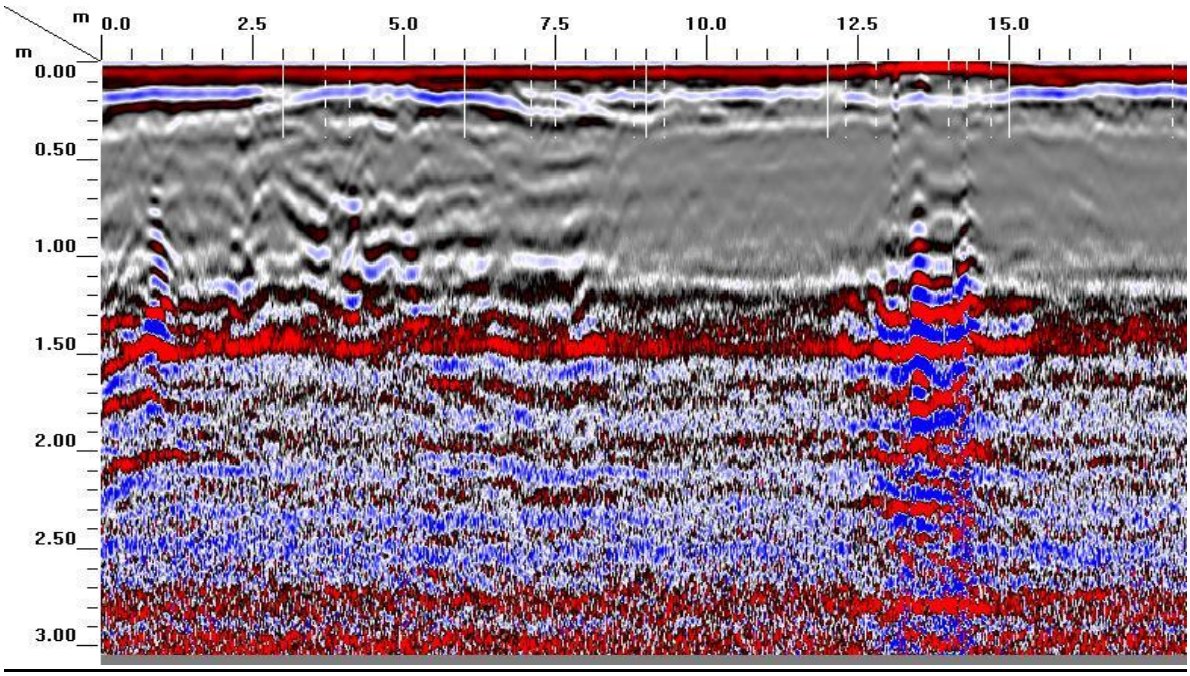


Remarks:

i. We found the foundation depth within 2.0 to 2.1 from GPR survey data. The approximate dimension was found approximately 2.1m X 1.5m

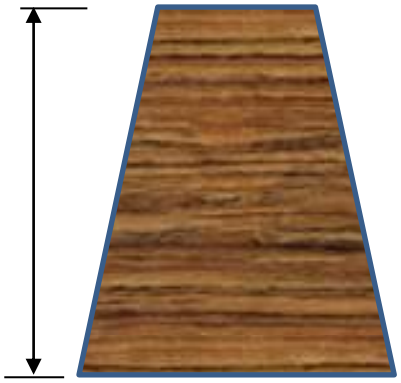
ii. No utility found at this location.

CARSHED-1/BIKE STAND:



RAW DATA

Foundation depth found by survey approximately 2.75m to 2.8 m.



Remarks:

i. We found the foundation depth within 275m to 2.8m from GPR survey data. The approximate dimension was found approximately 2.8m X 2.2m.

ii. Metallic utility found at 13.5m distance from starting point with 0.86 m depth.

