Memorandum of Understanding

M/s BHEL
Trichy – 620 014

and

M/s. XXXXXXXXXXXXXXXXXXX.
XXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXX
XXXXXXXXXX

(Vendor Code : XXXXX)

For supplying

Electrically Operated Handling Equipment

MOU NO : MOU / TPBHEL / HOIST- Rev.05
Date : 24-10-2018

Engineering **Quality** **Purchase** **Vendor**

Memorandum of Understanding (MOU) between BHEL / FB and M/s. xxxxxxxxxxxxxxx, for supplying Electrically operated Handling Equipments.

1.0 GENERAL:

1.1 This MOU is signed for supplying the Hoists as per the agreed standardized specification so that these details need not be discussed again and again for future supplies.

1.2 The various aspects covered in this MOU are as follows.

1.2.1 The general points are covered in Section – 1.0 – General.

1.2.2 The specification requirements are covered in Section – 2.0 – Specifications.

1.2.3 The documents to be submitted along with the offer / after placement of Order / along with the hoists are covered in Section 3.0.

1.2.4 The Inspection / Testing and Packing requirements are covered in Section – 4.0 Testing, Inspection and Packing.

1.2.5 The project specific details / data and if any customer specific requirements shall be covered in Section 5.0 – Project related Information. **DEVIATION ON PROJECT RELATED INFORMATION WILL LEAD TO REJECTION OF OFFER.**

1.2.6 **If any differences are found between the details given in Section 5.0 and other sections, Section 5.0 shall be considered as final and the vendors shall meet this requirement for that particular project.**

1.3 Sections 1.0, 2.0, 3.0 and 4.0 are standard and Section 5.0 alone will be furnished along with enquiry to the vendors for their acceptance.

1.4 **It is agreed that no deviations will be taken by the vendors while submitting their offers against future enquiries**.

1.5 Since the specifications are standardized and an understanding has been reached, the future enquiries will be floated on "SINGLE BID SYSTEM" only. Hence, if any offer is found with deviations, the same will be totally rejected and will not be considered for further evaluation.

1.6 Pre commissioning spares (if applicable) with price break up as per the list (vide Section 5.0) shall be supplied along with the hoists.

1.7 Two years recommended Spares list(vide Section 5.0) with price break up shall be enclosed.

1.8 If any special or non-standard tools are required for installation, operation or maintenance, the same shall be supplied along with the hoists.

1.9 Trouble-free operation of the equipment shall be guaranteed for a period of 18 months from the date of commissioning OR 24 months from the date of dispatch whichever is earlier.

1.10 Vendor has to provide Bank Guarantee for 10% order value (as per BHEL format) valid

for a period mentioned in point No.1.10.

1.11 Dispatch clearance will be issued along with PGMA with DU Nos. for the ordered items to vendor after the receipt of acceptable Inspection Report. Vendor agreed to mark the PGMA with DU Nos. in the casing of the packing and in the Packing Slip.

1.12 Materials shall be dispatched on "Door Delivery with or without Consignee Copy attached basis to avoid demurrage at transporter's go down".

1.13 Since the vendors works alone is approved by BHEL, it is agreed the vendor will manufacture this item in their own works only and will not off-load the jobs to any other suppliers without the written approval by BHEL.

1.14 All components of the hoists should be packed in such a way that it should not get damaged during transport.

1.15 BHEL and the Vendor shall have an involvement which will commence at bid stage and follow through the completion and acceptance, thus ensuring total conformity to Purchaser's requirements.

2.0 SPECIFICATIONS

2.1 Scope

This specification covers design, manufacture, inspection, testing and supply of electrically operated Under Hung Crane (UHC), Trolley With Hoist (TWH), and Down Shop Leads (DSL). Technical parameters for equipment design are furnished in Section-1 to 4. For scope of supply and special requirements refer to Section-5.

This is a general specification dealing with technical requirements of various handling equipment as specified under scope. Contract requirements and special requirements (if any) for a particular project are specified in Section5.

2.2 Codes & Standards:

In addition to the following latest revisions of codes and standards, the equipment shall be designed to meet the other governing standards as applicable and also meet with the local standards where the equipment is installed.

IS 3938	...	Electric wire rope hoists.
IS 807	...	Design, Erection and testing (structural portion) of cranes and hoists code of practice.
IS 2758	...	Mild steel point hooks for use with wire rope thimbles.
IS 15560	…	Point hooks with shank upto 160 tonne -specification
IS 2266	...	Steel wire rope for general engineering purpose.
IS 2365	...	Specn for Steel Wire Suspension Ropes for Lifts, Elevators and Hoists
IS 3681	...	Gears-cylindrical gears-accuracies.
IS 325	...	Three-phase induction motors.
IS 1554 Part 1	...	Insulated cables for working voltage upto and including 1100V.
IS 4691	…	Degrees of protection provided by enclosures for rotating electrical machinery.
IS 2062	...	Hot rolled low, medium and high tensile structural steel.
IS 816	...	Code of practice for use of metal arc welding for general construction in mild steel.
IS 2074	...	Ready mixed paint air drying red oxide-zinc chrome, priming.
IS 2932	...	Enamel synthetic, exterior (a) under coating, (b) finishing.
IS 3177	...	Code of practice for electric over head traveling crane and gantry crane other than steel work cranes.
IS 13947 (Part I)	…	Specification for low-voltage switchgear & control gear
IS 1024	…	Code of practice for use of welding in bridges and structures subject to dynamic loading.

IS 1875	…	Carbon steel Billets, Blooms, Slabs and Bars for Forgings.
IS 1835	…	Specification for Round Steel wires for ropes.
IS 9968 (Part-1)	…	Elastomer insulated cables:part 1 for working voltages upto and including 1100V.

2.3 Design & Constructional Requirements:

Construction of TWH, UHC and DSL shall be of consistent capacity, lift, head room, span, over hang and any other parameters as specified in Annexure- I of Section-5.

2.4 Electrically operated Under Hung Crane & Trolley With Hoist:

All equipments shall be designed for OUTDOOR application and suitable for ambient temperature range of 0 to 50ºC. Purchaser will provide electric power supply at one or more points near to the monorail / runways as required in the plant layout. Service class to be considered for design of trolley with hoist and under hung crane shall be as per class 2 of IS 3938 and IS 3177 / IS 807 respectively. All material used for construction of different components shall individually conform to applicable standard. All welds shall conform to IS 1024 and welders shall be qualified to AWS D1.1 / ASME Section IX.
Trolley with hoists and Under Hung Cranes shall be provided with protective hood and hard rubber sweepers.

2.4.1 Hooks:

2.4.1.1 Hooks shall meet the dimensional, material testing & inspection requirement of IS 15560.

2.4.1.2 The hook shall be provided with standard depress type safety latch and swivel thrust bearings with hardened race.

2.4.1.3 Lugs for fixing safety latch shall be either forged along with the hook or clamp type latch with lugs shall be provided.

2.4.1.4 Welding of lugs not permitted.

2.4.1.5 Locking arrangement shall be provided to avoid unscrewing of the hook in service.

2.4.1.6 Material of hook shall conform to IS-1875 or equivalent (with minimum tensile strength 50-62 Kg/mm2.) and made by controlled grain forging and normalized.

2.4.1.7 Proof load tests for all the hooks shall be tested as per IS 15560 (i.e. for lifting capacity upto 32T, proof load shall be two times the lifting capacity. For lifting capacity 40T to 50T, proof load shall be 1.7 times the lifting capacity).
All hooks shall be examined by MPI / LPI & UT (UT required for hooks >5.0T capacity) for cracks after proof load test.

2.4.1.8 The hook shall not distort or fracture. Ball & roller bearings shall not be used in these hooks. Anti-friction thrust bearings shall be used.

2.4.2 Wire Ropes:

Wire ropes shall meet the requirement of IS 2266 / IS 2365. Shall have six strands of 37/36 wires per strand with an ultimate tensile strength of 180 Kg/mm^2. The wire rope shall be galvanized, as per IS 1835 type B. All wire ropes shall be proof load tested for 2 times of SWL/Fall. Breaking load shall not be less than five times SWL/Fall. Indicating the breaking force of wire rope, test certificate provided by the wire rope manufacturer for breaking load test shall be furnished during inspection. The rope shall be of sufficient length to retain two full wraps on the drum at lowest hook position.

2.4.3 Drum & Sheave:

Drum shall be of welded steel or seamless steel and Sheave shall be of cast or welded steel. The drum shall accommodate all the length of rope required for the lift plus two dead wraps at each anchor point without overlap. Drum can be grooved right or left or both, and grooves shall suit the ropes used. Sheaves shall be equipped with sheave guards to retain the rope in groove.

2.4.4 Gears & Pinions:

Material of construction shall be conforming to relevant Indian Standard (IS:3681) / (BS 970) or equivalent and shall be hardened if required to achieve the specified hardness. Hardness for Cross Travel & Long Travel (CT & LT) shall be in the range of 250 to 290 BHN for pinions and 215 to 255 BHN for gears. Hardness for hoisting shall be in the range of 285 to 300 BHN for pinions & 250 to 265 BHN for gears. In case of case hardened gears and pinions, a max. hardness of 350 BHN for gears and 390 BHN for pinions is acceptable. However, vendor shall maintain and ensure that gear hardness is always less than pinion hardness by at least 35 BHN. Helical/Spur gears shall be used for hoists, CT & LT. All gears and pinions shall be examined by LPI/MPI for surface cracks after hardening. In case of enclosed gearing, means shall be provided for ample lubrication. Such lubrication points are to be indicated in the drawing. The vendor shall specify the specification of lubricant, market trade names, quantity of lubricant requirement and frequency of lubrication.

2.4.5 Wheels:

Shall be made out of forged or low carbon steel/cast steel with heat treated to 175 to 200 BHN hardness. The drive gears, if any, integral with the wheel shall be of the same material and hardness. Trolley wheels for hoists shall be spur geared type, cast / forged 4 wheeled out of which 2 wheels shall be driven by motor.

2.4.6 Rotating & Stationary shafts:

The material for shafts shall be as per relevant Indian standard or its equivalent and shall be hardened and tempered with a minimum tensile strength of 60 Kg/mm^2 and hardness shall be maximum 175 to 250 BHN. UT test shall be done for all Shafts of diameter more than 50mm. UT acceptance norms shall be as per ASME section VIII; Division 2.

2.4.7 Bearings:

Shall be reputed make (FAG/SKF/TATA/NBC) and shall meet relevant IS standards. All bearings shall be designed to give a minimum service life of 20 years.

2.4.8 Brakes:

Hoisting, cross travel and long travel shall be provided with electro- mechanical friction shoe type brake or Disc type brakes or Electromagnetic disc type brake or Electro hydraulic thruster brake. The brakes shall be released with electric power and fail-safe in case of power failure. All brakes shall, irrespective of controller portion, be applied immediately on operating an emergency push button or switch. It shall be possible to arrest the load at any desired location with minimum slip. Slip with reference to speed shall be specified along with the offer. Brakes shall be designed as per the latest edition of IS:3938 / International standards.

2.4.9 Trolley:

Shall be of minimum 4 wheeled out of which 2 wheels should be spur geared type and fabricated construction. Trolley shall be designed to suit the monorail size (straight or curved monorail, Which Purchaser will furnish during drawing approval). The travel path of the trolley on monorail (straight / curved) shall be read from BHEL drawing furnished along with the enquiry.

2.4.9.1 For ID Fan and Economiser handling hoists, suitable integral platform shall be provided at hoist to access control panel / motor / trolley / brake etc.,

2.4.10 Frame:

The frame shall be designed to proper strength, built from steel plates with bolted/welded construction.

2.4.11 End Carriages: (For Cranes)

Shall be of minimum 4 wheeled out of which 2 wheels should be spur geared type and fabricated construction. Suitable wheelbase shall be provided. End carriages shall be designed to suit the runway beam size. (Which Purchaser will furnish during drawing approval.) End carriages shall be connected with crane girder by welding or by fasteners (For ease of transportation, if site welding is required, the same shall be done at site by Purchaser).

2.4.12 Crane Girders:

Crane girders shall be of rolled section. Fabricated beam and welded beam shall not be used for this purpose unless otherwise accepted/approved by the Purchaser for special cases. For such cases, refer annexure-I of Section-5 to this specification for details. Camber / deflection under load shall be within SPAN / 1000 mm. In case vendor desires to provide higher camber, the same shall be clearly specified in the drawing. In any case camber provided shall not exceed –

- In case of double girder crane:

(Span ÷1000mm) + (Deflection under self-load of trolley with hoist ÷2)

- In case of single girder crane:

(Span ÷1000mm) + Deflection under self-load of trolley with hoist

Allowable bend shall be 1mm/metre and maximum bend shall not exceed 6mm for total span.

2.4.12.1 Buffers shall be provided for stopping the crane.

2.4.12.2 Design of crane should ensure anti tilting and anti toppling while the hoist is at overhang side.

2.5 Down Shop Leads (DSL):

DSL system shall be designed to transfer the power supply from End user supply point to the equipment, which is moving on runway beams / monorails. The DSL system shall be of Cable trolley type or Taut wire loop type as per contract requirement specified in Section 5.

2.5.1 Cable Trolley Type:

Cable trolleys shall run on "Tee" track / I-Beam. The system shall consist of:

- "Tee" track
- Cable Trolleys
- Flexible power cable (Fixed & Trailing)
- Switch fuse units / Isolators
- Supports for Auxiliary girder or "Tee" track / I-Beam
- Link chain
- Fasteners

2.5.1.1 Construction:

2.5.1.1a "Tee:" Track / I-Beam:

The system shall be provided with rolled sections suitable for cable trolley wheels as per the relevant Indian Standard. The “Tee” track / I-Beam shall be designed with minimum deflection for smooth travel of cable trolleys.

2.5.1.1b Cable Trolleys:

4-wheeled cable trolleys shall be of sturdy design constructed with suitable material. Diameter of trolley wheels shall be minimum 40mm. and with double seal roller or ball bearing. The cable trolleys shall be designed to take the load of cable and moving with the cable load smoothly on auxiliary girder or "Tee" track. Suitable arrangement shall be provided to tie the power cable and link chain with cable

trolley. Vendor shall specify the construction of material selected in the offer. Arrangement drawing shall be submitted along with the offer for review. After placement of purchase order, the same shall be submitted for approval. Vendor shall indicate the weight of total cable trolleys in the drawing.

2.5.1.1c Flexible Power Cable: (Fixed & Trailing)

(For Cable trolley & Taut Wire Loop type)

The trailing cable shall be suitable for 415V AC; 3 phase with neutral; 50Hz.; copper PVC flexible cable, PVC 650/1100V grade, suitable size/rating (for all motors running simultaneously) for the equipment under supply. The power supply flexible trailing cable shall comply with latest revision of IS 694 / IS 1554 Part 1 /IS 9968 and other relevant Indian standard for the equipment under supply. If any special requirement, respective IS Standard as mentioned in Section –5 of this specification shall be followed. For sub-vendor list refer clause no 2.12.5. Vendor shall indicate the weight of total system in the drawing.

2.5.1.1d Switch Fuse Units or Isolators: (For Cable trolley type & TW Loop type)

The system shall be supplied along with suitable switch fuse units / isolators to take the full load current, when the equipment trolley with hoist and under hung crane) is working with maximum safe working load. For sub-vendor list refer clause no 2.12.6.

2.5.1.1e Supports:

The system shall be provided with suitable supports to take the load of “Tee” track / I-Beam, cable trolleys, power flexible trailing and other materials.

2.5.1.1f Link Chain:

The system shall be provided with suitable link chain to pull the trolleys, which is with the load of cable. During pulling of cable trolleys due to impact load, the chain shall not fail at any point. The chain shall be made out of minimum 3mm diameter carbon steel wire.

2.5.1.1g Fasteners:

Suitable fasteners shall be provided. Fasteners shall be electro - galvanized / Hot dipped.

2.5.2 Taut wire loop:

Ceramic reel insulator shall drag on stretched steel wire with trailing cable. The system shall consist of:

- Bracket
- End hook
- Flexible power cable (Fixed & Trailing)
- Switch fuse units/Isolators

- Reel insulator
- Steel wire rope
- Rope clamp & thimble
- Leather belt or nylon wire rope
- Fasteners.

2.5.2.1 Construction:

2.5.2.1a Bracket:

Suitable size and material shall be provided to take the load of cable and axial force by the end hook.

2.5.2.1b End hook:

Suitable end hook shall be provided for the size of steel wire rope.

2.5.2.1c Reel insulator:

Cable reel insulators shall be of ceramic, with suitable size of the stretch wire. Suitable arrangement shall be provided in the reel insulator to tie the trailing cable with nylon rope or leather belt.

2.5.2.1d Steel wire rope:

Steel wire rope shall be of minimum 6mm diameter as per latest revision of IS 2365. Steel wire rope shall be suitably sized for load of cable without sagging for the total travel length.

2.5.2.1e Rope clamp & thimble:

Suitable rope clamps and thimbles shall be provided to tie the rope with bracket through end hook.

2.5.2.1f Leather belt or nylon tie:

Leather belt or nylon tie shall be supplied to tie the trailing power cable with reel insulator.

2.5.2.1g Fasteners:

Suitable fasteners shall be provided wherever required. Fasteners shall be Electro-galvanized / hot dipped.

