TECHNICAL PRE-QUALIFICATION REQUIREMENT (PQR) FOR ELECTRIC WIRE ROPE HOIST (IN CASE OF OPEN TENDER)

SL NO	Technical Pre-Qualification Requirement (PQR) for FOR ELECTRIC WIRE ROPE HOIST	Bidder's Reply with Supportive documents
1	Vendor should be a manufacturer of Crane / Hoist.	
	List of customer to whom Electric Wire rope Hoist / Underslung Cranes / EOT Cranes / Cranes of same capacity or higher supplied to silo/bunker application, FGD application, Coal fired Power plant, Industrial application, Nuclear power plant.	
	Minimum one number of Previous inspection and test report to be furnished for the same capacity or higher Capacity for Highest Capacity Hoist as per Enquiry, along with Previous purchase order of same item.	

Bidder's Seal & signed

1367585/2023/BAP-9762_FGD

TECHNICAL SPECIFICATION
OF
ELECTRIC WIRE ROPE HOIST (EWRH) WITH TROLLEY

Buyer(Purchaser)	:	M/s.BHEL
Application	:	Wet Limestone Flue Gas Desulphurization

Bharat Heavy Electricals Limited
Ranipet – 632 406

REV	DATE	DESCRIPTION	PREPARED	APPROVED
00	17-03-2023	Fresh Release	Jyotish Kumar Patel JYOTISH KUMAR PATEL (DM/EDC-FGD)	KESAVAN V (SDGM/EDC-FGD)

CONTENTS

1.0	INTENT OF SPECIFICATION
2.0	SCOPE
3.0	CODES AND STANDARDS
4.0	DESIGN REQUIREMENT
5.0	FEATURES OF CONSTRUCTION (MECHANICAL SYSTEM)
6.0	ELECTRICAL SYSTEM
7.0	EARTHING
8.0	MAKE OF COMPONENTS
9.0	PAINTING PROCEDURE
10.0	WARRANTY
11.0	STARTUP &COMMISSIONING SPARES, RECOMENDATED SPARE
12.0	SUPERVISION OF ERECTION,TESTING AND COMMISSIONING
13.0	DOCUMENTS DURING BID STAGE
14.0	DOCUMENTS ON PLACEMENT OF ORDER
15.0	INSPECTION
16.0	O&M MANUAL
17.0	PACKING
18.0	NAME PLATE
19.0	MARKING
20.0	ANNEXURES

Bidder sign & seal:

1367585/2023/BAP-9762_FGD

1.0. INTENT OF SPECIFICATION

This specification covers design, manufacture, inspection, testing at bidder's and/ or his sub vendor's work(s), packing, and transportation of ELECTRIC WIRE ROPE HOIST along with accessories etc. which is to be furnished in the Flue Gas Desulphurization plant.

a. It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to Purchaser/ Customer, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance herewith.

b. The requirement(s) specified under different sections of this specification shall be considered while quoting for this tender.

c. The bidder shall be deemed to have understood completely all the tender drawings and documents and quoted accordingly.

d. The bidder has to note carefully the parameters, estimated capacities of equipment indicated and the tender drawing in the specification are only for guidance of the bidder. The system shall be designed as per relevant standards/ codes and exact capacities and quantities are to be estimated by the bidder. All such estimations and design calculations shall be submitted for Purchaser's approval.

e. Contract shall be unit rate basis for this package. Variations in quantities during contract stage shall be settled on basis of unit rate quoted by the bidder in the tender. During contract stage, quantities of various items of BOQ may vary to any extent and same unit rates will be applicable.

f. Deviation: There shall preferably be no deviation on technical specification. In case of any deviation, the bidder shall indicate separately the deviations clause-wise with respect to the specification in the 'Schedule of Deviation' given in **ANNEXURE-A**. Deviations in any other form including clarifications / assumptions / etc will not be considered and it will be construed that the bid conforms strictly to the specification.

g. Compliance to this specification shall not relieve the Bidder of the responsibility of furnishing equipment and accessories/auxiliaries of proper design, materials and workmanship to meet the specified start up and operating conditions.

h. All accessories, items of work, though not indicated but required to make the system complete for its safe, efficient, reliable and trouble free operation and maintenance shall also be in supplier's scope unless specifically excluded.

i. **Special Note: In case of variance between sections, the requirement of CUSTOMER TECHNICAL SPECIFICATION shall prevail. Customer contract specification of HOIST is provided as ANNEXURE - C to the specification & shall be referred strictly.**

Bidder sign & seal:

2.0 **SCOPE:**

This specification covers the design, material constructional features, manufacture, testing, inspection, packing, supervision for erection & commissioning and supply of electric wire rope hoists assembly, with cross travel complete in all respect including control box, flexible trailing cable, festooning arrangement of feeding power to trolley assembly (cable trolleys), drag chain, auxiliary girder, FUSE-SWITCH unit etc. The assembly shall be complete in all respect ready for erection & commissioning.