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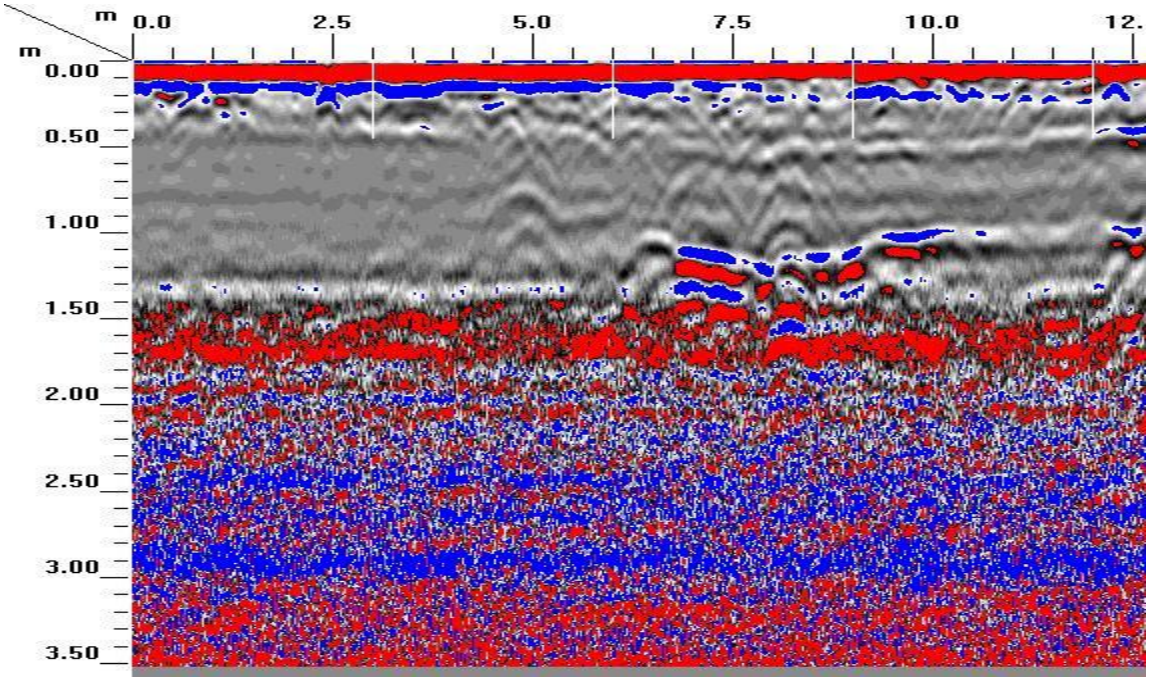
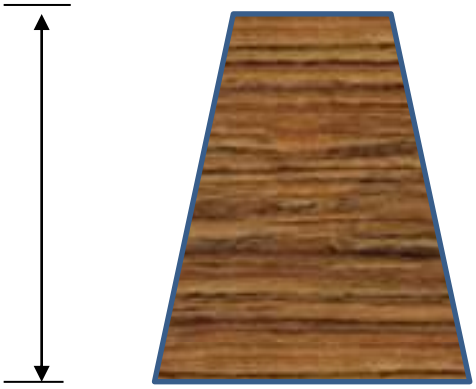
CARSHED-2



RAW DATA

Foundation depth found by survey approximately 2.8m to 2.9 m.