2.6 Electricals & controls:

2.6.1 CT, LT & Hoisting Motors (AC; Non-Flame Proof)

2.6.1.1 Site condition

2.6.1.1a	Altitude above sea level	: Less than 500m.
2.6.1.1b	Ambient temp. Condition	: 0 - 50°C
2.6.1.1c	Relative Humidity	:100%

2.6.1.1d	Atmosphere	: Dusty, salty, corrosive and highly polluted.
2.6.2	Standard (Latest revision)	: IS 325, IEC 60034, IS 3177
2.6.3	Application	: Trolley with hoist and Under Hung Crane
2.6.4	Duty cycle	: S3/S4; Duty factor: 40% CDF.
2.6.5	No of starts	: 150 starts/Hours
2.6.6	Pullout Torque	: 275 % of the full load torque
2.6.7	Rated voltage, frequency	: 415V, ±10%; 50 Hz±5% and combined 10% absolute
2.6.8	Minimum starting voltage	: 80% of the rated voltage (Cl. 2.6.5)
2.6.9	Capacity to restart (at Voltage Specified in cl.no 2.6.5)	No limitation on no. of starts. Calls for many starts at frequent intervals. Vendor to specify on any limitation
2.6.10	Direction of rotation	: Bi-directional
2.6.11	Class of insulation	: Class `F' temp. rise limited to class `B'

2.6.12 Winding treatment:

The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot humid and tropical climate

2.6.13	Temperature rise	: With in specified limits. Vendor to specify.
2.6.14	Starting current	: Vendor to specify.
2.6.15	Method of motor starting	: DOL

2.6.16 Type of enclosure:

IP 55 as per IS 4691.

2.6.17 Terminal Box:

2.6.17.1	Type	: Weather proof IP 55
2.6.17.2	Cable gland	: Double compression type, Brass with nickel plated
2.6.17.3	Cable entry	: Suitable for both, top and bottom entry.
2.6.18	Type of terminals	: Stud type with plain washers, spring/ washers check nuts & Lugs.
2.6.19	Fault level	: 50 KA at 415V.

2.6.20 Terminals:

Separately terminated with clear identification in main terminal box with double compression type glands.

2.6.21	Lifting device	: Eye bolt or lugs to facilitate safe lifting.

2.7 Controls & Interlocks:

The control system shall envisage a control cabinet and a push button operating station. The push button control shall have control for power switching to the motors and forward/reverse motion. The control voltage of both cabinet and push button station shall be 110V AC 50 HZ. single phase. The control stations shall have enclosure protection of IP 55 (IS:13947). Necessary electrical interlocks shall be included in control cabinet for fail-safe operation. Vendor shall clearly bring out all the interlocks in the control wiring drawing and submit the same for approval. Limit switches shall be provided for long and cross travel hoists. These switches shall be interlocked to cut off power to the motor and restrict further movement when the limits are crossed. Crimping tool shall be used for fitting lugs.

2.8 Control Cabinet:

2.8.1 Application:
To house all the power contactors, control transformers, control relays, fuses, indicating lamps, switches and protection circuits of all motors of hoist.

2.8.2 Type:
Wall mounting type. Normally mounted on a framework of the hoist. The cabinet shall be made of minimum 1.6mm thick cold rolled sheet.

2.8.3 Motor Protection:
All motor shall be protected against under voltage, over load and short circuit condition.

2.8.4 Isolator :
Input power to the cabinet through switch fuse unit is required.

2.8.5 Thermal over load relays : Shall be provided suitably for all motions.

2.8.6 Indicating Lamps : Shall be provided wherever required.

2.8.7 Terminal Blocks:
Shall be of Clip on type. Shall be suitable for 1.5mm^2 copper conductor. 20% of additional terminal blocks shall be supplied as spares along with the supply.

2.8.8 Customer Supply voltage : 415V 50 Hz. 3 phase

2.8.9 Control voltage : 110V 50 Hz.

2.8.10 Enclosure Protection: (For Control Cabinet & Pendant Station)

IP 55 as per IS 13947(part I).

2.8.11 Glands:
Shall be double compression type, Brass with nickel plated. To be included in vendor scope as per requirement.

2.8.12 Internal Wiring:

1. PVC 1100V Grade 1.5 mm^2 multi-strand /copper conductor.
2. All power wiring with red and black.
3. All control wiring is to be with grey wire & shall be marked with ferules as per wiring diagram.

2.9 Control Box:

2.9.1 Type:
Pendant station to house all start/stop/forward/reverse/up & down push button for all motors.

2.9.2 Location : Hanging from equipment. Push button pendant station shall be provided at above one meter from operating floor.

2.9.3 Push Button:
For all start green push button and for stop red push button shall be used. Make shall be of Siemens / L&T / GE / Telemechanic / BCH/Technic/ Control & Switchgear (C&S) . Push button shall return to "off" position when released. One stop push button shall be lockable to enable switch off power supply when equipment in not in use. The Push Button shall be clearly marked as the recommendation of IS:3938 to indicate the function of each button.

2.9.4 Control Voltage: 110 V AC 50 Hz. Single phase.

2.9.5 Enclosure Protection:
IP 55 as per IS 13947 Part I.

Box material:

Cold rolled sheet steel with 1.6mm thickness minimum.

2.10 Cabling:
Vendor shall include all the power and control cables necessary for the system. The cable shall comply with IS 1554. The power cable shall be of copper PVC flexible and vendor shall indicate the conductor size and over all size in the offer for all the motors. The control cable shall be armoured of 1.5 mm^2 copper conductor only. The no. of cores, cable size etc shall be indicated in the offer. There shall be 20% spare cores available for all control cables offered. If any special requirement, respective IS Standard as mentioned in Section –5 of this specification shall be followed.

2.11 Earthing :
All electrical equipments (motor, control cabinet etc.,) shall be provided with required elements (like bolt, washer, nut etc.,) for proper earthing at site.

2.12 Electrical & Control Items shall be as per the approved Sub-Vendor/Make List given below.

2.12.1 Control &Thermal Over Load Relays: Siemens/BCH/L&T/GE/ Telemechanic/ C&S

2.12.2 Transformers :SE / Kappa / Ind Coil /JE/ Vikas / Logicstat

2.12.3 Motors : NGEF/Kirloskar/Siemens/Crompton-Greaves / Bharat Bijlee/Autolec/GEC/GE

2.12.4 Limit Switches :BCH / Omron / Nucon / Festo / Siemens / Kaycee / EMM / SOC

2.12.5 Power & Control Cable :CMI Ltd. / Delton Cables / Fixwell / Pushincords /Asian cables/Cable corporation

of India / Finolex /Incab/Universal/Polycab/KEI

2.12.6 Isolator / Switch Fuse Units : Siemens / L&T / GE / C&S

2.12.7 Power Switches : Siemens / L&T / GE / C&S

2.13 Name Plates:

2.13.1 Nameplates shall be provided with non-corrosive material

2.13.2 Name plates shall have details of the equipment, model no., type, capacity, lift, span, and motor & brake details.

2.13.3 All lubrication points shall be provided with nameplates.

2.14 Limit switches and Electrical Protective devices

Limit switches and Electrical protective devices are to be supplied as per IS:3938 - 1983 to limit the ultimate positions of the hook, the hoist block running in monorail and crane long travel (in case of cranes).

3.0 DOCUMENTS TO BE SUBMITTED

3.1 Along with Offer.

3.1.1 Quality plan, General arrangement & DSL arrangement / Schematic drawing showing the critical dimensions with complete bill of materials. All dispatchable components / assemblies shall be indicated in detail. Sub-vendor items' make also shall be indicated in the drawing.

3.1.2 Wiring circuit diagram with details of make, type and rating of all components.

3.1.3 Spares list if required for 3 years of trouble free operation along with price. Commissioning / Initial spares shall form part of the base offer.

3.1.4 Duly filled-in and signed General Data Sheet (Section 5) for trolley with hoist, under hung crane and down shop lead system with all required details.

3.1.5 Write up on special features if any.

3.1.6 Technical specification for equipment.

3.1.7 Catalogues and other details of the product shall be submitted along with the offer.

3.1.8 Exclusion:

Any exclusion from scope of supply shall be clearly spelt out in the offer itself. Exclusion of major / critical items shall make the offer liable for rejection.

3.2 After Placement of Order.

3.2.1 Quality plan shall be submitted by vendor for Purchaser's approval.

3.2.2 Dimensional drawings of Under Hung Crane, Trolley With Hoist, Down Shop Leads, cable trolley, control panel and wiring diagram with B O M for approval.

3.2.3 Data sheet (Annexure-III to specification) for hoists and cranes for Purchaser / End user's approval.

3.2.4 The following calculations/details shall be furnished.

3.2.4.1 Hoist motor and Travel motor power calculations.

3.2.4.2 Brake Torque calculations and Brake selection for each hoist.

3.2.4.3 Main Hoist rope and wire rope selection.

3.2.4.4 Cross travel and Long travel wheel load and wheel diameter calculations/details.

3.2.5 Priced List of Recommended Spares for 2 years trouble free operation and maintenance. (if applicable)

3.2.6 Vendor to furnish load test procedure for the quoted hoist along with test load required to be carried out at site.

3.2.7. Vendor to fill and submit motor data sheet Annexure –IV.

3.3 Along with the Hoists:

3.3.1 Physical, Chemical, NDE and hardness test certificates shall be provided wherever applicable for trolley / crane wheels, wire ropes, pulleys, hook, gears, pinions, and shafts.

3.3.2 Test certificates for having carried out the tests as per Section-4 of this specification under Purchaser and End user's presence.

3.3.3 Test reports for wire rope and hooks and Test reports for NDT examination of gears, wheels, pinions and hooks

3.3.4 Type test and routine test certificates for motors and as per IS 325.

3.3.5 Performance test certificates for UHC, TWH, safety devices and other electrical items.

3.3.6 TC for control panel, pendent stations and motors shall be provided.

3.3.7 Two sets of as-built arrangement drawings and electrical circuit drawings shall be sent along with the hoist. 2 set Hard copy along with 2 set soft copy in CD/USB drive of vendor O&M Manual (along with BHEL approved vendor drawings & documents) for supplied hoists shall also be supplied along with the consignment.

3.3.8 The vendor check list shall be filled up at the manufacturer's work and shall be duly signed by inspection engineer and manufacturer's representative.

3.3.9 Drawing & O&M Manuals:

3.3.9.1. The bill of material shown in the drawing shall match with that of the dispatchable unit as indicated in the packing slip.

3.3.9.2 The drawing shall be prepared in AUTOCAD and vendor shall forward both hard copies and CD/USB drive (Copied with drawing files) to the Purchaser and along with the hoists.

3.3.9.3 O & M Manuals:

3.3.9.4 Operation and maintenance manuals shall be provided with details for Storage at site, installation, erection procedures, drawings, motor data sheet, relay characteristics, operating and troubleshooting, lubrication schedule, spares data, spares identification drawings, spares replacement procedure and special requirements if any. 2 Set Hard copy shall be sent along with hoist and 1 set to be sent to BHEL / Tiruchirappalli. 2 Set soft copy as CD/USB drive shall be sent along with hoist and 1 set soft copy as CD/USB to be sent to BHEL / Tiruchirappalli.

3.3.9.5 The hard copies of the Manuals should be in printed form only.

3.3.9.6 The size of manuals should be in correct A4 size with drawings in A3 size. Large size drawings (greater than A3 size) should be reduced in A3 size and inserted.

3.3.9.7 Drawings shall be of printed or laser printed form only.

3.3.9.8 O & M manuals, (hard copies and CD) shall be submitted to BHEL / Tiruchirappalli prior to dispatch of the equipment.

3.3.9.9 O&M **Manual, generally should contain the following:**

3.3.9.9a Data sheet with makes of components supplied.

3.3.9.9b Maintenance (including, storage, installation, Erection and lubrication wherever necessary) and service

3.3.9.9c Recommended spares for 2 years trouble free service.

3.3.9.9d Trouble shooting

3.3.9.9e Assembly drawings with part list, dimensional drawings & other applicable drawings.

3.3.9.9f Manuals should pertain only to the types or model supplied for the particular contract.

4.0 TESTING, INSPECTION AND PACKING

4.1 Purchaser's and End user's representative shall have access to the works of vendor at all reasonable times for the purpose of witnessing the purchased equipment being tested.

4.2. All electrical and mechanical equipment like motor, ropes, cables, electrical control panel etc. shall be tested as per the relevant IS standard at the vendor's / Sub-vendor's works.

4.3. The Trolley with hoist shall be run 5 times at manufactures works. First and 5th runs shall be tested with 125% safe working load. Second, third and fourth run with safe working load shall be conducted without any pause. The motor currents shall be checked and shall be with in the rated full load current of each motor at safe working load. The hoist shall be capable of lifting load from mid-air and moving the load without any problem. Normal speed shall be achieved during full load tests. Headroom variation shall be checked & allowable variation is 50mm only. Hook approach shall be checked as per approved drawing. (Ref. Standard : cl.20.2 of IS 3938)

4.4. The brakes for hoisting, long travel and cross travel shall be tested with 125% safe working load. The brakes shall be capable of holding this load, when the load is suspended by the hoist hook. As per IS 3177, the long travel motion should be tested at manufacturer's works on no load keeping the crane on sleepers or test bench. Maximum slip (braking path) shall be as per approved data sheet / drawing for hoisting and cross travel motions.

4.5 Test shall be conducted for effectiveness of automatic devices for hoist to limit the upward/downward & travel of hoist and to limit the forward & reverse travel of crane.

The limit switch shall be checked at vendor's works. Others shall be checked at site by Purchaser / End user and if found defective, the same shall be replaced at free of cost by vendor.

4.6 Before the hoist is put into operation, over load relays (electrical) shall be tested for lift & cross travel and sustain 125% safe working load. Long travel with 125% SWL shall be tested at site by Purchaser / End user and if found defective, the same shall be replaced at free of cost by vendor.

4.7 Trolley with hoist and under hung crane gears shall be tested with & without load for alignments, smooth and trouble-free operation.

4.8 Equipment shall be tested for hoisting and cross travel with 125% SWL.

4.9 Hoisting, and cross travel speed shall be tested and shall ensure the tolerance with in 10%. Hoisting and CT shall be tested for minimum 1.0 to 2.0m. (for hoisting- height & for cross travel-length). Long travel speed shall be tested at site. Vendor shall be responsible for meeting for full lift and lower limit switch operation at site. Any failure at site to meet the above requirement shall be resolved by the vendor at site at his cost.

4.10 Long travel shall be tested at site with and without safe working load by Purchaser / End User and if found defective, the same shall be replaced at free of cost by vendor.

4.11 **Load test** for TWH and UHC shall be carried out after installation at site under the supervision of the vendor's representative, to the satisfaction of the Purchaser / End user. Vendor should depute their Engineer for a period of 10 days per boiler free of cost.

4.12 All welding shall be tested with LPI / MPI. All butt welds shall be tested with radiography. Acceptance norms for radiography shall be as per AWS D1.1. /ASME Sec IX.

4.13 Hooks:

4.13.1 Raw material test certificate shall be submitted by manufacturer for scrutiny.

4.13.2 Proof load test should be done as per IS 15560 on each hook irrespective of capacity.

4.13.3 After proof load test, hook shall be examined for cracks, deformation, flaws and other defects with LPI / MPI & UT. No linear indications or cracks are acceptable while carrying-out LPI / MPI. Acceptance norm for UT shall be as per A388/ ASME - Section VIII - Division 2- AM203.2 / ASTM E446.

4.14 Under Hung Crane:

4.14.1 Check the dimensions of the under hung crane as per relevant standard.

4.14.2 Deflection Test: Under hung crane shall be tested for deflection with safe working load at the middle point of the span. Datum line for deflection is obtained by placing

hoist at one extreme of the span with hook approach. The deflection with Safe Working Load at center of span compared with this datum should be less than= $\frac{SPAN}{1000} mm$.

4.15 Down Shop Lead System (DSL):

4.15.1 Cable trolley shall be tested for smooth running on "Tee" track with cable load.
4.15.2 Cable reel insulator shall be tested for smooth running on steel wire rope with cable load.
4.15.3 Any discrepancy found in the design and/or supply shall be resolved by Vendor at the installation (site) at Vendor's Cost.

4.16 Electrical components:

4.16.1 The insulation values of all electrical equipments should be checked. Reading shall be not less than 1.0 MΩ with an unregulated type tester with DC voltage not less than twice the rated voltage.

4.16.2 Control panel shall be verified for make, model no. and location of all relays & components as per the approved drawing.

4.16.3 Functional test shall be conducted for power and control circuits.

4.16.4 Test for high voltage and measurement of insulation resistance shall be conducted.
4.16.5 Degree of protection test report shall be submitted. (Type test report)

4.16.6 The satisfactory operation of each controller, switch, contactor relay, other control devices, the connectors of all circuits and protective devices shall be tested under the most unfavourable conditions.

4.16.7 TC for control panel, pendant stations and motors shall be provided.

4.18 Painting, Protection, Packing, Supply and Identification:

4.18.1 Surface Preparation:

Weld slag & spatter shall be removed and the surfaces to be coated shall be free from contamination. Surface defects shall be removed by suitable methods. Sharp edges shall be smoothened by grinding. Prior to surface preparation oil, grease, drilling emulsions, cutting emulsions and preservative agents shall be carefully removed by suitable solvents. The surface shall be carefully dried with clean cloths to prevent the dissolved impurities from spreading over the entire surface. The surface shall be cleaned by wire brush and shot blasting if required. Proper adhesiveness of paint to the surface shall be ensured.

4.18.2 Painting:

Normal painting schedule is as detailed below. For special requirement if any, refer Section-5.0 to this specification.

4.18.3 **Control cabinet:**

Exterior: Grey; Interior: Brilliant white - glossy finish with enamel paint. For special painting if any, refer Section 5 to this specification. Paint thickness: Exterior - 120 microns; Interior - 80 microns minimum
Alternatively, control panel shall be of powder coated but both outside and inside will be of grey in colour.