2.1 **APPLICATION**

The electric wire rope hoists and trolley are meant for handling for equipment installed at Flue Gas desulfurization plant.

2.2 **SCOPE OF SUPPLY OF HOIST**

Each Electric wire rope hoists should necessarily consists of the following items:

Capacity : As per Enquiry
Maximum trolley travel speed for electric hoists : As per Annexure-C (Customer Spec)
Maximum trolley hoisting speed for electric hoists : As per Annexure-C (Customer Spec)

S. No	Description	Unit	**FOR EACH ELECTRIC WIRE ROPE HOISTS**
1	EWRH assembly for lifting & cross travel including brakes, drum with ropes suitable for required height of lift, electrical control panel, Pendant PB with control cable with link chain suitable against each EWRH capacity, Height (H), Length of travel (L) & Radius (R) as per As per Annexure-D (Hoist Details) & Layout GA as per Enquiry.	ST	As Per Enquiry
2	Fuse with enclosure suitable for outdoor installation, wall mounted Per Crane	NO	1 for Each Hoist
3	Trailing flexible copper cable for power supply	MR	To suit for Each Hoist
4	Galvanized link drag chain	MR	To suit for Each Hoist
5	Cable trolley assembly	ST	To suit for Each Hoist
6	Auxiliary girder assembly for trailing cable for a cross travel length	MR	To suit for Each Hoist
7	Rain hood for Hoist motor, cross travel motor and control box per Hoist	ST	1 for Each Hoist
8	Grease gun with grease	NO	1 for Each Hoist
9	10 % lubricant	ST	1 for Each Hoist

2.3 **DESIGN & CONSTRUCTIONAL REQUIREMENTS**

Construction of Electric wire rope hoists with Trolley shall be of consistent capacity, lift, head room, Hoist & Trolley speed, Travel Length, radius of Travel, Monorail beam size and any other parameters as specified in **Annexure-D** (Hoist Details) and **Annexure-F** (GA layout drawing).

Note: Vendor has to design Hoist Headroom as minimum as possible. The Hoist Headroom value shall be specified in Vendor technical offer itself.

Bidder sign & seal:

3.0 **CODES AND STANDARDS**

The applicable codes and standards are as given below (with latest amendments if any) / equivalent international standards.

3.1.0	Electric wire rope hoist	: IS 3938
3.2.0	Service class	: IS 807
3.3.0	Drum, Sheave	: IS 3938
3.4.0	Gears	: IS 3681,IS 7403
3.5.0	Rope	: IS 2266
3.6.0	Hook	: IS 3815
3.7.0	Bearings	: IS 6455,IS 6457
3.8.0	Grease nipple	: IS 4009
3.9.0	Motor	: IS 325,IS 4691,IS 4729
3.10	Cables	: IS 694 Part I&II,IS 3961 IS 1554,IS 9968,IS 6380
3.11	Structural materials	: IS 2062
3.12	Earthing	: IS 3043
3.13	Colour shade	: IS 5
3.14	AC Contactors	: IS 13947 Part - IV
3.15	HRC Cartridge fuse links upto 650V	: IS 9224
3.16	Heavy duty air brake switches and composite units for air brake switches and fuses for voltage not exceeding 1000V	: IS 4064
3.17	General requirements for switchgear and control gear for voltage not exceeding 1000 V	: IS 4237
3.18	Control switches for voltage upto and including 1000 V AC, 1200 V DC (Part-I&II)	: IS 6875
3.19	The offered Hoist shall comply with all the latest statuary regulation and safety code/standard applicable. Nothing in this specification shall relieve the vendor of his responsibility.	

4.0 **DESIGN REQUIREMENT**

The Electric wire rope hoists shall be designed and constructed in accordance with the latest revision of **IS: 3938** and shall be suitable for **Duty class 2**.

Electric wire rope hoists and trolley shall be complete with hoisting and cross travel motor, wire rope drum, wire rope, hook, gear box for CTs hoist wheels with Trolley necessary gearing, sheaves, shoe type electro Mechanical Type brakes with asbestos lining for hoisting & cross travel, guides, weather and dust proof pendent push button station, & control panel, all wiring, 4 core Power cable with Festoon arrangement of feeding power to trolley assembly, galvanised drag (link) chain with complete supporting arrangement, pendent cable, limit switches, earthing terminals and other accessories to make system complete and ready for erection & commissioning. The hoist assembly shall be fully balanced. Counter weight, if any, required shall

Bidder sign & seal:

be supplied as a part of the system. Limit switches shall be provided for over hoisting, over lowering and for cross travel limits at both extreme position.