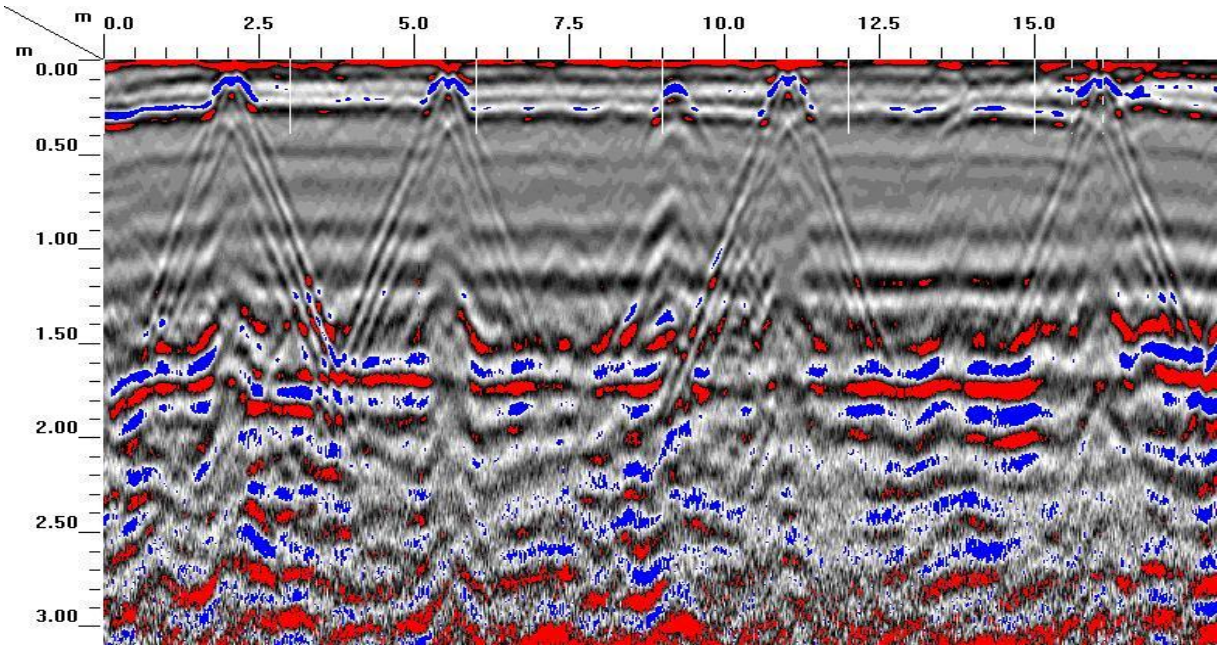


Remarks:

i. We found the foundation depth within 2.8m to 2.9m from GPR survey data. The approximate dimension was found approximately 2.9m X 2.2m.

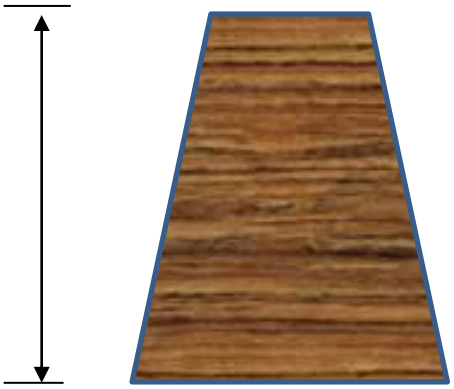
ii. **Metallic utility found at 5m to 6.5 distance from starting point with 0.7 m to 1.01mdepth respectively**.

CENTRAL STORAGE OFFICE:



RAW DATA

Foundation depth found by survey approximately 2.44m to 2.5 m.