4.18.4 Two coat of red oxide with minimum 40 microns DFT as per IS 2074 and two coats of synthetic enamel paint with minimum 40 microns DFT as per IS 2932.
Colour Scheme:

Under hung crane	: Golden Yellow
Trolley with hoist	: Golden Yellow
Interlock mechanism	: Ash Grey
DSL Components	: Ash Grey
Hook	: Black

4.18.5 All the despatchable units shall be packed in a wooden case with waterproof material. The packed item reaching site shall be suitable to be stored in open at site.
4.18.6 The material shall be dispatched with clear bill of material for each system.
4.18.7 Each and every despatchable item shall be identified with item number. Purchase Order reference number and tagged properly for easy identification.
4.18.8 Two sets of as-built arrangement drawings and electrical circuit drawings shall be sent along with the consignment.

5.0 PROJECT RELATED INFORMATIONS (will be filled and furnished during enquiry)

Project Name :

Enquiry No. / P.O.No. :

Sl.No.	Description	Specification	Vendor Confirmation Yes / No
5.1	Hoist, Crane & DSL Parameter	Refer Annexure-I	
5.2	Power & Control cable code		
5.3	Power supply		
5.3.1	Control supply		
5.3.2	Commissioning Spares	Vendor to specify	
5.4	2 Years recommended spares	Vendor to specify	
5.5	Data Sheet	(Annexure-III) Vendor to fill and submit	
5.6	G.A. Drawings (for hoists, cranes, DSL, Wiring diagram, pendant etc.)	Vendor to submit	
5.7	Motor Data Sheet	(Annexure –IV) Vendor to fill and submit after P.O	
5.8	Special contract requirements		

Note: 1. Deviation in the above requirements shall reject the offer.
2. If required, please add more sheets.

Engineering **Quality** **Purchase** **Vendor**

Trolley with Hoist - Electrically Operated

Sl. No.	Appln.	Ref Drg No	Drg Item no	Cap. in T.	Lift in m.	Hd. room in mm.	Monorail			Qty / Blr. in nos.
							Type	Size	Bottom Elev. In M	
01	PA & FD Rotor	1-99-100-40911/04	01	05.00	9.50	Supplier to furnish		WB700X300-32/20	10.250	2
02	PA & FD Motor	1-99-100-40911/04	03	20.00	6.00			WB800X300-32/20	7.800	2
03	ID Fan Motor	1-99-100-40912/03	03	40.00	09.50			WB900X400-32/16	11.700	1
04	ID Fan Rotor	1-99-100-40912/03	01	20.00	13.50			WB700X300-32/20	15.300	1
05	APH Elements	1-99-400-40909/00	01	2.00	27.00			WB450X250-16/16	27.718	1
06	SCAPH Handling	1-99-400-40910/00	01	2.00	12.70			WB500X250-20/16	13.668	1
07	Pressure Parts Handling #	0-99-502-40371/01	02	10.00	77.00		As per UHC Girder		76.368	1
08	Water Recirc. Pump **	Will be furnished later					Lug mounted hoists with chain pulley			2

Note :

The lift shown in the table is approximate only ; depending upon head room of the hoist it may be altered.

Power supply provided for the panels shall be 415V, 3 PH, 3 wire only. Vendor to make suitable transformer arrangement inside the panel for single phase control supply.

** -(Lug mounted hoists with Chain Pulley Blocks) Two hoists are to be interconnected by a single control panel for tandom operation. Vendor shall include fixed power supply cable from power supply point to the equipment. Length - 15.00m and Switch Fuse Unit.

Hoist shall have an integral approach platform for control panel, motors & brake.

Prepared & Checked : SAURABH KUMAR SINGH

Approved : SRINIVAS ARUGULA.

Annexure - I to specification MOU/TPBHEL/HOIST -Rev.05

Under Hung Crane - Electrically Operated									
Sl. No.	**Appln.**	**Ref Drg No**	**Drg Item no**	**Cap. in T.**	**Span in m.**	**Overhang in mm**	**Runway beam size**	**Qty / Blr. in nos.**	**Remarks**
01	Pr. Parts Handling	0-99-502-40371/01	01	10.0	5.80	600/600	WB700X300-32/16	1	

DSL trailing cable system.								
Sl. No.	Appln.	Ref Drg No	Drg Item no	Type	DSL travel length in m.	Fixed cable length in M.	Qty / Blr. in nos.	Remarks
01	PA & FD Rotor	1-99-100-40911/04	02	CT$$	22.500	19.00	2	
02	PA & FD Motor	1-99-100-40911/04	04	CT$$	22.500	19.00	2	
03	ID Motor	1-99-100-40912/03	04	CT$$	60.322	20.00	1	
04	ID Rotor	1-99-100-40912/03	02	CT$$	60322	20.00	1	
05	APH Elements	1-99-400-40909/00	02	CT$$	60.00	10.00	1	
06	SCAPH Handling	1-99-400-40910/00	02	CT$$	29.800	20.00	1	
07	Economiser handling	0-99-502-40371/01	03	CT$$	54.00	45.00	1	
08	Water Recirc. Pump							

CT $$ - Cable trolley type

Prepared & Checked :

Approved :

Project :
Enquiry No.:
P.O.No. Date:

Description of the item:

The following data sheet/check list is to be filled by the vendor and submitted . This data sheet shall form part of ordering specification and shall be approved by Purchaser on acceptance of the offer. All columns are to be filled up. "Non-applicability" shall be specified. Separate *Data sheet/check list for each type of crane and TWH offered shall be submitted*

Technical Data Sheet / Check list for Electrically Operated Under Hung Crane (UHC) & Trolley With Hoist (TWH)

Ref no	Description	Spec clause no	As per spec	As quoted
Gen.1.0	**Codes & Standards**	2.2		
Gen.1.1	Electric wire rope hoists….	2.1	IS 3938	
Gen.1.2	Code of practice.cranes and hoists	2.2	IS 807	
Gen.1.3	Mild steel point hooks…	2.3	IS 2758	
Gen.1.4	Point hooks with shanks upto 160t	2.4	IS 15560	
Gen.1.5	Steel wire rope…	2.5	IS 2266	
Gen.1.6	General plan-spur & helical gears	2.6	IS 3681	
Gen.1.7	Three phase induction motor	2.7	IS 325	
Gen.1.8	PVC insulator cables…	2.8	IS 694	
Gen.1.9	Degrees of protection-elec. M/c..	2.9	IS 4691	
Gen.1.10	Weldable structural steel	2.10	IS 2062	
Gen.1.11	Code of practice.metal arc welding..	2.11	IS 816	
Gen.1.12	Ready mixed paint…	2.12	IS 2074	
Gen.1.13	Enamel synthetic ..coat/finish…	2.13	IS 2932	
Gen.1.14	Code of practice .. Electrical..crane	2.14	IS 3177	
Gen.1.15	Spec for..switch gear & control gear	2.15	IS 13947-Part1	
Gen.1.16	Code of practice .. For welding…	2.16	IS 1024	
Gen.1.17	Carbon steel forging ….	2.17	IS 2004	
Gen.1.18	Round steel wire for ropes	2.18	IS 1835	
Gen.1.19	Elastomer insulated cables….	2.19	IS 9968-Part-1	
CR1.0	**Under hung crane-UHC**			
CR1.1	Capacity - in tons	Annexure-I		
CR1.2	Span - in m.	Annexure-I		
CR1.3	Overhang on either side - in mm.	Annexure-I		
CR1.4	Operating floor - in m.	Annexure-I		
CR1.5	Service class of crane/hoist	2.4	Class 2	
CR1.6	All welding	2.4	IS 1024	
CR1.7	Welder qualification	2.4	AWS D1.1/ASME section IX	
CR2.0	**Wheels-UHC**	2.4.5		
CR2.1	Wheel shape to match with runway beam	2.4.5	Vendor to confirm	
CR2.2	Wheel material	2.4.5	Forged/cast steel	
CR2.3	Wheel diameter - in mm.	2.4.5	Vendor to specify	
CR2.4	Wheel base - in mm.	2.4.5	Vendor to specify	
CR2.5	BHN	2.4.5	200 BHN Max.	
CR3.0	**Crane girder-UHC**	2.4.12		
CR3.1	Section	2.4.12	Rolled section	

Vendor Name :
Signature :
Date :

Project :
Enquiry No.:
P.O.No. Date:

Description of the item:

Ref no	Description	Spec clause no	As per spec	As quoted
CR3.2	Size	2.4.12	Vendor to specify	
CR3.3	Material	2.4.12	Vendor to specify	
CR3.4	Camber / Deflection	2.4.12	Span/1000mm	
CR3.5	Allowable bend	2.4.12	1mm/m	
CR3.6	Maximum bend	2.4.12	6mm	
CR3.7	Provision of buffers	2.4.12.1	Vendor to specify	
CR3.8	Provision of anti tilt / topple arrangement	2.4.12.2	Vendor to specify	
CR4.0	**Wheel bearing-UHC**	2.4.7		
CR4.1	Type	2.4.7	Vendor to specify	
CR4.2	Size	2.4.7	Vendor to specify	
CR4.3	Make	2.4.7	FAG/SKF/Tata/NBC	
CR5.0	**Crane speed-UHC**			
CR5.1	Maximum speed in m/min.		Vendor to specify	
CR5.2	Minimum speed in m/min		Vendor to specify	
CR6.0	**Weight of the crane - in Kgs.**		Vendor to specify	
CR7.0	**Dimensions of crane**	Vendor drawing	Vendor to specify	
CR8.0	**Limit switch-UHC-LT&CT**	2.12.4		
CR8.1	Type	2.12.4	Heavy duty	
CR8.2	Make	2.12.4	BCH/Omron/Nucon/ Festo/ Siemens/ Kaycee/ EMM/ SOC	
CR8.3	Rating	2.12.4	Vendor to specify	
CR9.0	**Crane Motors-UHC-LT**	2.6.0	Conform to IS 325	
CR9.1	Motor Rating		Vendor to specify	
CR9.2	Motor Type		Vendor to specify	
CR9.3	Motor Make		Vendor to specify	
CR9.4	Duty factor	2.6.4	40% CDF	
CR9.5	Duty cycle	2.6.4	Continuous/S3/S4	
CR9.6	Enclosure	2.6.14	IP 55	
CR9.7	Power supply (equipment)		415 VAC; 50Hz	
CR9.8	Quantity		Vendor to specify	
	Crane Motors-UHC-CT	2.6.0	Conform to IS 325	
CR9.9	Motor Rating		Vendor to specify	
CR9.10	Motor Type		Vendor to specify	
CR9.11	Motor Make		Vendor to specify	
CR9.12	Duty factor	2.6.4	40% CDF	
CR9.13	Duty cycle	2.6.4	Continuous/S3/S4	
CR9.14	Enclosure	2.6.14	IP 55	
CR9.15	Power supply (equipment)		415 VAC; 50Hz	
CR9.16	Quantity		Vendor to specify	

Vendor Name :
Signature :
Date :

Project :
Enquiry No.:
P.O.No. Date:

Description of the item:

Ref no	Description	Spec clause no	As per spec	As quoted
CR10.0	**End stopper-UHC**			
CR10.1	Provided		Vendor to specify	
CR10.2	Type		Vendor to specify	
CR11.0	Clearance between Runway beam bottom & Crane girder top - in mm.		Vendor to specify	
HO1.0	**Trolley With Hoist(TWH)**			
HO1.1	Capacity - in tons	Annexure-I		
HO1.2	Lift - in m.	Annexure-I		
HO1.3	Headroom - in mm.	Annexure-I		
HO1.4	Approximate Hoist dimension	Vendor drawing	Vendor to specify	
HO1.5	Operating floor - in m.	BHEL drawing	Vendor to confirm	
HO1.6	Approximate weight - in Kgs.		Vendor to specify	
HO1.7	Service class of crane/hoist	2.4	Class 2	
HO1.8	All welding	2.4	IS 1024	
HO1.9	Welder qualification	2.4	AWS D1.1/ASME section IX	
HO2.0	**Hoist speed-TWH**			
HO2.1	Maximum speed - in m/min		Vendor to specify	
HO2.2	Minimum speed - in m/min		Vendor to specify	
HO3.0	**Cross travel speed-TWH**			
HO3.1	Maximum speed - in m/min		Vendor to specify	
HO3.2	Minimum speed - in m/min		Vendor to specify	
HO4.0	**Trolley -TWH**	2.4.9		
HO4.1	Type	4 - wheeled-Min	Vendor to specify	
HO4.2	Design to suit monorail size		Vendor to confirm	
HO5.0	**Trolley wheels-TWH**	2.4.5		
HO5.1	Type	3.1.5	Spur geared	
HO5.2	Wheel diameter - in mm.	3.1.5	Vendor to specify	
HO5.3	Material of construction	3.1.5	Cast / forged steel	
HO5.4	Hardness	3.1.5	200 BHN Max.	
HO5.5	Quantity	3.1.5	Vendor to specify	
HO6.0	**Wire rope-TWH**	2.4.2		
HO6.1	Code	2.4.2	IS 2266 / IS 2365	
HO6.2	Rope construction	2.4.2	6 strands of 37/36	
HO6.3	Rope diameter - in mm.	2.4.2	Vendor to specify	
HO6.4	Number of falls	2.4.2	Vendor to specify	
HO6.5	Ultimate tensile strength	2.4.2	Vendor to specify	
HO6.6	Whether wire rope has sufficient extra length to retain two full wraps on the drum	Yes / No	Vendor to confirm	
HO6.7	Rope material	2.4.2	Galvanised	
HO6.8	Core material	2.4.2	Vendor to specify	

Vendor Name :
Signature :
Date :

Project :
Enquiry No.:
P.O.No. Date:

Description of the item:

Ref no	Description	Spec clause no	As per spec	As quoted
HO6.9	Breaking load	2.4.2	5 times SWL	
HO7.0	**Rope drum-TWH**	2.4.3		
HO7.1	Diameter - in mm.	2.4.3	Vendor to specify	
HO7.2	Material of construction	2.4.3	Cast / weld steel	
HO7.3	Construction	2.4.3	Seamless/fabricated	
HO8.0	**Hook-TWH**	2.4.1		
HO8.1	Code	2.4.1.1	IS 15560	
HO8.2	Material (Forged)	2.4.1.6	IS 2004-35C8	
HO8.3	Minimum tensile strength	2.4.1.6	50-62 kg/mm ²	
HO8.4	Capacity - in tons	2.4.1	Vendor to specify	
HO8.5	Safety latch provided in the hook	2.4.1.2	Vendor to confirm	
HO8.6	Bearing in the swivel hook	2.4.1.2	Thrust bearing	
HO8.7	Locking arrangement of hook	2.4.1.5	Forged lug/clamp latch	
HO8.8	Examination	2.4.1.7	MPI / LPI	
HO8.9	Hooks > 5 ton capacity	2.4.1.7	UT	
HO8.10	Proof load test as per	2.4.1.7	IS 15560	
HO9.0	**Bearing for Cross Travel-TWH**	2.4.7		
HO9.1	Type	2.4.7	Vendor to specify	
HO9.2	Size	2.4.7	Vendor to specify	
HO9.3	Make	2.4.7	FAG/SKF/Tata/NBC	
HO10.0	**Bearing for Hoist-TWH**	3.1.7		
HO10.1	Type	3.1.7	Vendor to specify	
HO10.2	Size	3.1.7	Vendor to specify	
HO10.3	Make	3.1.7	FAG/SKF/Tata/NBC	
HO11.0	**Hoist Motors - TWH**	2.6.0	Conform to IS 325	
HO11.1	Motor Rating		Vendor to specify	
HO11.2	motor Type		Vendor to specify	
HO11.3	Motor Make		Vendor to specify	
HO11.4	Duty factor	2.6.4	40% CDF	
HO11.5	Duty cycle	2.6.4	Continuous/S3/S4	
HO11.6	Enclosure	2.6.14	IP 55	
HO11.7	Power supply (equipment)		415 VAC; 50Hz	
HO11.8	Quantity			
HO12.0	**Cross travel motor-TWH**	2.6.0	Conform to IS 325	
HO12.1	Motor Rating		Vendor to specify	
HO12.2	motor Type		Vendor to specify	
HO12.3	Motor Make		Vendor to specify	
HO12.4	Duty factor	2.6.4	40% CDF	
HO12.5	Duty cycle	2.6.4	Continuous/S3/S4	
HO12.6	Enclosure	2.6.14	IP 55	
HO12.7	Power supply (equipment)		415 VAC; 50Hz	
HO12.8	Quantity			

Vendor Name :
Signature :
Date :

Project :
Enquiry No.:
P.O.No. Date:

Description of the item:

Ref no	Description	Spec clause no	As per spec	As quoted
HO13.0	**Limit switch-Hoist**	2.12.4		
HO13.1	Type	2.12.4	Heavy duty	
HO13.2	Make	2.12.4	BCH/Omron/Nucon/ Festo/ Siemens/ Kaycee/ EMM/ SOC	
HO13.3	Rating	2.12.4	Vendor to specify	
HO14.0	**Limit switch for CT-TWH**	2.12.4		
HO14.1	Type	2.12.4	Heavy duty	
HO14.2	Make	2.12.4	BCH/Omron/Nucon/ Festo/ Siemens/ Kaycee/ EMM/ SOC	
HO14.3	Rating	2.12.4	Vendor to specify	
HO15	Approach platform at hoist for panel, motor & brake		Vendor to confirm	
DSL.1.0	**DSL system for Long Travel**	2.5		
DSL.1.1	Travel length - Wire / Cable trolley	Annexure-I		
DSL.1.2	Type	Cable trolley/Taut wire loop		
DSL.1.3	Cable length - Fixed cable		Vendor to specify	
DSL.1.4	Cable length - Tailing cable		Vendor to specify	
DSL.1.5	Cable size & rating		Vendor to specify	
DSL.1.6	***Cable tolley type***	2.5.1		
DSL.1.6.1	Type of trolley	2.5.1.1.b	4 - wheeled type	
DSL.1.6.2	Material of construction	2.5.1.1.b	Vendor to specify	
DSL.1.6.3	Diameter of trolley wheel	2.5.1.1.b	Min. dia 40 mm	
DSL.1.6.4	Type of Bearing used		Double seal roller/ball	
DSL.1.6.5	Make of bearing used		FAG/SKF/Tata/NBC	
DSL.1.6.6	Trolley track	2.5.1.1.a	Tee track/I-Beam	
DSL.1.6.7	Loop size	2.5.1.1.b	Vendor to specify	
DSL.1.6.8	Link chain size / diameter	2.5.1.1.b	Vendor to specify	
DSL.1.6.9	Pitch between two cable trolleys	2.5.1.1.b	Vendor to specify	
DSL.1.6.10	Supply of Earthing conductor	2.5.1.1.b	Vendor to confirm	
DSL.1.6.11	Provision of suitable supports	2.5.1.1.b	Vendor to confirm	
DSL.1.6.12	Arrangement drawing with the offer	2.5.1.1.b	Vendor to confirm	
DSL.1.7	***Taut wire loop type***	2.5.2		
DSL.1.7.1	Bracket size	2.5.2.1a	Vendor to specify	
DSL.1.7.2	Bracket material	2.5.2.1a	Vendor to specify	
DSL.1.7.3	Provision of end hook	2.5.2.1b	Vendor to confirm	
DSL.1.7.4	Reel insulator	2.5.2.1c	Ceramic	
DSL.1.7.5	Tieing arrangement	2.5.2.1c	Nylon rope/leather belt	
DSL.1.7.6	Steel wire rope	2.5.2.1d	IS 2266/Mini 6mm dia	
DSL.2.0	**DSL system for Cross Travel**	2.5		
DSL.2.1	Travel length - Wire / Cable trolley	Annexure-I		