The supplier shall provide 63A fuse switch unit (FSU) with enclosure designed for IP 55 degree of protection, to receive the power supply. The FSU shall be provided with crimping type ATC lug to receive owner's Aluminium unarmoured power cable. The FSU shall be located 5meters away from the hoist. Control supply shall be 110V AC, 50Hz and the same shall be derived from 3ph, 415V, and 50Hz supply provided at 63A FSU. Suitable earthing terminal shall be provided in the FSU enclosure for terminating the earth conductor of the flexible trailing cable. All outdoor Electrical equipment's shall be suitable for IP 55 Degree of protection. 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.

5.0 FEATURES OF CONSTRUCTION (MECHANICAL SYSTEM)

5.1 DRUM

Rope drum shall be either cast/seamless/welded to sustain concentrated loads resulting from the rope pull. Drum shall be machine grooved right or left or both with grooves of a proper shape to suit the ropes used. Drum shall accommodate all the length of the rope required for the lift plus two dead wraps at each anchor point, without over lapping. Each end of the rope shall be anchored to the drum in such a way as the anchorage is readily available for maintenance Each rope shall have two (2) full turns of the drum when the hook is at its lowest position and one (1) spare groove when the hook is at its highest position. The leading rope taken by the drum should not slope sideways when slack and it should not be caught between the gear wheel.

5.2 BOTTOM BLOCK

The bottom block shall be of enclosed type and shall have guard against rope jamming in normal use. It shall have standard forged swivel shank hook fitted on antifriction thrust bearing. Lock to prevent hook from rotation and locking arrangement to prevent accidental unlocking shall be provided. Pulley of the bottom block shall be provided with antifriction bearings.

5.3 SHEAVES

Rope sheaves shall be cast steel, cast steel, or mild steel as suitable for the Duty conditions and shall be confirm the relevant IS. Grooves shall be machined to the proper shape for the rope used. Sheaves shall be equipped with sheave guards to retain the rope in groove. Sheaves shall be fully guarded so that the rope cannot come off.

When the load is supported by more than one fall of the rope off the drum and bottom block are used, the rope system shall be equalized by using equalizing sheaves.

5.4 GEARS

Gears shall be cut from quality alloy steel of chromium, nickel. Pinions shall be of heat treated alloy steel.All gears and pinions shall be of hardened and tempered steel with machine cut teeth in metric modules. Surface hardening of steel is not acceptable.

Bidder sign & seal:

5.5 **BEARINGS**

All running shafts and wheels shall be fitted with ball / roller bearings with a rated life not less than 20 years based on equivalent running time as per IS:3938.Bearings shall comply with relevant IS/BS. depending upon the capacity and loading conditions the manufacturer shall design suitable grease lubricated or oil lubricated bearings.

5.6 **ROTATING AND STATIONERY SHAFT**

Shafts and axles shall be of 080 M40 as per BS 970

5.7 **LUBRICATION**

The hoists shall be supplied with all required lubricants, one number grease gun shall be supplied.

5.8 **HOIST ROPE**

Hoist ropes shall be of extra flexible steel rope with a well lubricated and having six strands of 36 wires per strands, pre-formed type, hemp cored, and regular lay construction. The rope shall be of sufficient length so that two full wraps shall remain on the drum at the extreme low position of the hook. Braking loads for the hoist rope shall not be less than six times the calculated load in the ropes at the drum, based on rated load on hook plus the weight of the bottom block plus the weight of the rope. Hoisting rope shall confirm to IS 2266.The rope shall be hot dip galvanized. The rope shall be free from kinks and shall be continuous. **Minimum number of falls of rope shall be four (4)**. Reverse bend of ropes is not acceptable.

5.9 **HOOK**

Swivelling type forged circular shank section Hooks shall be solid, forged, heat treated, high tensile steel of tough construction and shall be provided with a standard depress type safety latch. It shall have swivels and operate on bearings with hardened race. Lock to prevent hooks from unscrewing shall be provided. Hook shall be confirm to the relevant Indian standard.The materials Hooks shall be as per relevant Indian standard.

5.10 **BRAKES**

Hoisting motor and trolley motor shall be equipped with Electro Mechanical type with asbestos lining. The brakes shall apply when either the motor starter or the main power switch is in OFF position or in the event of "power failure". The braking capacity of the brakes shall be 150% of the rating of the hoist.

5.11 **ROPE GUIDE**

Rope guides shall have wear resistant property, prevents slack rope, and retains wire rope in the barrel grooves.