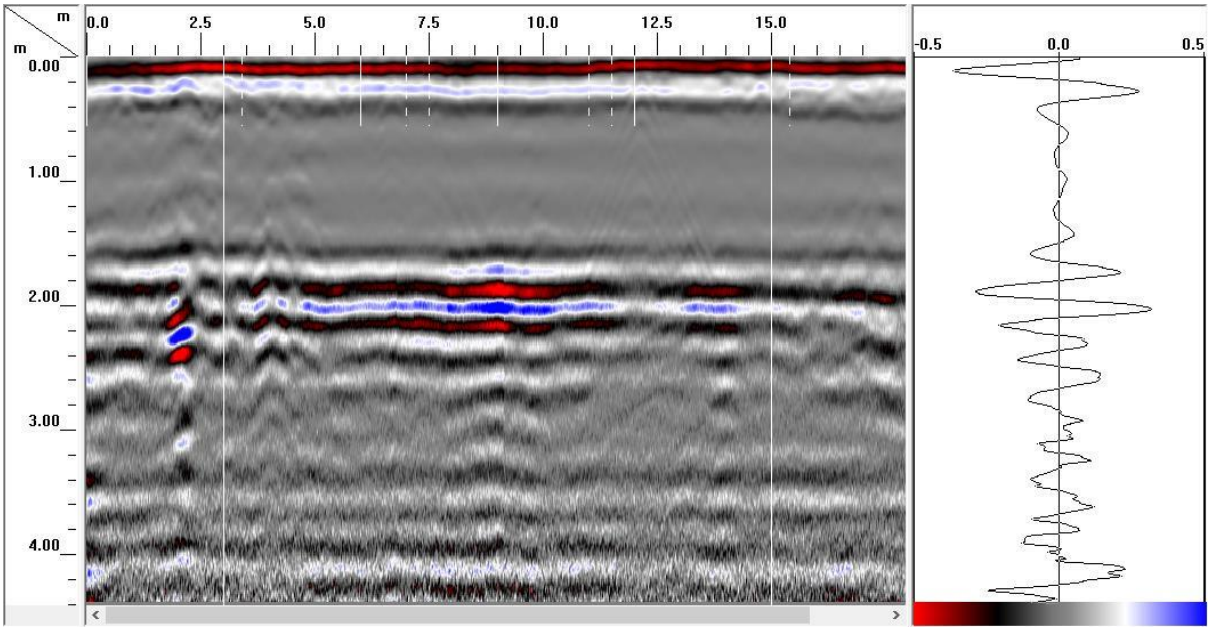
Remarks:

i. We found the foundation depth within 2.44 to 2.5 from GPR survey data. The approximate dimension was found approximately 2.5m X 2m

ii. No utility found at this location.

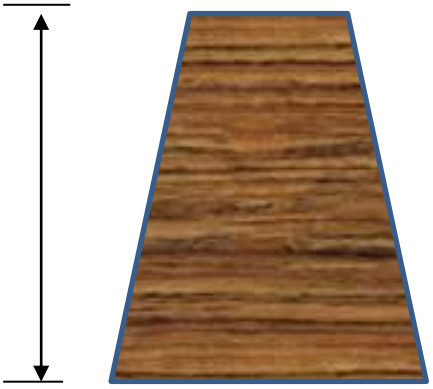
CISF BARRACK:

SHED 1



RAWA DATA

Foundation depth found by survey approximately 2.26m to 2.5 m.



Remarks:

i. We found the foundation depth within 2.26 to 2.5 from GPR survey data. The approximate dimension was found approximately 2.5m X 2.1m