Vendor Name :
Signature :
Date :

Project :
Enquiry No.:
P.O.No. Date:

Description of the item:

Ref no	Description	Spec clause no	As per spec	As quoted
DSL.2.2	Type	e trolley/Taut wire loop		
DSL.2.3	Cable length - Fixed cable			
DSL.2.4	Cable length - Tailing cable			
DSL.2.5	Cable size & rating			
DSL.2.6	***Cable tolley type***	2.5.1		
DSL.2.6.1	Type of trolley	2.5.1.1.b	4 - wheeled type	
DSL.2.6.2	Material of construction	2.5.1.1.b	Vendor to specify	
DSL.2.6.3	Diameter of trolley wheel	2.5.1.1.b	Mini dia 40 mm	
DSL.2.6.4	Type of Bearing used		Double seal roller/ball	
DSL.2.6.5	Make of bearing used		FAG/SKF/Tata/NBC	
DSL.2.6.6	Trolley track	2.5.1.1.a	Tee track/Auxiliary girder	
DSL.2.6.7	Loop size	2.5.1.1.b	Vendor to specify	
DSL.2.6.8	Link chain size / diameter	2.5.1.1.b	Vendor to specify	
DSL.2.6.9	Pitch between two cable trolleys	2.5.1.1.b	Vendor to specify	
DSL.2.6.10	Supply of Earthing conductor	2.5.1.1.b	Vendor to confirm	
DSL.2.6.11	Provision of suitable supports	2.5.1.1.b	Vendor to confirm	
DSL.2.6.12	Arrangement drawing with the offer	2.5.1.1.b	Vendor to confirm	
DSL.2.7	***Taut wire loop type***	2.5.2		
DSL.2.7.1	Bracket size	2.5.2.1a	Vendor to specify	
DSL.2.7.2	Bracket material	2.5.2.1a	Vendor to specify	
DSL.2.7.3	Provision of end hook	2.5.2.1b	Vendor to confirm	
DSL.2.7.4	Reel insulator	2.5.2.1c	Ceramic	
DSL.2.7.5	Tieing arrangement	2.5.2.1c	Nylon rope/leather belt	
DSL.2.7.6	Steel wire rope	2.5.2.1d	IS 2266/Mini 6mm dia	
COM.0.0	**Common to UHC & TWH**			
COM.I.1	**Brakes**	2.4.8		
COM.I.2	Type	2.4.8	ElectroMech friction shoe type/ Disc type/ Electromagnetic disc type/ Electro hydraulic thruster brake	
COM.I.3	Shoe Material	2.4.8	Vendor to specify	
COM.I.4	Make	2.4.8	Vendor to specify	
COM.I.5	Slip to speed	2.4.8	Vendor to specify	
COM.2.0	**Shaft**	2.4.6		
COM.2.1	Material	2.4.6	Vendor to specify	
COM.2.2	Hardness	2.4.6	175-250 BHN	
COM.2.3	Tensile strength		60 kg/mm ²	
COM.2.4	UT test	Dia>50 mm	ASMEVIII/Div 2	
COM.3.0	**Gears / Pinions**	2.4.4		
COM.3.1	Material	2.4.4	IS 3681/ BS 970	
COM.3.2	Hardness-Pinion (LT&CT)	2.4.4	250 BHN min.	
COM.3.3	Hardness-gears (LT&CT)	2.4.4	215 BHN min.	
COM.3.4	Hardness-Pinion (hoist)	2.4.4	285-300 BHN	

Vendor Name :
Signature :
Date :

Project :
Enquiry No.:
P.O.No. Date:

Description of the item:

Ref no	Description	Spec clause no	As per spec	As quoted
COM.3.5	Hardness-gears (hoist)	2.4.4	250 -265BHN	
COM.3.6	BHN difference - gear < pinion	2.4.4	35 BHN Min.	
COM.3.7	Type (for LT & CT)	2.4.4	Spur/Helical	
COM.3.8	Type (for hoist)	2.4.4	Spur/Helical	
COM.3.9	Lubricant details	2.4.4	Vendor to specify	
COM.3.10	Trade name	2.4.4	Vendor to specify	
COM.3.11	Quantity/Peiodicity	2.4.4	Vendor to specify	
COM.3.12	LPI/MPT tests	2.4.4	Vendor to specify	
COM.4.0	**Fasteners**	2.5.2.1g		
COM.4.1	Grade	2.5.2.1g	Precision/high tensile	
COM.4.2	Galvanising	2.5.2.1g	As per IS	
COM.4.3	Special bolts/fasteners	2.5.2.1g	Details in drawing	
COM.5.0	**Controls/Interlocks-UHC&TWH**	2.7.0		
COM.5.1	Type of control cabinet	2.7.0	Wall mounting	
COM.5.2	Location of control cabinet	2.7.0	Vendor to specify	
COM.5.3	Control power supply	2.7.0	110VAC/50Hz	
COM.5.4	Control cabinet & Pendent enclosure	2.7.0	IP 55 as per IS13947	
	Push Button	2.9.3	Siemens/ L&T/ GE/ Telemechanic/ BCH/ Technic	
COM.5.5	Control wiring diagram	2.7.0	To be enclosed	
COM.5.6	Relays	2.12.1	Siemens/BCH/L&T/ GE/Telemechanic	
COM.5.7	Tranformers	2.12.2	SE/Kappa/Ind coil/ JE/ Vikas/ Logicstat	
COM.5.8	Motors	2.12.3	NGEF/Kirloskar / Siemens/Crompton greaves/ Bharat Bijlee/ Autolec/ GEC/ Alstom	
COM.5.9	Limit switches	2.12.4	BCH/Omron/Nucon/ Festo/ Siemens/ Kaycee/ EMM/ SOC	
COM.5.10	Power & control cable	2.12.5	CMI Ltd/Delton cables/ Fixwell/ Pushincords/ Asian cablews/ Cable corporation of India/ Finolex/ Incab/Universal/ PolycabCCI	
COM.5.11	Cabling	2.10		
COM.5.12	Code	2.10	IS 694 / IS 9968	
COM.5.13	Power cable	2.10	Copper PVC flexible / Elastomer insulated flexible	
COM.5.14	Power cable - conductor size	2.10	Vendor to specify	
COM.5.15	Control cable	2.10	Armoured	

Vendor Name :
Signature :
Date :

Project :
Enquiry No.:
P.O.No. Date:

Description of the item:

Ref no	Description	Spec clause no	As per spec	As quoted
COM.5.16	Control cable - conductor size	2.10	Vendor to specify	
COM.5.17	Provision of spare cores	2.10	20 % spare cores	
COM.5.18	Internal wiring	2.10	Vendor to confirm	
COM.5.19	Painting	2.10	Vendor to confirm	
COM.6.0	**Painting**	4.18	Annexure II	
COM.6.1	Vendor's Compliance of painting		Vendor to confirm	
COM.6.2	Colour scheme		Vendor to confirm	
COM.6.3	Vendor's Compliance of colour scheme		Vendor to confirm	
COM.7.0	**Packing**	4.0		
COM.7.1	Vendor's Compliance of packing		Vendor to confirm	
COM.8.0	**Inspection & Testing**	4.0		
COM.8.1	Vendor's Compliance of above		Vendor to confirm	
COM.9.0	Load test at site /vendor supervision	5.9.2	Vendor to confirm	
COM.10.0	**Drawings**	3.3.9		
COM.10.1	Drawings shall be made in AUTOCAD	3.3.9	Vendor to confirm	
COM.10.2	Drg BOM to match with packing slip	3.3.9	Vendor to confirm	
COM.10.3	Drawing CD to be submitted	3.3.9	Vendor to confirm	
COM.11.0	**Guarantee**	9.0	18 / 24 months	

DATA SHEET - AC MOTORS (Non-Flame proof)

Attach separate data sheet for each motor under supply

MO.1	Application	
MO.2	Manufacturer	
MO.3	Type, frame size & degree of protection	
MO.4	Rated output in Kw & rated speed	
MO.5	Full load current	
MO.6	Full load efficiency & power factor	
MO.6.1	Duty cycle	
MO.7	Rated torque	
MO.7.1	Starting current	
MO.8	Starting torque in % of full load torque	
MO.9	Pull up torque in % of full load torque	
MO.10	Pull out torque in % of full load torque	
MO.11	No load starting time	
MO.12	Stator winding connection	
MO.13	Type & no. of terminals brought out	
MO.14	Resistance / phase	
MO.15	Qty. & power consumption of space heaters	

Vendor Name :
Signature :
Date :

Project :
Enquiry No.:
P.O.No. Date:

Description of the item:

Ref no	Description	Spec clause no	As per spec	As quoted
MO.16	Gland size for space heaters			
MO.17	Cable entry			
MO.18	Cable gland - Double compression			
MO.19	GD^2 of motor			
MO.20	Total weight of motor			
MO.21	Anticipated bearing life			
MO.22	Method of connection to driven equipment			
Drawings/Documents to be furnished along with the offer				
D.1.0	Drawings/documents	6.1.0	3 sets of each items	
D.1.1	GA / Assy. of Cranes	3.1.1	Vendor drawing number	
D.1.2	GA / Assy of Hoists	3.1.1	Vendor drawing number	
D.1.3	GA / Assy for DSL system	3.1.1	Vendor drawing number	
D.1.4	Electrical Wiring / Circuit diagram	3.1.2	Vendor drawing number	
D.1.5	Technical specification of system	3.1.6	Vendor to specify	
D.1.6	Exclusion list	3.1.8	Vendor to specify	
Drawings/Documents to be furnished after award of contract				
(Vendor to confirm the submission of the following documents)				
D.2.0	Drawings/documents	3.2		
D.2.1	Quality plan for Purchaser's approval	3.2.1		
D.2.2.0	Dimensional drawing with BOM for:	3.2.2	Purchaser's approval	
D.2.2.1	Under hung crane		Purchaser's approval	
D.2.2.2	Trolley with Hoist		Purchaser's approval	
D.2.2.3	Down shop leads		Purchaser's approval	
D.2.2.4	Cable trolley		Purchaser's approval	
D.2.2.5	Control panel		Purchaser's approval	
D.2.2.6	Wiring diagram		Purchaser's approval	
D.2.3	Data sheet for cranes & hoists		Purchaser's approval	
D.2.4	Calculation for the following:	3.2.4		
D.2.4.1	Hoist & Travel motor power	3.2.4.1	Purchaser's review	
D.2.4.2	Brake torque for each drive	3.2.4.2	Purchaser's review	
D.2.4.3	Brake selection for each drive	3.2.4.2	Purchaser's review	
D.2.4.4	Main hoist rope selection	3.2.4.3	Purchaser's review	
D.2.4.5	CT/LT wheel load details	3.2.4.4	Purchaser's review	
D.2.4.6	CT/LT wheel load dia selection	3.2.4.4	Purchaser's review	
D.2.5	Details of gear box		Purchaser's review	
D.2.6	Details of Hooks		Purchaser's review	
D.2.7	Details of couplings		Purchaser's review	
D.2.8	Performance certificate		Purchaser's record	
D.2.9	O&M manual to contain the following:	3.3.9.3		
D.2.9.1	Storage details	3.3.9.4	Vendor to confirm	
	Installation procedure	3.3.9.4	Vendor to confirm	
	Erection procedure	3.3.9.4	Vendor to confirm	

Vendor Name :
Signature :
Date :

Project :
Enquiry No.:
P.O.No. Date:

Description of the item:

Ref no	Description	Spec clause no	As per spec	As quoted
	Drawings	3.3.9.4	Vendor to confirm	
	Lubrication schedule	3.3.9.4	Vendor to confirm	
	Spares list	3.3.9.4	Vendor to confirm	
	Motor data sheet	3.3.9.4	Vendor to confirm	
	Operation & trouble shooting	3.3.9.4	Vendor to confirm	
	No of copies	3.3.9.4	26 copies	
	CDs copied with drawings	3.3.9.5	Vendor to confirm	
Test certificates to furnished along with the supply				
(Vendor to confirm the submission of the following documents)				
TC.1.0	**Test certificates**	3.3		
TC.1.1	Physical/Chemical,NDE,Hardness	3.3.1	Vendor to confirm	
TC.1.1.1	Trolley wheel	3.3.1	Vendor to confirm	
TC.1.1.2	Crane wheel	3.3.1	Vendor to confirm	
TC.1.1.3	Wire rope	3.3.1	Vendor to confirm	
TC.1.1.4	Pulley	3.3.1	Vendor to confirm	
TC.1.1.5	Hooks	3.3.1	Vendor to confirm	
TC.1.1.6	Gears & Pinions	3.3.1	Vendor to confirm	
TC.1.1.7	Shafts	3.3.1	Vendor to confirm	
TC.1.2	TWHoist load test	4.3	Vendor to confirm	
TC.1.3	Brake test for LT/CT/Hoist	4.4	Vendor to confirm	
TC.1.4	Testing of torque/limit switch	4.5	Vendor to confirm	
TC.1.5	Over load relay test	4.6	Vendor to confirm	
TC.1.6	Alignment test	4.7	Vendor to confirm	
TC.1.7	Crane load test	4.11	Vendor to confirm	
TC.1.8	Hook type & load test	4.13.2	Vendor to confirm	
TC.1.9	Deflection test for crane	4.14.2	Vendor to confirm	
TC.1.10	Cross travel movement test	4.9	Vendor to confirm	
TC.1.11	Dimensional checks		As per approved QP	
TC.1.12	Wire rope load test	4.2	Vendor to confirm	
TC.1.13	NDT as per Quality plan & Specification		Vendor to confirm	
TC.1.14	Material test certificates		Vendor to confirm	
TC.1.15	Insulator test on electrical circuit	4.16.1	Vendor to confirm	
TC.1.16	Functional test/power&control circuit	4.16.3	Vendor to confirm	
TC.1.17	High volt test on electrical circuit	4.16.4	Vendor to confirm	
TC.1.18	Motor routine, type & weather protection TCs.	4.16.5	Vendor to confirm	
TC.1.19	Control panel & Pendent I R, HV & physical inspection record and weather protection TC.	4.16.7	Vendor to confirm	

Vendor Name :
Signature :
Date :

DATA SHEET FOR HOISTS

Project :

CUST NO:

Sl. No.	APPLICATION	FD & PA FAN -MOTOR HANDLING	FD & PA FAN -ROTOR HANDLING	ID FAN ROTOR HANDLING	ID FAN MOTOR HANDLING	WATER CIRCULATING PUMP HANDLING		APH Elements handling	SCAPH HANDLING	FOPH HANDLING	LTSH & ECO. Coil handling			
1.0	Operation	Electric	Electric	Electric	Electric	Electric	Manual	Electric	Electric	Electric	Electric	Manual CPB	Manual TWH	Ratchet Lever
2.0	VENDOR NAME													
3.0	MODEL No.													
4.0	TOTAL No. OFF per BOILER													
5.0	CAPACITY (T)													
6.0	LIFT (MTR)													
7.0	HEAD ROOM(MM)													
8.0	HOIST MOTOR RATING													
9.0	C.T. MOTOR RATING													
10.0	POWER SUPPLY RATING FOR EQPT.													
11.0	POWER SUPPLY RATING FOR CONTROLS													
12.0	DSL SYSTEM TYPE													
13.0	TRAVEL LENGTH+ FIXED CABLE (MTR)													
14.0	SWITCH FUSE UNIT													
15.0	FUSE RATING FOR HOIST MOTOR													
16.0	FUSE RATING FOR CT MOTOR													

Vendor's Name
Signature Seal
with date

Annexure – IV Hoist Motor Data Sheet

MOTOR DATASHEET		
PROJECT		
PO REFERENCE		
SNO	**DESCRIPTION**	**VALUE**
A.	**GENERAL**	
1.	Manufacturer & Country of origin.	
2.	Equipment driven by motor	
3.	Motor type	
4.	Quantity	
B.	**DESIGN AND PERFORMANCE DATA**	
1.	Frame size	
2.	Type of duty	
3.	Type of enclosure /Method of cooling/ Degree of	
4.	Applicable standard to which motor generally	
5.	Efficiency class	
6.	Type of mounting	
7.	Direction of rotation as viewed from DE END	
8.	Standard continuous rating at 40 deg. C. ambient temp. as per Indian Standard (KW)	
9.	Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)	
10.	Maximum continuous load demand of driven	
11.	Rated Voltage (volts)	
12.	Permissible variation of :	
	a. Voltage (Volts)	
	b. Frequency (Hz)	
	c. Combined voltage and frequency	
13.	Rated speed at rated voltage and frequency(RPM)	
14.	At rated Voltage and frequency:	

Vendor's Name
Signature & Seal
with date

5.0 PROJECT RELATED INFORMATIONS

Project Name : UDANGUDI 2X660MW (1729 &1730)

Enquiry No. / P.O.No. :

Sl.No.	Description	Specification	Vendor Confirmation Yes / No
5.1	Hoist, Crane & DSL Parameter	Refer Annexure-I	
5.2	Painting schedule & Special requirements	Refer Customer approved painting schedule (if applicable)	
5.3	Power & Control cable code	IS 1554 part(1)	
5.3.1	Power supply	415V,AC,3PH,50Hz	
5.3.2	Control supply	110V,AC,50Hz	
5.4	Commissioning Spares	Vendor to specify	
5.5	2 Years recommended spares	Vendor to specify	
5.6	Data Sheet	(Annexure-III) Vendor to fill and submit	
5.7	G.A. Drawings (for hoists, cranes, DSL, Wiring diagram, pendant etc.)	Vendor to submit	
5.8	Motor Data Sheet	(Annexure –IV) Vendor to fill and submit	
5.9	Special Project requirement	As per attached customer specification Volume II Sub Section 2.19.0(Cranes and Hoist.	

Note: 1. Deviation in the above requirements shall reject the offer.
2. If required, please add more sheets.

VOLUME II

SUB-SECTION - 2.19.0

CRANES & HOISTS

1.0.0 GENERAL

This part of the specification covers the requirements for Cranes and Hoists.

This section of the specification shall be read in conjunction with other sections of the specification as appropriate and the equipment offered shall meet the requirements as spelt out therein. The system shall comprise of cranes and hoists.

2.0.0 SCOPE OF SUPPLY

The scope of supply shall have to meet all the requirements to make the system complete as per specification and for satisfactory performance guarantee of the complete crane and hoist.

Crane and Hoist shall be provided in the following area considering the design requirement of crane and hoist.

~~Crane:~~

~~a) Two number of EOT crane for Power House building.~~
~~b) GIS building~~
~~c) BFP and its auxiliaries and its drives~~
~~d) CW pump house~~
~~e) Sea water intake pump house~~
~~f) Screens and gates~~
~~g) Desalinated water pump house~~
~~h) Filtered water pump house~~
~~i) Sea water outfall pump house~~
~~j) Fuel oil pump house (unloading and forwarding)~~
~~k) Air Compressor room (Instrument and service air)~~
~~l) Ash Slurry pump & ash water pump house~~
~~m) Recovery water pump house~~
~~n) Conveying air compressor room~~
~~o) Ahs clarified water tank and pump house~~
~~p) Sea water tank and ash slurry pump house.~~
~~q) One number of 15T EOT crane for Store~~
~~r) One number of 10T EOT crane for Workshop~~
~~s) DG set building~~
~~t) Any other areas as applicable~~

Hoist :

~~a) Boiler area(ID fan, FD fan, PA fan, Boiler circulation pump, coal feeder area, Air preheater, seal air fan)~~
~~b) ESP~~
~~c) Bottom ash silo, fly ash silo and mill reject ash silo~~
~~d) Mill reject compressor~~
~~e) Power house building(Vacuum pumps, CEP, DMCW pumps, ACW pumps, butterfly valves at condenser inlet and outlet, condenser water box, Lube oil unit, control oil unit and central lube oil system)~~
~~f) Electro Chlorination building~~
~~g) Desalination building~~

~~h) Gravity filtered pipe gallery~~
~~i) Coal Handling System (Crusher House, Transfer towers, Head/Tail end of conveyors, Bunker building, flap gate, flow divider, junction tower, ERH, etc.)~~
~~j) Water treatment plant , Effluent treatment plant and Sewage treatment plant~~
~~k) Sea water intake pump house stop-log gates and screens.~~
~~l) HVAC Building.~~
~~m) AC plant,~~
~~n) Fuel Oil Pump House,~~
~~o) ETP~~
~~p) Air Washer Room~~
~~q) Chemical house~~
~~r) Hydrogen generation building~~
~~s) Any other areas as applicable~~

2.1.0 Crane

~~Crane shall be provided complete with all accessories as specified under, but not limited to the following:~~

~~a) Box type steel bridge girder complete with bridge rails, end stoppers, walkway platforms across the span of either side of crane and access ladders for double girder crane, (cabin for TG hall EOT crane, etc~~

~~b) End carriage complete with minimum two (2) nos. of wheels for each end carriage and access ladders from gantry platforms, spring buffers etc.~~

~~c) Service cage with all protections and access ladder, for maintenance of DSL's.~~

~~d) Crab (trolley) with wheels and drive equipment for hoists and trolley complete with motors, gear reducers with Suitable arrangement for collection of oil spillage, brakes, limit switches, couplings, rope drums, wire ropes, main hook, auxiliary hook, end stoppers etc.~~

~~e) Set of crane longitudinal drive equipment complete with motor, gear reducers with Suitable arrangement for collection of oil spillage, brakes, shaft bearings, gear pinions, and limit switches.~~

~~f) EOT crane runway gantry rails complete with fixtures comprising of fixing clamps (machined to suit rail flange contour), bolts, nuts etc for effective crane longitudinal runway length, end stoppers specified.~~

~~g) Brakes for all motion, Anti-collision switch for TG hall EOT crane and limit switch for over hoisting/lowering, CT and LT motion.~~

~~h) Runway conductors & bridge cross conductors with accessories.~~

~~i) Crane shall be operated through Pendant Push Button station. TG hall EOT crane shall be operated from cabin as well as Pendant Push Button station.~~

~~j) Crane buffer stops shall include the buffers on the crane itself. The stoppers to be fixed on the building frame and wheel stoppers shall be provided at either end of the crane runway.~~

~~k) Lifting beam, loose slings and cradle shall be provided as required.~~

l) The complete electrical equipment basically including:

- Load break changeover switch mounted on the building structure.

- Cabling between the load break switch and the down shop leads.
- Down shop leads and current collector for crane.
- Load break switch on the crane bridge walkway
- Protective and control switch gear
- Motors
- Festoon cable system for crab
- Master controllers
- Pendent controller (where specified)
- Wireless remote control (where specified)
- Indicating lamps, push buttons.
- Lighting panel, lighting fixtures, Cabin fan, light, alarm/bell, socket outlets etc.
- All power and control cables.
- Cable trays & supports, Conduits, Cable glands, lugs & clamps etc.
- Crane earthing system
- Variable Voltage and Variable Frequency (VVVF) control for speed control of crane motors.
- Electronic Anti-collision device

2.2.0 Hoist

a) Electrically operated trolley suspended, mono girder type hoists complete with drive motor.
b) Hoisting cable, hoisting block and hooks complete with drive motor.
c) Limit switches to prevent over travel while hoisting and lowering of the hook.
d) Limit switches to prevent over travel of hoist assembly at both ends.
e) Runway conductors for feeding power to trolley assembly.
f) Pendent control stations suspended from hoist.
g) Monorails for the travelling of hoist assembly.
h) Brakes for hoist and trolley motion.
i) Protective and control switch gear
j) Motors
k) All power and control cables including Festoon cable system
l) Conduits, Cable glands, lugs & clamps, earthing etc.

2.3.0 Lifting tackles

The crane installations shall be supplied with all the ropes (slings), lifting beam (if required), chains, shackles etc. needed for maintenance of the plant equipment/component.

The minimum scope of supply per handling equipment (crane & hoist) for each lifting tackle includes the following items:

- Two (2) nos. single ropes each with 2 eyes at the ends, each rope 2 m long
- Two(2) nos. single ropes each with 2 eyes at the ends, each rope 4 m long
- Four (4) nos. shackles.

The load-bearing capacity of the ropes and shackles must be suitable for the relevant crane & hoist.

The maximum tension in the rope shall not exceed 1/8 of the calculated braking capacity of the rope. The ropes shall be of the stranded type, and galvanized wires shall be used.

The eyes of the single ropes must be secured with compression fittings. The length of the eyes must be at least 15 times the nominal diameter of the rope.

In special cases, where safe lifting of the relevant component is not certain, specially-made devices shall be provided. At least two (2) of these shall be provided in each individual case.

For each installation a list shall be submitted, showing the number, type, nominal load-carrying capacity and strength characteristics of the materials used. In addition, factory and acceptance certificates shall be submitted for all ropes (slings) and materials.

3.0.0 DESIGN REQUIREMENTS

~~a) Cranes & hoist shall be provided in the areas where handling of the equipment /component to be lifted for maintenance weighing above 300 kg..~~

b) ~~The cranes and hoist designed to operate at 100% safe working load and subjected to over load test at 125% of rated load.~~

c) ~~The Turbine Building EOT crane is required to handle the heaviest component other than the generator stator. The main hoist is used for maintenance of the main steam turbine and electric generators, generator coolers, condensate pumps, lube oil units and other equipment located in power house building. The auxiliary hoist is used to handle smaller components more rapidly.~~

d) Cranes and hoist shall be designed considering the ambient temperature of 50 °C.

e) The cranes and hoist would be designed considering for hazardous area or non hazardous classification as required.

f) Crane and hoist control shall be from Variable Voltage and Variable Frequency (VVVF) drive. Creep speed shall be achieved through VVVF drive for cranes.

g) The hoists shall be provided with flexible trailing cable system.

h) Manual Hoists shall be operated at floor level by means of endless chain.

i) Specification for the gantry/semi gantry crane shall be referred from the single or double girder crane (based on the type of crane)

j) ~~The CW Pump house EOT crane shall be rated for the heaviest component to be handled in the CW Pump house.~~

~~k) The lift for the CW Pump house EOT crane shall be based on lifting the circulating water pump out of the pump suction flume onto the maintenance floor area.~~

~~l) Layout Considerations: The span of EOT cranes shall be derived based on the building layout with considerations to clearances and hook approach to handle all equipments.~~

~~m) At crane girder level, Access walkway of minimum 500 mm width with safety handrails on one side shall be provided along the full span length of the cooling water building crane and other double girder cranes except TG hall EOT crane.~~

n) ~~At crane girder level, Access walkway of minimum 500 mm width with safety handrails on both side shall be provided along the full span length of the TG hall EOT crane.~~

~~3.1.0 Sizing Criteria~~

~~a) The TG hall crane capacity shall be taken as 10% more than the single heaviest equipment/component to be lifted. And other cranes and hoists capacity shall be selected by considering 20% margin over the weight of the component to be lifted.~~

~~b) Crane and hoist selection criteria~~

~~Crane shall be provided in the areas where the handling of the equipments / components shall have requirement in both transverse and longitudinal direction. Otherwise, hoist shall be considered. Curved monorail with hoist shall also be considered, if the equipments / components are located inline with the monorail. Height of the building shall be finalized considering the required lift over other equipments, piping etc.~~

~~Type of Handling equipment~~	~~Crane & Hoist's Safe working load (SWL)~~
~~CRANE~~	-
~~Double Girder EOT Crane~~	~~> 7.5T~~
~~Single Girder over head / Under Slung cranes~~	~~≤ 7.5T~~
~~HOIST~~	-
~~Electric hoists~~	~~≥ 1000 Kg~~
~~Manual hoists with trolley~~	~~> 300 Kg and < 1000 Kg~~

~~**Note**: Electrical hoists shall be provided at all equipments / components location which has a lift more than 10 m (for all >300 kg and < 1000 kg). Hook shall be provided for all possible maintenance location for the weight less 300kg. Hoists shall also be provided if required specifically as mentioned in respective section..~~

~~c) Auxiliary hoist shall be provided, for TG hall EOT crane and CW pump house EOT crane. AH capacity shall be rated for a minimum capacity of 20% from the main hoist capacity or 20% more than the single heaviest equipment/component to be lifted whichever is higher.~~

d) For guidance purposes the following crane speeds shall be considered:-

	Double girder Cranes	Single Girder Crane
• Main Hoist	1m/min (for TG hall EOT crane) 2m/min (for other cranes)	2.5 to 5m/min
• Aux Hoist (if applicable)	5m/min	N/A
• Trolley Travel	10 m/min	10 to 15 m/min
• Bridge Travel	15 m/min	15 m/min
• Creep speeds	10% of operating speeds for all motion	

e) Speeds for the electric hoist shall be

- Hoisting speed 3.5 m/min to 5 m/min
- Travel speed 5 m/min to 10 m/min
- Creep speeds 10% of operating speeds for all motion

4.0.0 DOCUMENTATION

4.1.0 Drawings, data / documents to be submitted along with bid

4.1.1 Completely filled up technical schedules and data sheets of tender documents

4.1.2 Crane clearance diagram showing various dimensions/data. (Including highest crane hook position, safe working load etc.)

4.1.3 General Arrangement Drawing of the E.O.T. crane assembly.

4.1.4 Wheel Loading Diagram.

4.1.5 Detailed drawing showing the features of the components of the Crane Bridge and trolley.

4.1.6 A detailed write-up on the crane control system. Drawings and data sheets showing the particulars of the controllers, switches, contactors, relays, other control devices and limit switches.

4.1.7 General arrangement drawing of protection, control and lighting panels.

4.1.8 Electrical /Control Schematic diagrams.

4.1.9 Equipment arrangement drawing.

4.1.10 Quality Assurance Plan /Inspection and Test Plan (ITP).

4.1.11 Field Quality Plan

4.1.12 List of tests to be conducted at shop and at site.

4.1.13 Testing procedures.

4.1.14 A comprehensive write-up and /or brochure on the details of the manufacturing facilities and the test facilities in the shop of the supplier..

4.1.15 Detailed engineering, manufacturing, delivery, erection and commissioning schedule and PERT chart.

4.1.16 Details of similar job executed in last five years.

4.1.17 Lubricants list (with quantities for initial fill and make-up).

4.1.18 List of erection and commissioning spares for each crane.

4.1.19 List of recommended O&M spares for 3 years normal operation.

4.1.20 List of Special Tools & Tackles.

4.1.21 List of makes of bought out items.

4.1.22 End user certificates.

4.2.0 Drawings, data / documents to be furnished by the successful bidder

	Description	Approval Category
4.2.1	Technical data sheets	A
4.2.2	Crane clearance diagrams showing various dimensions.	A

	Description	Approval Category
4.2.3	Drawings showing general arrangement, clearance requirement, assembly, cross sectional data and material of construction for : a. E.O.T. Crane Unit b. Bridge Assembly and Components c. Bridge and long travel and Wheel Assembly d. Trolley e. Trolley Wheel Assembly f. Drive and Transmission Unit for Bridge Travel, Trolley Travel, and Hoist g. Suspension Unit for Hook Block h. Main Hook Block i. Protection, control and lighting panels. j. Electric hoist k. Manual hoist	A
4.2.4	Drawings on runway rails, fixtures to fix runway rails with the runway main girder and stops etc.	A
4.2.5	Design calculations of the following : Bridge girder, Rope drum, Machinery Shafts, Gearbox excluding proprietary items, Motor rating, Brake capacity, Bearing life, Wheel loading and current collector, angle iron conductor sizing.	A
4.2.6	Leaflets on proprietary items such as motors, brakes, gear box, coupling etc.	A
4.2.7	Electrical documents as listed in respective sections.	A
4.2.8	Material test certificates, including those for the Hooks and wire rope.	I
4.2.9	Report on various tests at shop and at site and certificates of approval by authorised authority for all flame proof components and test reports for the same if required.	I
4.2.10	Quality plans/ Inspection test plan and Field Quality Plan	A
4.2.11	Erection Manual	I
4.2.12	Operation and Maintenance Manuals	I

4.3.0 To be submitted after the award of contract:

- Completely filled in technical Schedules.
- Dimensional General arrangement drawing for Panels, Main Switch, Master controller etc.
- Schematic wiring diagram for Panels.
- Dimensional General arrangement drawing for Motors, Brakes etc
- Characteristic curves for Motors.
- Load requirement for each crane / hoist
- VVVF Control Features.
- Control write-up for tandem operation.
- Catalogues for the all the electrical items such as cables, brakes, limit switches, relays, meters, etc.
- Quality Plans for agreed list of equipments.

- Type test certificates.
- Sizing calculation for DSL.
- Sizing calculation for Motors & Brakes
- Sizing calculation for Cables.
- Lighting arrangement.
- Earthing layout drawing.
- Cable routing drawing.

4.4.0 Any other drawings required for review during the detailed engineering stage, same shall also be submitted by contractor.

	a. Full load current	
	b. No load current	
15.	Power Factor at	
	a. 100% load	
	b. No load	
	c. Starting.	
16.	Efficiency at rated voltage and frequency,	
	a.100% load	
	b. 75% load	
	c. 50% load	
17.	Starting current (amps) at	
	a. 100 % voltage	
	b. 85% voltage	
	c. 80% voltage	
18.	Minimum permissible starting Voltage (Volts)	
19.	Starting time with minimum permissible voltage	
	a. Without driven equipment coupled	
	b. With driven equipment coupled	
20.	Safe stall time with 100% and 110% of rated voltage	
	a. From hot condition	
	b. From cold condition	
21.	Torques :	
	a. Starting torque at min. permissible voltage(kg-mtr.)	
	b. Pull up torque at rated voltage.	
	c. Pull out torque	
	d. Min accelerating torque (kg.m) available at lowest permissible starting voltage	
	e. Rated torque (kg.m)	
22.	Stator winding resistance per phase (ohms at 20 Deg.C.)	