ii. No utility found at this location

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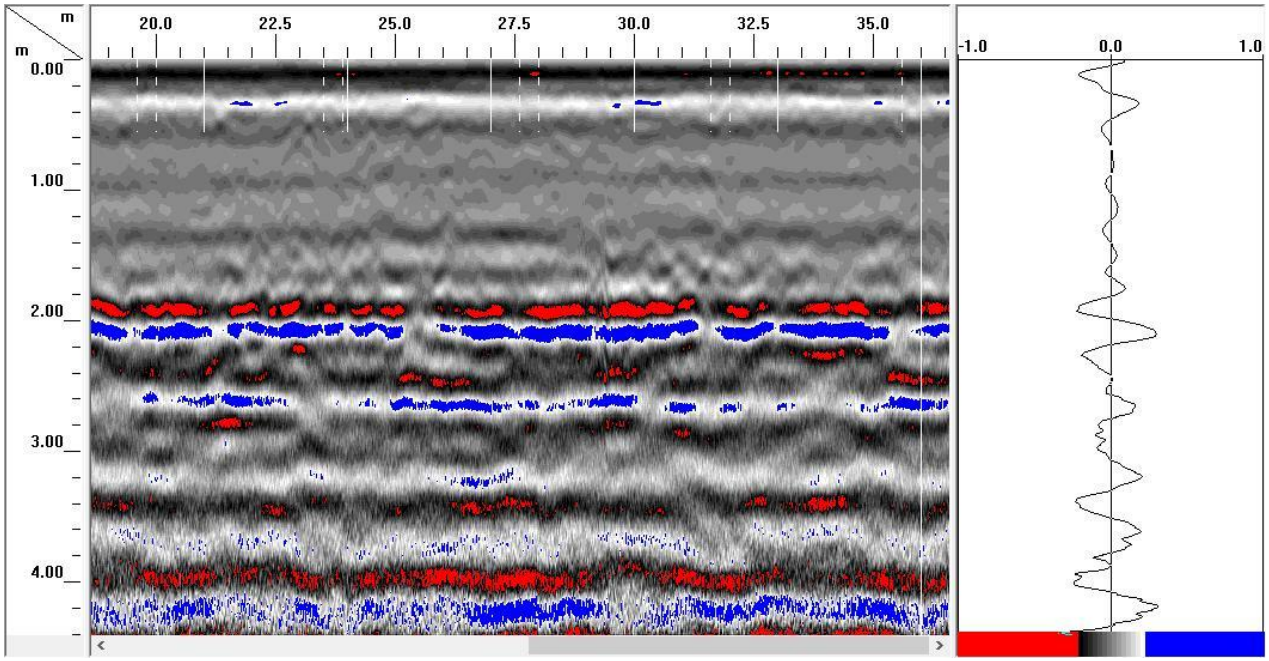
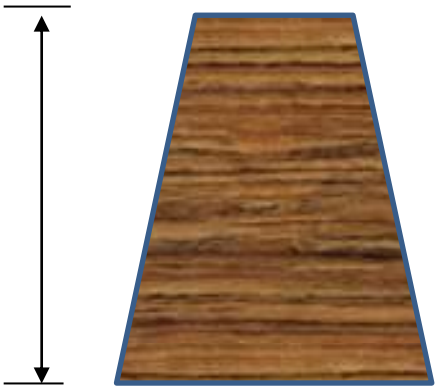
SHED 2



RAW DATA

Foundation depth found by survey approximately 2.2m to 2.3 m.



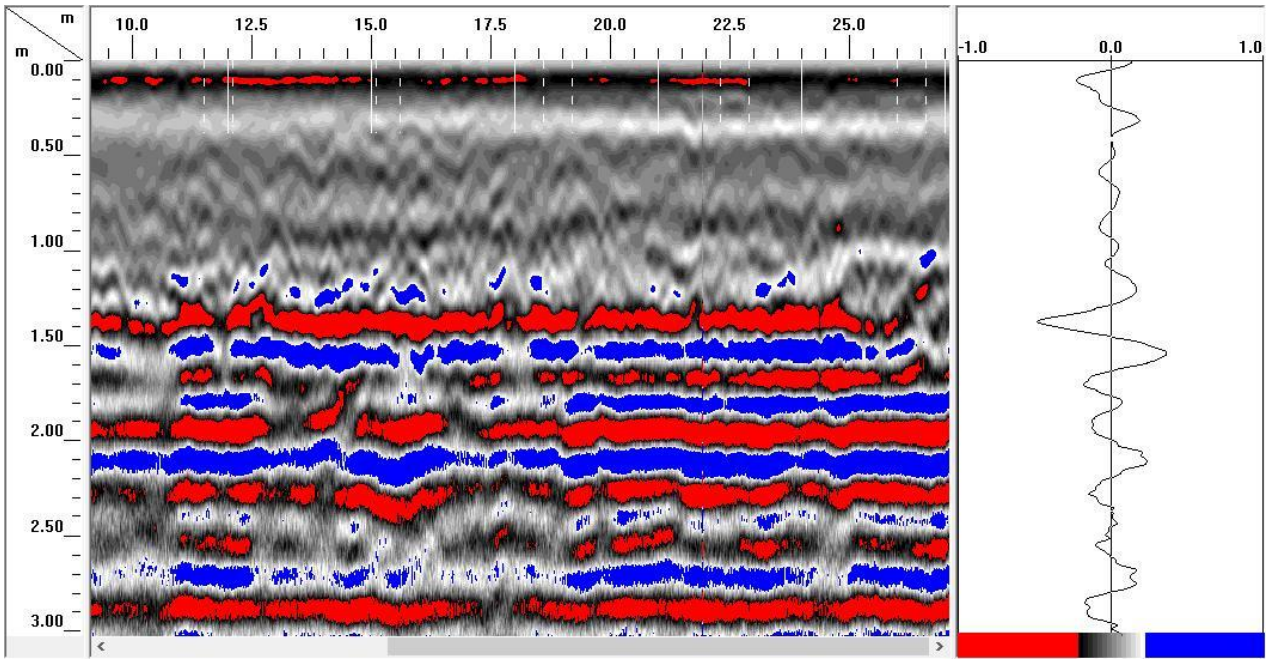
Remarks:

i. We found the foundation depth within 2.2 to 2.3 from GPR survey data. The approximate dimension was found approximately 2.3m X 1.8m

ii. No utility found at this location

AIMIL LTD KOLKATA

SHED 3 & 4



RAW DATA

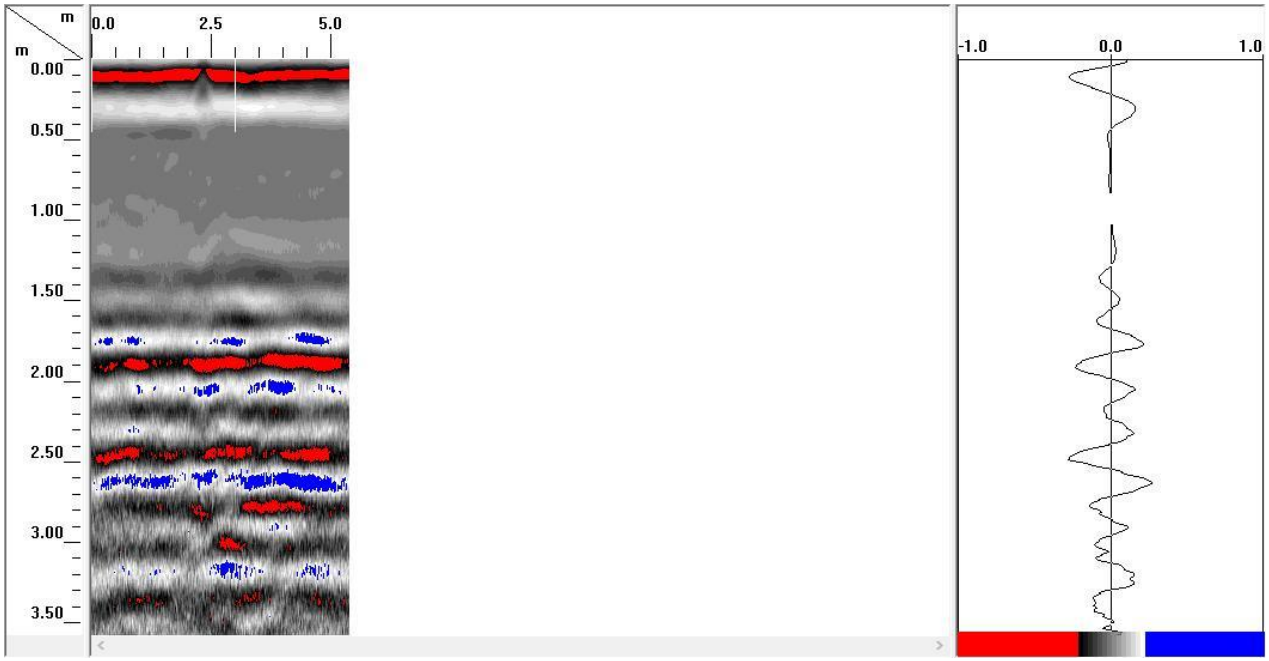
Foundation depth found by survey approximately 2.0m to 2.05 m.

Remarks:

i. We found the foundation depth within 2.0 to 2.05 from GPR survey data. The approximate dimension was found approximately 2.0m X 1.5m

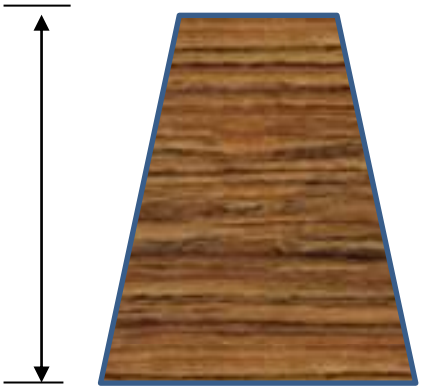
ii. No utility found at this location.