Vendor's Name
Signature & Seal
with date

23.	GD^2 value of motors	
24.	No of permissible successive starts when motor is in hot condition.	
25.	Locked Rotor KVA Input	
26.	Locked Rotor KVA/KW	
27.	Vibration limit :Velocity (mm/s)	
28.	Noise level limit (dBA)	
C.	**CONSTRUCTIONAL FEATURES**	
1.	Stator winding insulation	
	a. Class & Type	
	b. Winding Insulation Process	
	c. Tropicalized	Yes
	d. Temperature rise over specified maximum ambient temperature of 50 deg. C	
	e. Method of temperature measurement	
	f. Stator winding connection	
2.	Main Terminal Box	
	a. Type	
	b. Location(viewed from NDE side)	
	c. Entry of cables(bottom/side)	
	d. Recommended cable size(To be matched with cable size envisaged)	
	e. Fault level (MVA),Fault level duration(sec)	
	f. Cable glands & lugs details (shall be suitable for power cable)	
3.	Type of DE/NDE Bearing	
4.	Motor Paint shade	
5.	Weight of	
	a. Motor stator (KG)	
	b. Motor Rotor (KG)	
	c. Total weight (KG)	
D.	**List of accessories.**	
1.	Grounding pads	
	i) No and size on motor body	

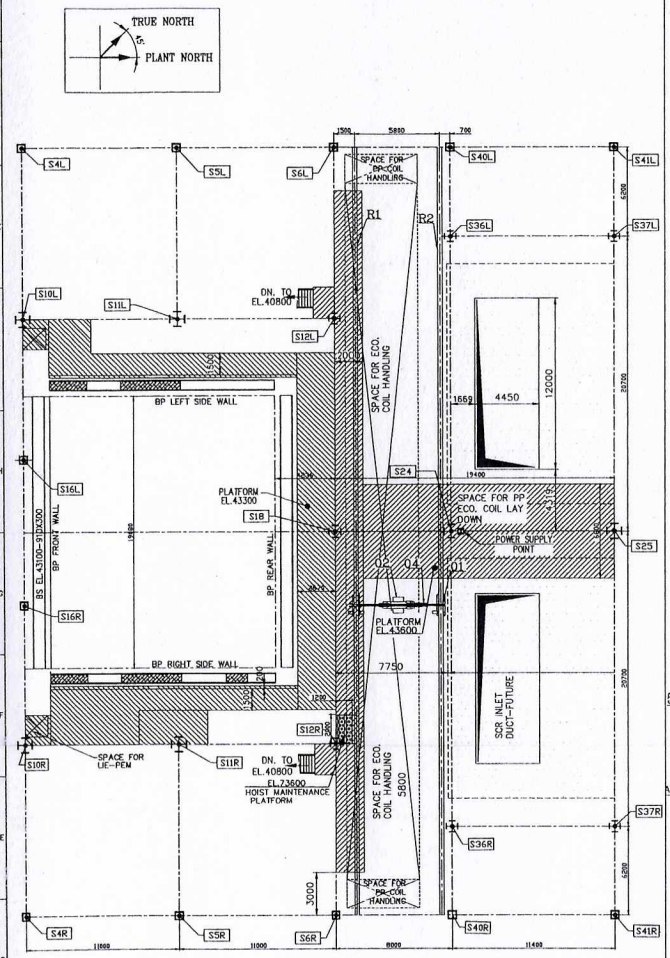
Vendor's Name
Signature & Seal
with date

	ii) Nos on terminal Box	
2.	Any other fitments	
E.	**List of curves.**	
1.	Torque speed characteristic of the motor	
2.	Thermal withstand characteristic	
3.	Starting. current Vs. Time	
4.	Starting. current Vs speed	
5.	P.F. and Efficiency. Vs Load	

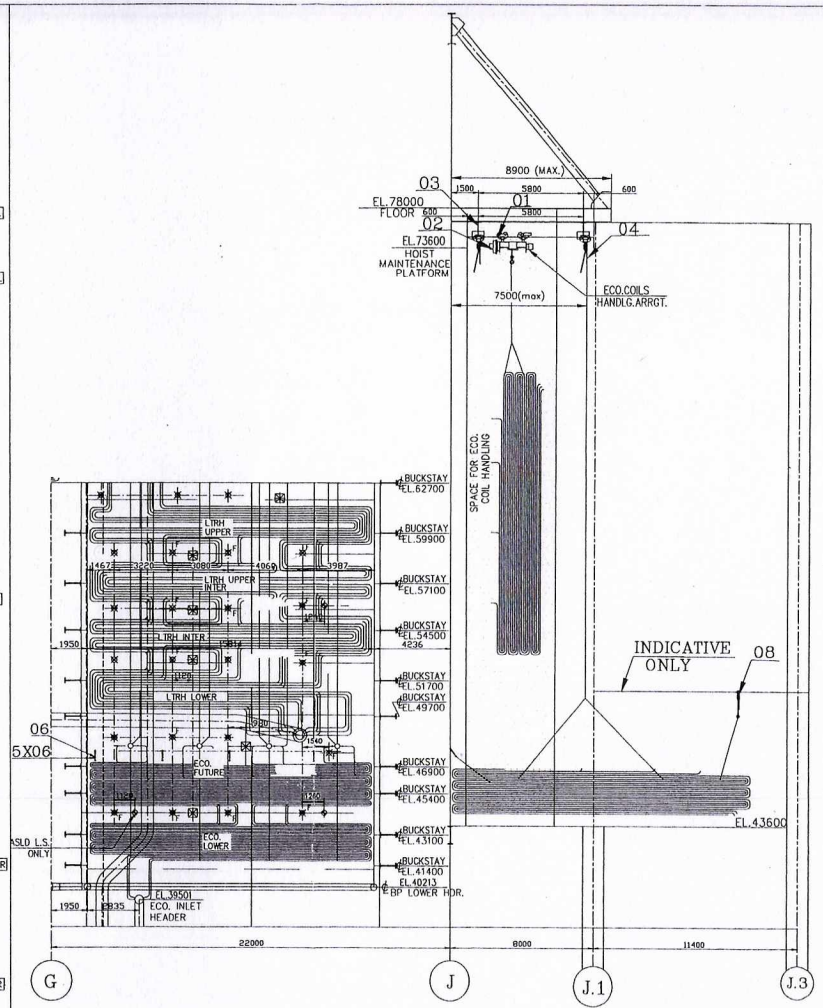
Vendor's Name
Signature & Seal
with date

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM



PLAN VIEW
SCALE 1:125



ELEVATION VIEW
SCALE 1:100

NOTES:

1. NO INTERCONNECTING STEEL OR VERTICAL BRACING BETWEEN COLUMN ROWS J & J.3 FROM PLATFORM EL. 43600 TO EL. 78000 FOR MOVEMENT OF HOIST AND P.P. COILS TO DROP AREA.
2. ONE (1) ELECTRICALLY OPERATED UNDERHUNG HOIST SHALL BE PROVIDED FOR LOWERING/RAISING P.P. COILS TO/FROM GRADE.
3. TWO (2) TROLLEY TYPE MANUALLY OPERATED CHAIN HOISTS SHALL BE PROVIDED TO POSITION P.P. COILS ONTO PLATFORM EL. 43600 AND AID IN TILTING VERTICALLY FOR LOWERING TO GRADE.
4. FOUR (4) MANUALLY OPERATED CHAIN PULLEY BLOCKS SHALL BE PROVIDED FOR HANDLING P.P. COILS INSIDE BACKPASS ALONG WITH ONE (1) MANUALLY OPERATED CHAIN HOIST LOCATED OUTSIDE OF BACKPASS AT COLUMN ROW J, SUSPENDED EITHER ABOVE LTRH OR ECONOMIZER BANKS.
5. MAXIMUM OF SIX (6) PAIRS OF P.P. COILS MAY BE LOADED ON PLATFORM EL. 43600 AT A TIME.
6. SUITABLE LUGS AND PIPES SHALL BE SUPPLIED FOR POSITIONING THE MANUALLY OPERATED CHAIN PULLEY BLOCK AT COLUMN ROW J.
7. THE REQUIRED NUMBER OF LUGS ARE TO BE PROVIDED FOR SUSPENDING WIRE ROPES INSIDE THE BACKPASS FOR SUPPORTING THE MANUALLY OPERATED CHAIN PULLEY BLOCKS. THEY SHALL EITHER ATTACH TO THE BACKPASS SIDE WALLS OR PASS THROUGH AND ATTACH TO INTERCONNECTING BEAMS.
8. TWO (2) MONORAILS (R1 & R2) SHALL BE SUPPLIED FOR UNDERHUNG CRANE-LENGTH 54.00M.
9. PIPE CLAMPS OF DIFFERENT CONFIGURATIONS FOR LTRH AND ECONOMISER COILS SHALL BE DESIGNED AND SUPPLIED.
10. THREE (3) SETS OF CLAMPS ARE REQUIRED PER BUNDLE WITH A TOTAL OF 21 SUPPLIED.
11. RUNWAYS BEAMS SHALL BE INSTALLED AND SHALL MAINTAIN LEVEL WITH EACH OTHER AND WITHOUT SLOPE THROUGHOUT.
12. VERTICALITY OF RUNWAYS SHALL BE WITHIN ±2MM. SHIMS SHALL BE USED TO ENSURE SUCH.
13. REFER TO O&M MANUALS FOR DETAILED INSTRUCTIONS ON DISMANTLING/ASSEMBLY OF P.P. COILS.
14. QUANTITY FURNISHED IN THE DRAWING IS FOR ONE BOILER ONLY.
15. 3 NOS OF CHAIN PULLEY BLOCKS(ITEM NO 06) ARE TO BE USED IN TENDEM FOR DRAWING OUT COILS;
16. ITEM#08 SHALL BE USED TO HANDLE THE COILS IN THE SPACE FOR HANDLING ECO. COILS AND SHALL BE SUITABLY SUSPENDED AT SITE AS PER INDICATED LOCATION.

REFERENCE DRAWINGS:

1. 0-00-022-77466 GENERAL ARRANGEMENT-SIDE ELEVATION "EE"
2. 0-00-021-77500 FLOOR PLAN AT EL. 41000,43300&43600 (MBL-3).

NOTES TO SUPPORTING STRUCTURES/PE/FB:

1. NO INTERCONNECTING STEEL MEMBER OR VERTICAL BRACING BETWEEN 43.600M AND 78.00M IN THE REGION OF ECO COIL HANDLING SPACE.
2. RUNWAY BEAMS (R1&R2) LENGTH 54.00M EACH.

NOTES TO PRESSURE PARTS/PE/FB:

1. PIPE CLAMPS OF DIFFERENT CONFIGURATIONS FOR ECO & LTRH COILS SHALL BE DESIGNED AND SUPPLIED.
2. 3 SETS OF LUGS ARE REQUIRED PER BUNDLE.
3. REQUIRED NO.OF LUGS FOR ROPE TYING ARRANGEMENT SHALL BE DESIGNED AND SUPPLIED.
4. BEAMS FOR TYING UP THE ROPE BETWEEN COLUMNS AS PER PROCEDURE ARE TO BE PROVIDED.
5. FOR POSITIONING THE PULLEY BLOCK AT OUTSIDE THE SECOND PASS, SUITABLE LUGS AND PIPES SHALL BE DESIGNED AND SUPPLIED.

NOTES TO BHEL-PEM & C&I (FB):

A. POWER SUPPLY POINTS ARE TO BE PROVIDED AT 1.0M ABOVE OPERATING FLOOR AT EL. 43600 AT COLUMN S24.
B. POWER SUPPLY REQUIRED RATING 415V AC; 3 PHASE; 50Hz.

NOTES TO VENDOR:

A. VENDOR TO PROVIDE INTEGRATED PLATFORM FOR ITEM#02.

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECN	A/C/P	DI	UNIT	UNIT WEIGHT / QUANTITY	DS	ZONE
	08	CPB-CAP.10T, LIFT 15M								170.000 / 1		
	07	WIRE ROPE DIA 28MM, L=35M								170.000 / 5		
	06	CHAIN PULLEY BLOCK CAP.3T; LIFT 26M								100.000 / 5		
	05	RATCHET LEVER WITH HOIST CAP.10T; LIFT 35M								900.000 / 1		
	04	MANUAL TROLLEY WITH CPB CAP.10T; LIFT 35M								700.000 / 2		
	03	DSL-CABLE TROLLEY TYPE TRAVEL LENGTH 54.00M								700.000 / 1		
	02	ELEC.TROLLEY WITH HOIST CAP.10T; LIFT 77.0M								3500.000 / 1		
	01	UNDERHUNG CRANE CAP.10T; SPAN 5.8M (OVERHANG 600MM ON BOTH SIDES)								3000.000 / 1		

CUSTOMER NO. 1729, 1730

HOIST VENDOR ITEMS

01

ITEM NO.	DESCRIPTION	QTY.	REMARKS
01	UNDERHUNG CRANE-ELEC., CAP. 10T, SPAN 5800mm	1	
02	TROLLEY WITH HOIST-ELEC., CAP. 10T, LIFT 77.0M	1	
03	DSL FOR UNDERHUNG CRANE-TRAVEL LENGTH 56.472M	1	
04	MANUAL TROLLEY WITH CHAIN PULLEY BLOCK-CAP. 10T, LIFT 36.0M	2	
05	RATCHET LEVER TYPE AUX. HOIST-CAP.10T, LIFT 35.0M	1	NOT SHOWN
06	CHAIN PULLEY BLOCK (LUG MOUNTED TYPE WITH LATCHING ARRANGEMENT FOR BOTH HOOKS)-CAP. 3T, LIFT 26.0M	5	
07	WIRE ROPE DIA 28; L35	5	NOT SHOWN
08	CPB-CAP.10T, LIFT 15M	1	

Max.weight of pair of coils to be handled

ECONOMISER	7500 KG.

REV	DATE	ALTERED : SAURABH KR
01	08.01.19	CHD & APPD :SRINIVAS A

ZONE: DRAWING REVISED TO INCORPORATE CUSTOMER COMMENTS FURNISHED IN 5th EBM HELD AT BHEL-TRICHY FROM 7TH TO 9TH JAN 2019.

PROJECT: 2 X 660MW UDANGUDI SUPERCRITICAL TPP - STAGE I

OWNER: TAMILNADU GENERATION & DISTRIBUTION CORPORATION LIMITED
5TH Floor,Western Wing,NPKRR Maaligai
144,Anna Salai,Chennai-600002.

OWNER'S CONSULTANT: DESEIN PRIVATE LIMITED
DESEIN HOUSE, GREATER KAILASH-II, NEW DELHI

BHARAT HEAVY ELECTRICALS LIMITED
NEW DELHI
UNIT : BOILER PLANT UNIT; TIRUCHIRAPALLI - INDIA-620 014
EQUIPMENT: STEAM GENERATOR

	NAME	SIGN.	DATE
DRAWN	R S YADAV	Sd/-	07.12.2018
CHECKED	SAURABH	Sd/-	07.12.2018
APPROVED	NOORUL FAZIL	Sd/-	07.12.2018

TITLE: PRESSURE PARTS HANDLING ARRANGEMNT

ALL DIMENSIONS ARE IN MILLIMETERS

PROJECTION	SCALE	SHEET	BHEL DRAWING NO.	REV
	1:125 1:100	01 of 01	0-99-502-40371	01

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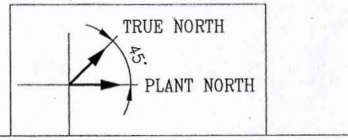
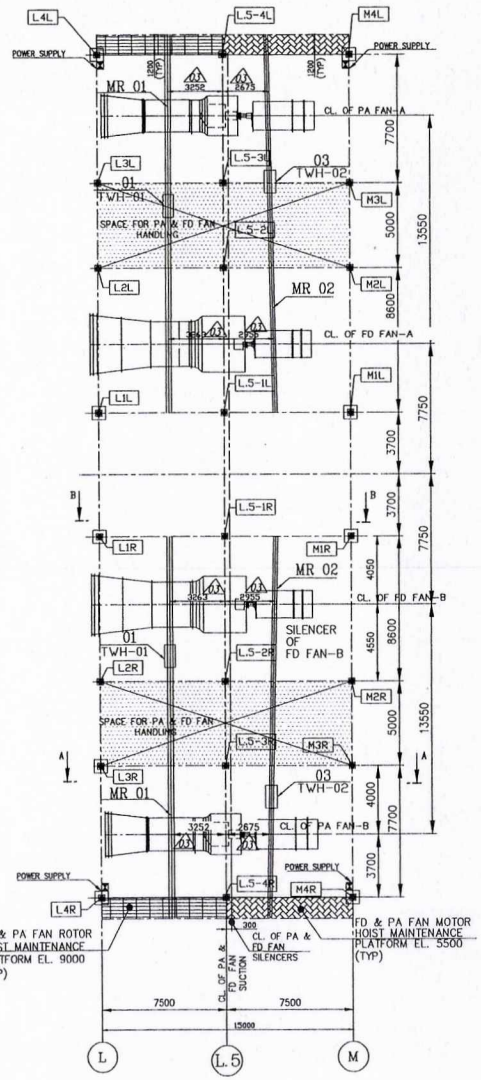
ELECTRONIC FILE NAME:

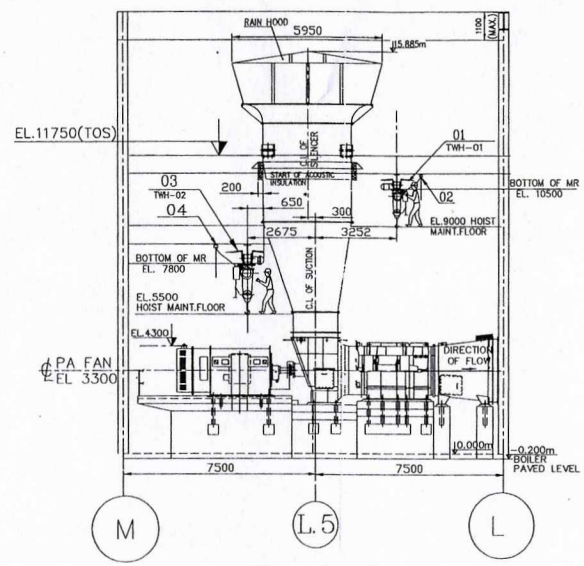
SIZE-A0

DRAWING NO. 1-99-100-40911

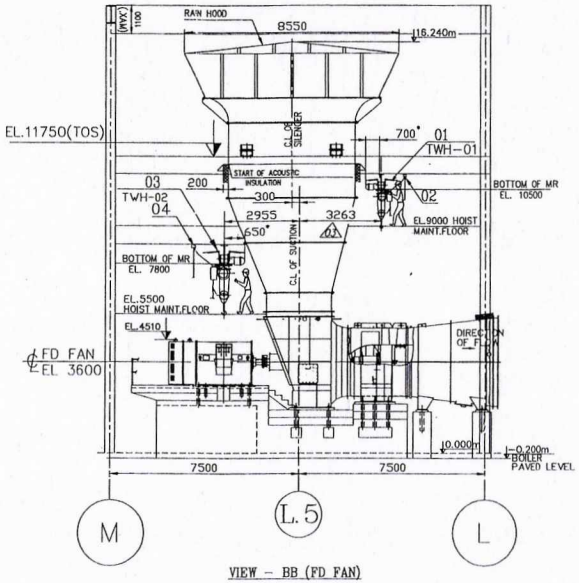




PLAN VIEW
SCALE 1:150



VIEW – AA (PA FAN)
SCALE 1:100



VIEW – BB (FD FAN)
SCALE 1:100

LEGEND

MR-01 – MONORAIL FOR F.D. AND P.A. FANS "A" ROTORS – QTY. TWO–22.500M
MR-02 – MONORAIL FOR F.D. AND P.A. FANS "A" MOTORS – QTY. TWO–22.500M
TWH-01 – TROLLEY WITH HOIST FOR F.D. AND P.A. FANS ROTORS – ITEM No. 1
TWH-02 – TROLLEY WITH HOIST FOR F.D. AND P.A. FANS MOTORS – ITEM No. 3

GENERAL NOTES:

A. REFERENCE DRAWINGS:
   01. G.A DUCT LAYOUT – COLD PRI. AIR DUCTING: 0-00-020-77479
   02. G.A DUCT LAYOUT – COLD SEC. AIR DUCTING: 0-00-020-77480
   03. LAYOUT OF ID SYSTEM ELEVATION : 0-00-020-77473
   04. FLOOR PLAN AT EL.6850& EL.8500 : 0-00-021-77491
   05. GENERAL ARRANGEMENT OF PA FAN (PAF 19/11.8-2): 1-00-100-29190
   06. SILENCER ARRANGEMENT OF PA FAN: 2-00-100-30263.
   07. GENERAL ARRANGEMENT OF FD FAN (FAF 26.6/13.3-1): 1-00-098-29188
   08. SILENCER ARRANGEMENT OF FD FAN: 2-00-098-30262
B. TROLLEY WITH HOISTS ARE ELECTRICALLY OPERATED.
C. QUANTITY FURNISHED IN DRAWING IS FOR ONE BOILER ONLY.
D. EL.0.0M CORRESPONDS TO RL(+)3.80M WHICH IS FINISHED FLOOR LEVEL (FFL) OF TG BUILDING. BOILER PAVED LEVEL IS EL.(–)0.20M.
E. MONORAIL OFFSET DIMENSIONS SHOWN ARE ARRIVED AT CL. OF RESPECTIVE FANS.

NOTES TO PEM, NEW DELHI:

1. POWER SUPPLY POINTS (⊠) ONE METER ABOVE GROUND LEVEL TO BE PROVIDED BY BHEL–PEM.
2. POWER SUPPLY POINTS AT COLUMNS L4L,M4L,L4R & M4R.
3. POWER SUPPLY REQUIRED RATING AT COLUMN L4L,M4L,L4R & M4R: : 415V AC: 3 PHASE: 50Hz.

NOTES TO VENDORS:

1. SUPPLIER'S SCOPE STARTS AT BHEL–PEM'S POWER SUPPLY POINT.
2. DIMENSIONS MARKED WITH (*) SHOULD BE STRICTLY MAINTAINED.
3. VENDORS ITEMS INCLUDE:
   A. FIXED POWER CABLE AND TRAILING CABLE.
   B. DSL TRAILING CABLE SYSTEM – CABLE TROLLEY – COMPLETE SET.
   C. SWITCH FUSE UNITS AND ALL ELECTRICAL ITEMS FOR TWH FROM POWER SUPPLY POINT.
   D. TROLLEY WITH HOIST – CAPACITY 20.0/5.0 TONS: LIFT 6.0/9.5M.

Max Load to be Handled (kgs)	
P.A. FANS MOTORS	15000
P.A. FANS ROTORS	4000
F.D. FANS MOTORS	12500
F.D. FANS ROTORS	3000

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECN	ACTUAL / UNIT	UNIT WEIGHT / QUANTITY	SS	ZONE
	04	DSL-CABLE TROLLEY TYPE LENGTH : 22.50M.					ST	800.000		
						SUB-DELY	L	2		
02	03	TWH-02 ELEC.; CAP: 20T LIFT : 6.0 M.					ST	3000.000		
						SUB-DELY	L	2		
	02	DSL-CABLE TROLLEY TYPE LENGTH : 22.50M.					ST	600.000		
						SUB-DELY	L	2		
02	01	TWH-01 ELEC.; CAP: 5T LIFT : 9.5 M.					ST	1000.000		
						SUB-DELY	L	2		

CUSTOMER Nos. : 1729 & 1730

CUSTOMER: TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION LIMITED, TANGEDCO HEAD QUARTERS, 1ST FLOOR, NEW EB QTRS., 144,ANNASALAI, CHENNAI 600002.

CONSULTANT NAME: TATA CONSULTING ENGINEERS LIMITED, BENGALURU

PROJECT NAME: 2 X 660 MW UDANGUDI STPP STAGE – I

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

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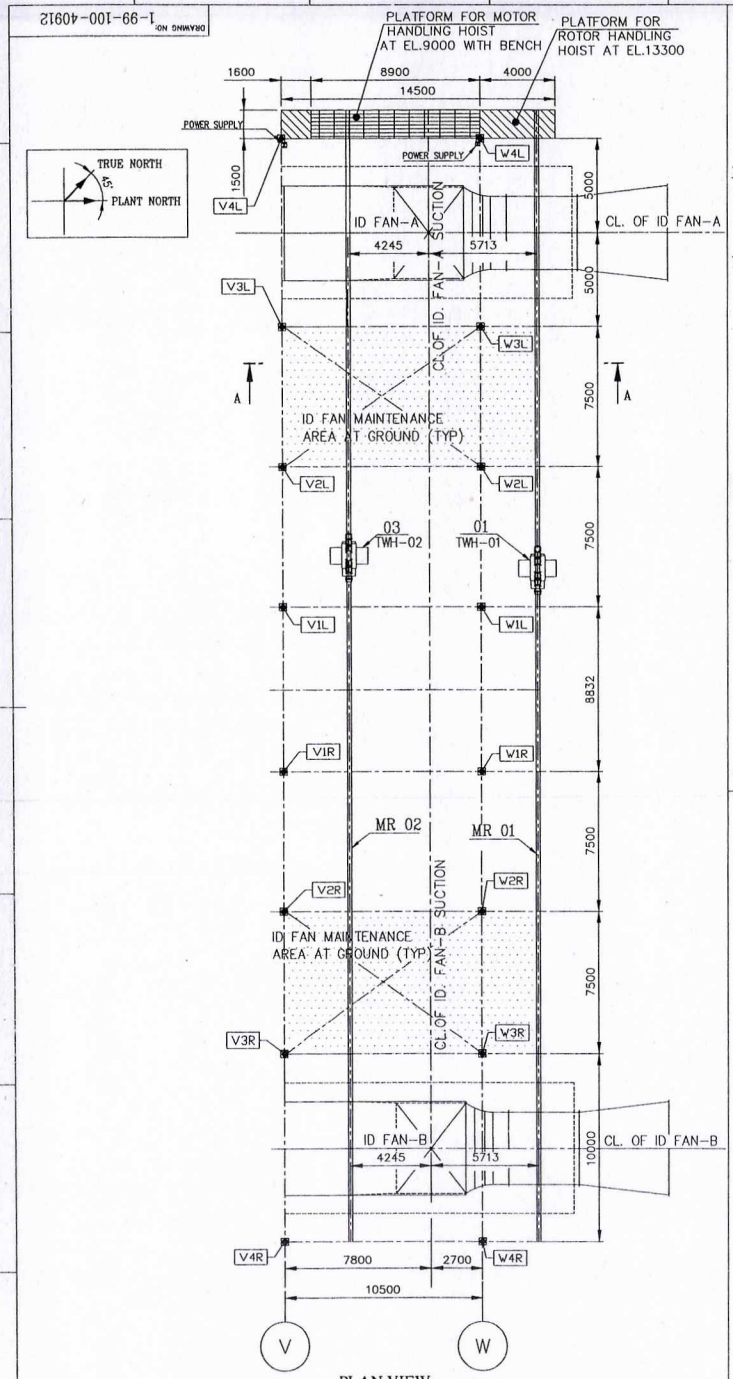
DEPT CODE		NAME	SIGN	DATE
129	DRN	R S YADAV		18.07.2018
	DESN	R S YADAV		18.07.2018
	CHD	NOORUL FAZIL		18.07.2018
	APPD	M. GANGADHAR		18.07.2018

TITLE: PA& FD FAN HANDLING ARRANGEMENT

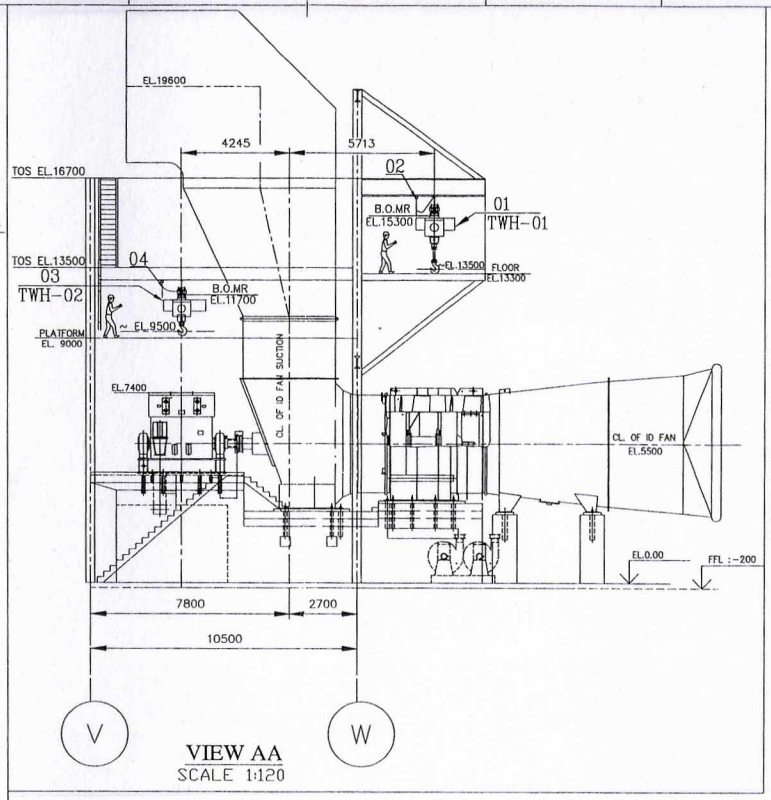
DEPT. | SCALE 1:100 | SIGN | DRAWING NO. 1-99-100-40911 | SHEET 01 OF 01 | REV. 04

REV	DATE	ALTERED :	REV	DATE	ALTERED :
04	14.05.19	SAURABH KR / CHD & APPD : SRINIVAS A	03	26.02.2019	SAURABH KR SINGH / CHD & APPD : SRINIVAS A
ZONE	DRAWING IS REVISED TO CHANGE THE TITLE BLOCK.		ZONE	DRAWING REVISED TO INCORPORATE LATEST REVISION OF GA DRAWING FOR FD FAN WITH FOUNDATION 1-00-098-29188 REV 04.	
02	08.01.2019	SAURABH KR SINGH / CHD & APPD : SRINIVAS A	01	28.08.2018	R S YADAV / CHD & APPD : NOORUL FAZIL
ZONE	DRAWING REVISED TO INCORPORATE CUSTOMER COMMENTS FURNISHED IN 5th ERM HELD AT BHEL–TRICHY FROM 7TH TO 9TH JAN 2019.		ZONE	ENGG. DETAILS ADDED	

DRAWING NO: 1-99-100-40912



PLAN VIEW
SCALE 1:135



VIEW AA
SCALE 1:120

LEGEND

MR-01 – MONORAIL FOR ID FANS ROTORS – QTY. ONE (L=60.322m)
MR-02 – MONORAIL FOR ID FANS MOTORS – QTY. ONE (L=60.322m)
TWH-01 – TROLLEY WITH HOIST FOR ID FANS ROTORS – ITEM No. 1
TWH-02 – TROLLEY WITH HOIST FOR ID FANS MOTORS – ITEM No. 3

GENERAL NOTES:

A. REFERENCE DRAWINGS:
   01. LAYOUT OF ID SYSTEM ELEVATION: 0-00-020-77473
   02. LAYOUT OF ID SYSTEM PLAN: 0-00-020-77474
   03. GENERAL ARRANGEMENT OF ID FAN (SAF 38.5/20-2): 1-00-099-29189
B. TROLLEY WITH HOISTS ARE ELECTRICALLY OPERATED.
C. QUANTITY FURNISHED IN DRAWING IS FOR ONE BOILER ONLY.
D. ALL ELEVATIONS ARE WITH RESPECT TO EL. 0.0M, WHICH CORRESPONDS TO RL (+) 3.8M (FFL OF TG BUILDING).

NOTES TO CUSTOMER:

1. POWER SUPPLY POINTS (⊠) ONE METER ABOVE GROUND LEVEL – TO BE PROVIDED BY BHEL-PEM.
2. POWER SUPPLY POINTS AT COLUMNS W4L AND V4L.
3. POWER SUPPLY REQUIRED RATING AT COLUMN W4L: AC; 3 PHASE; 50Hz.
4. POWER SUPPLY REQUIRED RATING AT COLUMN V4L: AC; 3 PHASE; 50Hz.

NOTES TO VENDORS:

1. SUPPLIER'S SCOPE STARTS AT BHEL-PEM'S POWER SUPPLY POINT.
2. VENDORS ITEMS:

A. FIXED POWER CABLE AND TRAILING CABLE.
B. DSL TRAILING CABLE SYSTEM – CABLE TROLLEY – COMPLETE SET.
C. SWITCH FUSE UNITS AND ALL ELECTRICAL ITEMS FOR TWH FROM POWER SUPPLY POINT.
D. TROLLEY WITH HOIST – CAPACITY 20/40 TONS WITH LIFT 13.5/9.5 M RESPECTIVELY.

VARIANT No#	ITEM No#	DESCRIPTION	STD	DRAWING NUMBER	ITEM No# / VAR No#	MATERIAL CODE / MATERIAL SPECN	A/C/P	UNIT / DI	UNIT WEIGHT / QUANTITY	GS	ZONE
	04	DSL-CABLE TROLLEY TYPE. LENGTH: 60.322M							600.000 / 1		
02	03	TWH-02 ELEC.; CAP: 40T LIFT: 9.500M							4000.000 / 1		
	02	DSL-CABLE TROLLEY TYPE. LENGTH: 60.322M							600.000 / 1		
02	01	TWH-01 ELEC.; CAP: 20T LIFT: 13.500M							2700.000 / 1		

Max Load to be Handled (kgs)	
ID FAN ROTOR	14500
ID FAN MOTOR	30000

CUSTOMER NO. 1729, 1730

CUSTOMER: TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION LIMITED, TANGEDCO HEAD QUARTERS, 1ST FLOOR, NEW EB QTRS., 144,ANNASALAI, CHENNAI 600002.