QUARTER GUARD TOWER



RAW DATA

Foundation depth found by survey approximately 1.9m to 2.0 m.



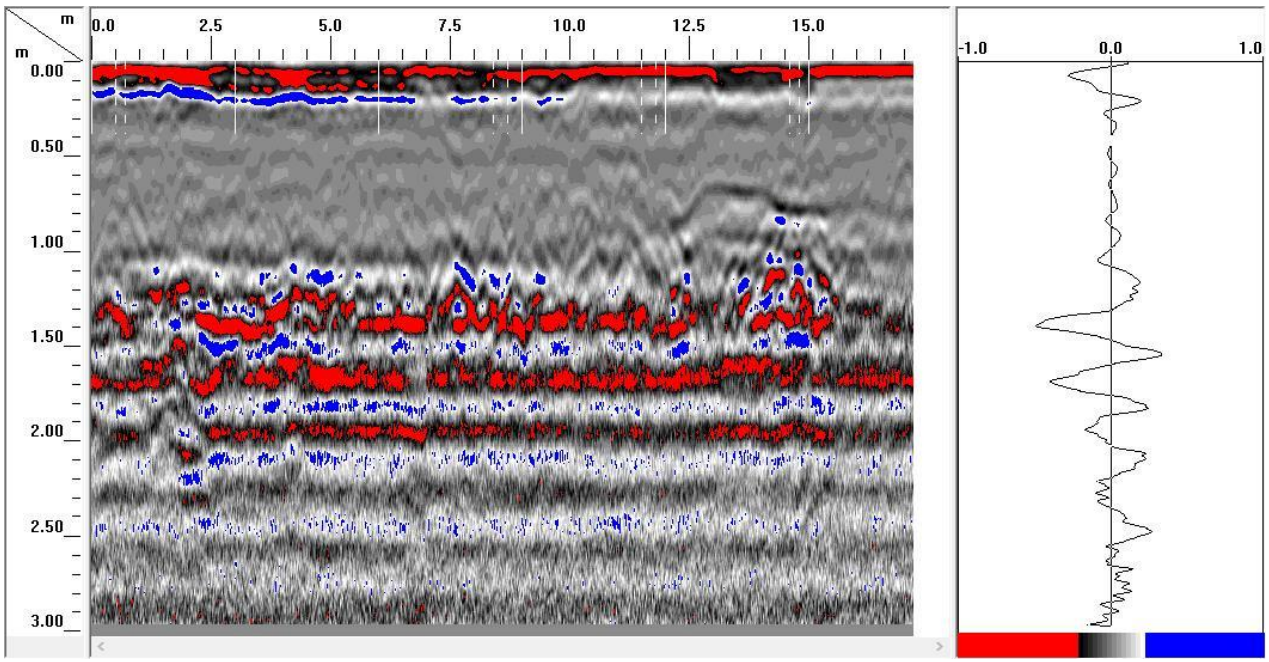
Remarks:

i. We found the foundation depth within 1.9 to 2.0 from GPR survey data. The approximate dimension was found approximately 2.0m X 1.5m

ii. No utility found at this location.

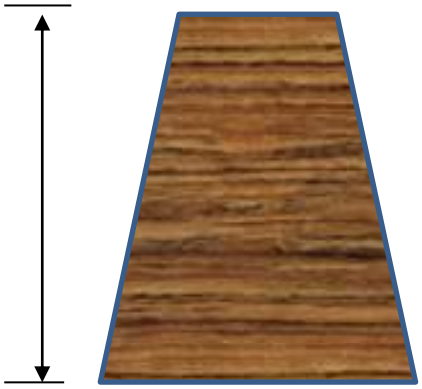
AIMIL LTD KOLKATA

QUARTER GUARD BILDING



RAW DATA

Foundation depth found by survey approximately 1.4m to 1.5m.

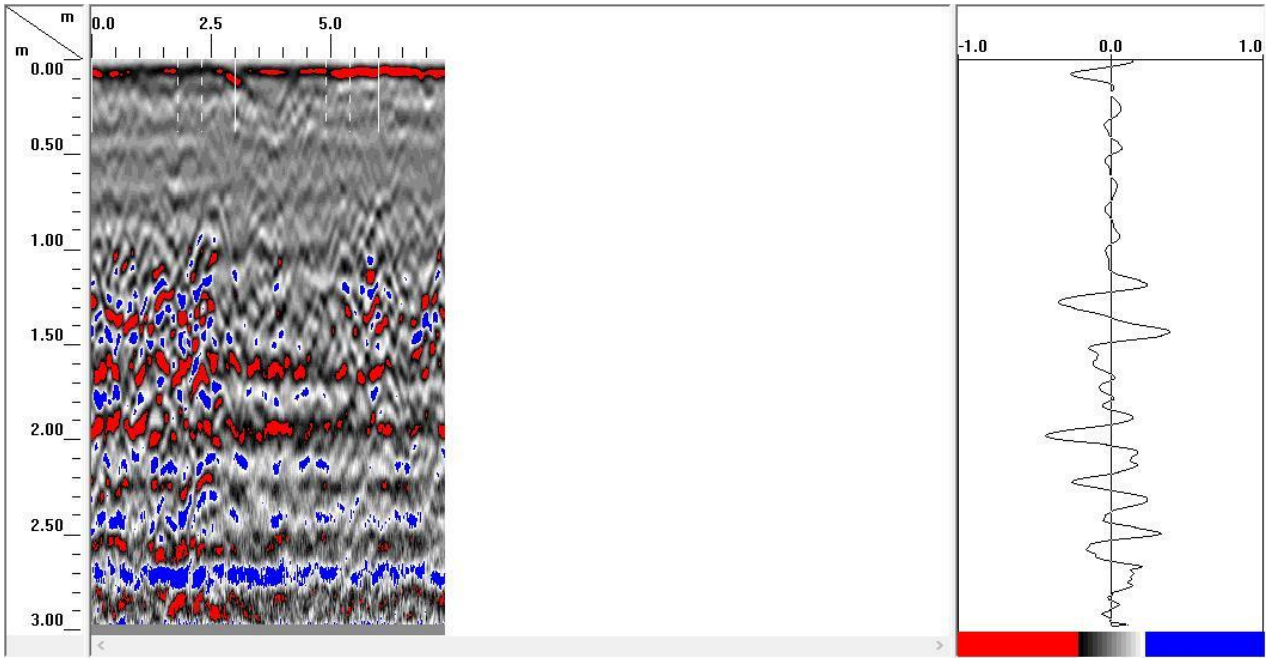


Remarks:

i. We found the foundation depth within 1.4 to 1.5 from GPR survey data. The approximate dimension was found approximately 1.5m X 1.0m

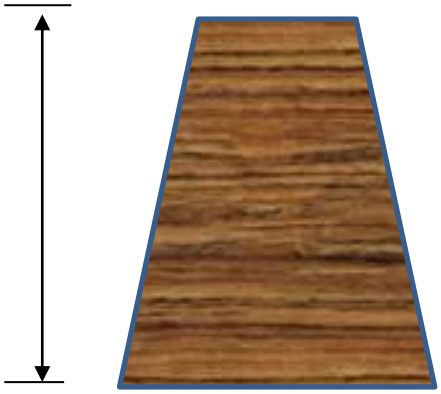
ii. No utility found at this location.

SO'S BARACK 1 & 2



RAW DATA

Foundation depth found by survey approximately 1.3m to 1.4m.



Remarks:

i. We found the foundation depth within 1.3 to 1.4 from GPR survey data. The approximate dimension was found approximately 1.5m X 1.0m

ii. No utility found at this location.