CONSULTANT NAME: TATA CONSULTING ENGINEERS LIMITED, BENGALURU

PROJECT NAME: 2 X 660 MW UDANGUDI STPP STAGE – I

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

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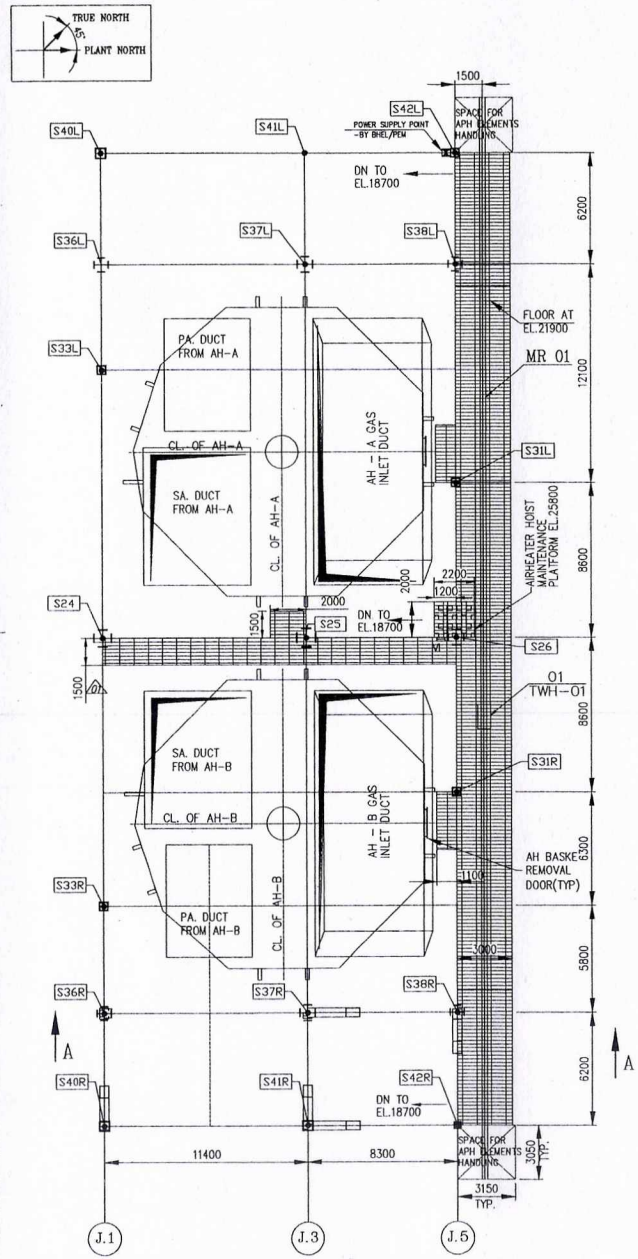
DEPT CODE		NAME	SIGN	DATE
129	DRN	R S YADAV		18.08.2018
	DESN	R S YADAV		18.08.2018
	CHD	NOORUL FAZIL		18.08.2018
	APPD	M. GANGADHAR		18.08.2018

TITLE: ID FAN HANDLING ARRANGEMENT

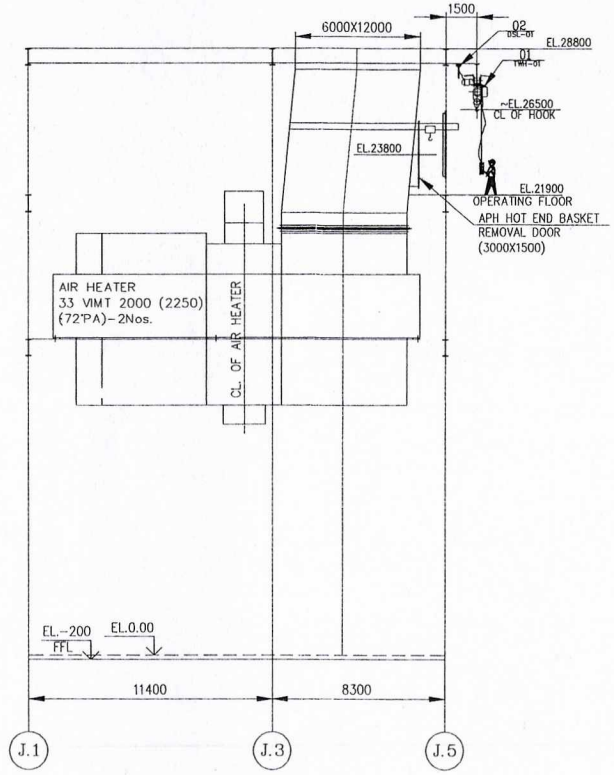
DEPT. / SIGN / SCALE 1:100 / DRAWING NO. 1-99-100-40912 / SHEET 1 OF 1 / REV. 03

REV	DATE	ALTERED :	REV	DATE	ALTERED :	REV	DATE	ALTERED :
03	14.05.19	SAURABH KR / CHD & APPD : SRINIVAS A	02	08.01.2019	SAURABH KR / CHD & APPD : SRINIVAS A	01	28.08.2018	R S YADAV / CHD & APPD : NOORUL FAZIL
ZONE		DRAWING IS REVISED TO CHANGE THE TITLE BLOCK.	ZONE		DRAWING REVISED TO INCORPORATE CUSTOMER COMMENTS FURNISHED IN 5th EPM HELD AT BHEL-TRICHY FROM 7TH TO 8TH JAN 2019.	ZONE		ENGG. DETAILS ADDED

DRAWING NO: 1-99-400-40909



APH ELEMENTS HANDLING – PLAN VIEW
SCALE 1:140



APH ELEMENTS HANDLING: VIEW–AA
SCALE 1:60

LEGEND

A. TWH-01 –TWH FOR APH HANDLING CAP.2T;LIFT:27.00M.
B. DSL-01 –DSL FOR APH HANDLING – CABLE TROLLEY TYPE--LEN. 60.0M.
C. MR-01 – MONORAIL LENGTH :60.0M.– 1 No.

NOTES:–

A. REFERENCE DRAWINGS:
   01. G.A SIDE ELEVATION– "E–E" 0–00–022–77466
   02. LAYOUT OF FLUE GAS DUCTING – ECO. TO AIRHEATER 0–00–020–77485
   03. FLOOR PLAN AT 21900 0–00–021–77495
B. MONORAIL & MONORAIL SUPPORTS ARE TO BE RELEASED BY SUPPORTING STRUCTURES
C. AIR HEATER ELEMENTS HANDLING SPACE ARE TO BE CLEARED UP TO GROUND LEVEL
D. DIMENSIONS ARE TAKEN FROM ABOVE DRAWINGS
E. SIZE AND TOS ELEVATION FOR MONORAIL IS TO BE FURNISHED BY SUPPORTING STRUCTURES/FB.
F. LENGTH OF MONORAIL
   LENGTH OF MONORAIL (MR–01) : 60.0M; Qty : 1 No.
G. QUANTITY INDICATED IN THE BOM IS FOR ONE BOILER ONLY.
H. MAXIMUM WEIGHT OF ELEMENT : 760KG
I. HANDLING ARRANGEMENT FOR REMOVING THE APH ELEMENTS FROM THE AIR PREHEATER SHALL BE PROVIDED BY BAP/RANIPET. BHEL/TRICHY SCOPE IS TO HANDLE THE ELEMENTS FROM 21.900M FLOOR TO GROUND LEVEL ONLY.

NOTES TO PEM / DELHI

1. POWER SUPPLY POINT TO BE PROVIDED AT ONE METER ABOVE 21.900M FLOOR
2. SUPPLY POINT AT COLUMN–S42 L
3. POWER SUPPLY REQUIRED RATING : 5 KVA:415V AC; 3 PHASE; 50Hz.

NOTES TO VENDORS

SUPPLIER'S SCOPE STARTS AT PEM–BHEL'S POWER SUPPLY POINT.

VENDOR ITEMS

A. FIXED POWER CABLE AND TRAILING CABLE
B. DSL TRAILNG CABLE SYSTEM– CABLE TROLLEY WITH "Tee" TRACK–COMPLETE SET.
C. SWITCH FUSE UNITS AND ALL ELETRICAL ITEMS FOR TWH FROM POWER SUPPLY POINT
D. TROLLEY WITH HOIST – CAPACITY 2 TONS; LIFT 27.0MTRS.

EL.0.0M CORRESPONDS TO RL(+)3.80M WHICH IS FINISHED FLOOR LEVEL (FFL) OF TG BUILDING. BOILER PAVED LEVEL IS EL.(–)0.20M.

MAXIMUM WEIGHT OF ELEMENT : 760KG

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECN	A/C/P / DI	UNIT	UNIT WEIGHT(Kg) / QUANTITY	QS	ZONE
	02	DSL-CABLE TROLLEY TYPE. LENGTH : 60.0M.				SUB-DELY		ST	400.000		
								L	1		
	01	TWH-01 ELEC.; CAP:2T LIFT : 27.00M.				SUB-DELY		ST	800.000		
								L	1		

CUSTOMER NO. 1729, 1730

PROJECT: 2 X 660MW UDANGUDI SUPERCRITICAL TPP - STAGE I

OWNER: TAMILNADU GENERATION & DISTRIBUTION CORPORATION LIMITED
5TH Floor,Western Wing,NPKRR Maaligai
144,Anna Salai,Chennai–600002.

OWNER'S CONSULTANT: DESEIN PRIVATE LIMITED
DESEIN HOUSE, GREATER KAILASH–II, NEW DELHI

BHARAT HEAVY ELECTRICALS LIMITED
NEW DELHI
UNIT : BOILER PLANT UNIT; TIRUCHIRAPALLI – INDIA–620 014
EQUIPMENT: STEAM GENERATOR

	NAME	SIGN.	DATE
DRAWN	R S YADAV	Sd/-	07.12.2018
CHECKED	SAURABH	Sd/-	07.12.2018
APPROVED	NOORUL FAZIL	Sd/-	07.12.2018

TITLE: APH HANDLING ARRANGEMENT

ALL DIMENSIONS ARE IN MILLIMETERS
PROJECTION
SCALE 1:140 1:60
SHEET 01 OF 01
BHEL DRAWING NO. 1-99-400-40909
REV 01

REV	DATE	ALTERED SAURABH KR
01	00.00.19	CHD & APPD SRINIVAS A.

ZONE: DRAWING REVISED TO INCORPORATE CUSTOMER COMMENTS FURNISHED IN 5th DRN HELD AT BHEL–TRICHY FROM 7TH TO 9TH JAN 2018.

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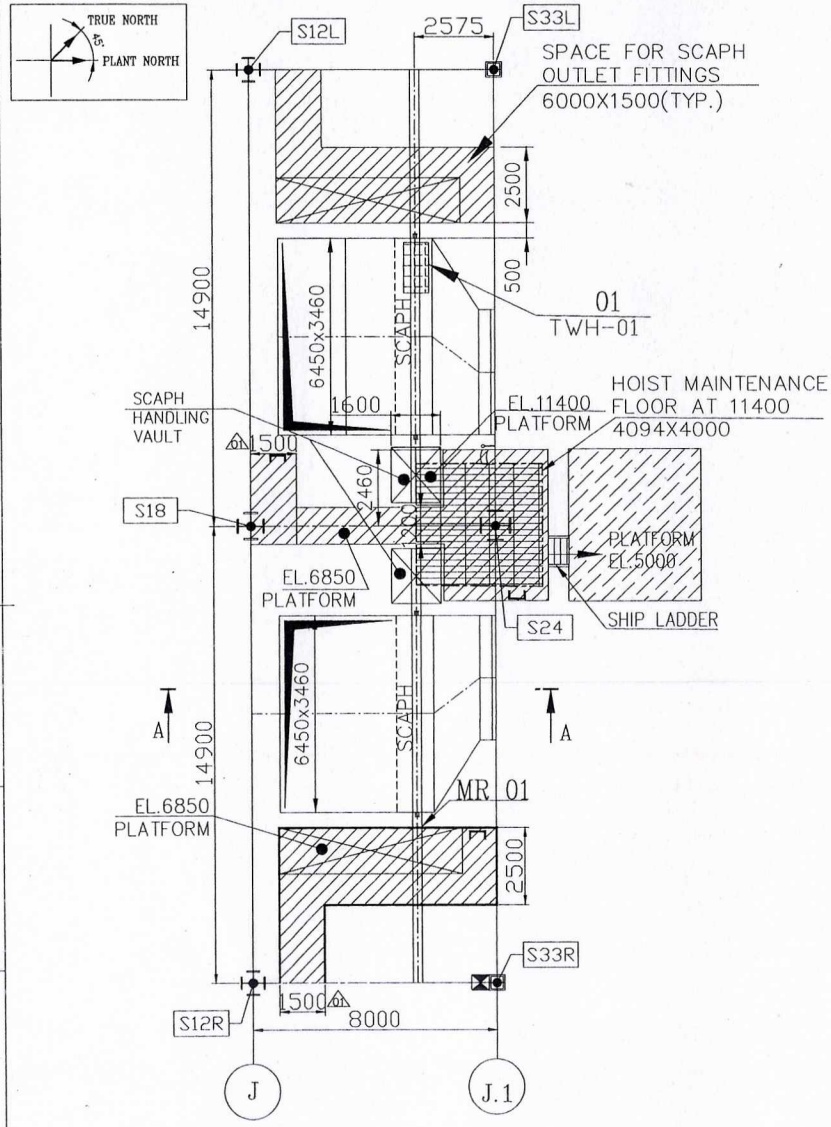
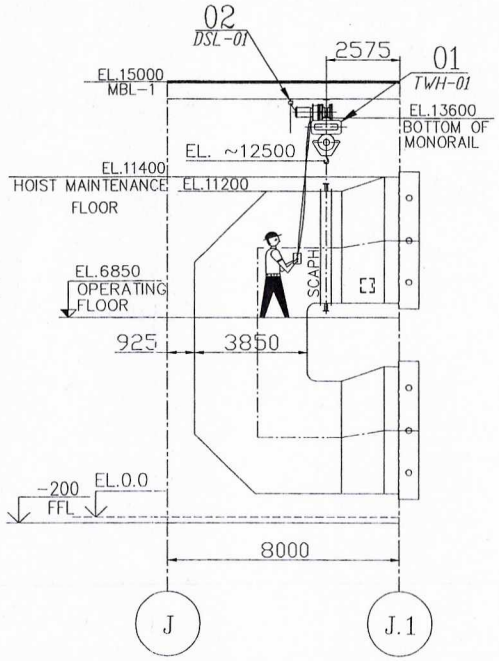
DRAWING NO. 1-99-400-40910



PLAN VIEW
SCALE 1:80



SIDE ELEVATION VIEW
VIEW-AA
SCALE 1:80

Max Load to be Handled (kgs)	
SCAPH WEIGHT	1400

NOTE - GENERAL:

01. REFERENCE DRAWINGS:
    A. GA OF BOILER SEC. SIDE ELEVATION SEC EE--- 0-00-022-77466.
    B. GA DUCT LAYOUT - COLD SECONDARY AIR DUCTING --- 0-00-020-77480.
    C. FLOOR PLAN ARRGT. AT EL.6850&8500--- 0-00-021-77491.
    D. FLOOR PLAN ARRGT. AT EL.9000 & EL.11400--- 0-00-021-77492
    E. ASSY OF STEAM COIL AIR PREHEATER --2-50-510-XXXXX. (DUCT SIZE(8000X346)
02. SCAPH SHALL BE HANDLED IN BLOCKS.
03. HANDLING SPACE IS TO BE CLEARED UPTO 0.00M LEVEL FROM 13.600M WITHOUT ANY INTERFERENCE/ENCROACHMENTS.
04. REFER LAYOUT DRAWING FOR ARRANGEMENT OF HOIST MAINTENANCE/ACCESS PLATFORM.
05. EL.0.0M CORRESPONDS TO RL(+)3.80M WHICH IS FINISHED FLOOR LEVEL (FFL) OF TG BUILDING. BOILER PAVED LEVEL IS EL.(-)0.20M.

LEGEND

A. TWH-01 -TROLLEY WITH HOIST FOR SCAPH HANDLING CAP.2.5T;LIFT:12.70 M- 1 NO.
B. DSL-01 -DSL FOR SCAPH HANDLING - CABLE TROLLEY TYPE-LEN. 29.800M- 1 NO.
C. MR-01 -MONORAIL FOR SCAPH HANDLING LENGTH : 29.800M.- 1 No.

NOTES TO PEM / DELHI

A. POWER SUPPLY POINTS ARE TO BE PROVIDED AT 1.00M ABOVE GROUND FLOOR AT COLUMN S33R.
B. POWER SUPPLY REQD. RATING 5KVA; 415V AC; 3 PHASE, 50Hz.

NOTES TO VENDORS:

A. TOTAL POWER SUPPLY AVAILABLE IS 5KVA.DESIGN THE HOISTING AND CROSS TRAVEL MOTOR AS PER THE AVAILABLE POWER INDICATED ABOVE.
B. SUPPLIER'S SCOPE STARTS AT POWER SUPPLY POINT.

VENDOR ITEMS:

A. FIXED POWER CABLE & TRAILING CABLE SYSTEM.
B. DSL TRAILING CABLE SYSTEM. CABLE TROLLEY & "Tee" TRACK TYPE -COMPLETE.
C. SWITCH FUSE UNITS & ALL ELECTRICAL ITEMS FOR TWH FROM CUSTOMER'S POWER SUPPLY POINT.
D. TROLLEY WITH HOIST - CAP.2.0 TONS; LIFT -12.7 M

VARIANT No#	ITEM No#	DESCRIPTION	STD	DRAWING NUMBER	ITEM No# / VAR No#	MATERIAL CODE / MATERIAL SPECN	A/C/P	UNIT / DI	UNIT WEIGHT / QUANTITY	GS	ZONE
	02	DSL-CABLE TROLLEY TYPE. LENGTH: 29.800M							400.000 / 1		
	01	TWH-01 ELEC.; CAP: 2.0T LIFT: 12.700M							800.000 / 1		

CUSTOMER NO. 1729, 1730

PROJECT: 2 X 660MW UDANGUDI SUPERCRITICAL TPP - STAGE I

OWNER: TAMILNADU GENERATION & DISTRIBUTION CORPORATION LIMITED
5TH Floor,Western Wing,NPKRR Maaligai
144,Anna Salai,Chennai-600002.

OWNER'S CONSULTANT: DESEIN PRIVATE LIMITED
DESEIN HOUSE, GREATER KAILASH-II, NEW DELHI

BHARAT HEAVY ELECTRICALS LIMITED
NEW DELHI
UNIT : BOILER PLANT UNIT; TIRUCHIRAPALLI - INDIA-620 014
EQUIPMENT: STEAM GENERATOR

	NAME	SIGN.	DATE
DRAWN	R S YADAV	Sd..	28.11.2018
CHECKED	SAURABH	Sd..	28.11.2018
APPROVED	NOORUL FAZIL	Sd..	28.11.2018

TITLE: SCAPH HANDLING ARRANGEMENT

ALL DIMENSIONS ARE IN MILLIMETERS

PROJECTION	SCALE	SHEET	BHEL DRAWING NO.	REV
	1:80 1:80	1 OF 1	1-99-400-40910	01

REV	DATE	ALTERED : SAURABH KR.
01	08.01.19	CHD & APPD :SRINIVAS A.

ZONE: DRAWING REVISED TO INCORPORATE CUSTOMER COMMENTS FURNISHED IN 5th ERM HELD AT BHEL-TRICHY FROM 7TH TO 9TH JAN 2018.

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