5.12 **TROLLEY WHEELS**

Trolley wheels shall be of single flange type in the taper treads. The wheels shall be mounted on antifriction bearings and shall be easily removable for repair/ replacement.

Bidder sign & seal:

5.13 **LINK (DRAG) CHAIN**

Hot dip Galvanised Link (drag) chain shall be provided for the Flexible Trailing cable, to avoid direct loading on the cable.

5.14 **AUXILIARY GIRDER FOR TRAILING CABLE**

Auxiliary girder system shall be provided for the support of Festoon arrangement of feeding power to trolley assembly. The Trolleys for the trailing cable shall be supported by the Auxiliary Girder. The Auxiliary Girder will be supported by the main beam (main beam will be supplied by the Purchaser). The hoist supplier shall provide obligatory support materials to support the Auxiliary Girder on the main beam at an interval not exceeding 750mm. complete structural materials required for Auxiliary Girder system shall be included in the scope of supply of the hoist supplier.

5.15 **MOTOR OPERATED GEARED TROLLEY**

Motor operated geared trolley shall have two (2) pairs of wheels, one pair of which shall be driven through motor. Trolley for cross travel shall be designed to accommodate a wide range of I-beams and shall Trolley shall be capable of travelling on straight as well as curved monorails with the design being such to maintain uniform distribution of pressure on the flanges.

6.0 ELECTRICAL SYSTEM

Electrical system comprises of 63A Fuse Switch Unit/MCB, Control panel, Pendent Push Button Station, Trailing cable, Pendent cable, Hoist & Cross travel motors with electro mechanical brake etc., to make the system complete. All these items are included in the scope of supply of the vendor.

6.1 **CONTROL PANEL**

Control panel shall be provided to house the electrical components like fuses, contactors, over load relays, isolators, switches, control supply transformers etc along with necessary wiring. The components shall be clearly identified by labels. The panel shall be made of sheet steel of minimum 2mm thick CRCA sheet steel and shall be dust and vermin proof, suitable for outdoor condition. The control panel shall be designed for IP 55 degree of protection. Adequate number of DOUBLE COMPRESSION type cable glands (heavy duty) of brass with nickel plating and Annealed Tinned Copper lugs shall be provided with dummy plugs. The door, removable cover plates and metal- to-metal joints shall be fully neoprene gasketted. The control panel shall be wall mounted type & easily approachable from the floor by a standing man.

6.2 **CONTROL SUPPLY TRANSFORMER**

Dry type step down control supply transformer 415V/110V AC shall be provided to derive control supply for starter operation and indication. The transformer shall have minimum class 'B' insulation. The rating of the transformer shall be decided based on maximum power consumption plus **25% margin**. The transformer shall meet IS 12021

Bidder sign & seal:

6.3 **MOTOR**

The motor shall meet IS 325 or equivalent international standards. The motor shall be designed for frequent reversal, braking and acceleration. Frequency of reversal shall be minimum 150 times/hour. The motor shall be rated for S4 duty 40% cyclic duration factor. Maximum continuous rating shall have **at least 10% margin** over maximum load demand including voltage and frequency variations, temperature rise and other variations. The body shall have two earthing points on opposite sides. For electric hoists, trolley movement and hoisting shall be effected by using two separate motors.

6.4 **ENCLOSURE**

The motor shall be provided with an enclosure fully meeting the requirements of IP 55 as per IS 4691 meant for outdoor service. In addition rain-hood shall be provided for the motors. The motor shall be Totally Enclosed Fan Cooled (TEFC) type

6.5 **INSULATION AND WINDING**

Motors shall have minimum class "B" type insulation. The winding shall be suitable for successful operation in hot, humid, & tropical climate with the ambient temperature of 50 degree centigrade. The temperature rise shall be limited to 70 degree C (by resistance method) over an ambient of 50 degree C. The insulation shall be given fungicidal and tropical treatment as per IS 3202.

6.6 **MOTOR FRAME**

The frame shall be cast and rigid.

6.7 **DIRECTION OF ROTATION**

The motors shall be designed for both directions of rotation.

6.8 **TERMINAL BOX OF MOTORS**

The terminal box shall be weather and water tight and suitable for outdoor service, having a degree of protection of IP 55.It shall be provided with removable front cover for making connections. Neoprene gaskets at cover joints shall be provided. The terminal box shall be suitable to withstand 31 MVA for 0.25 seconds without damaging the box with fuse protection. Nickel-plated brass double compression cables glands and ATC lugs shall be provided to receive the power cables.

6.9 **VIBRATION**

The motor vibration and noise shall be within the limits specified in IS 12065 and IS 12075. The noise level shall be limited to 85 dB when measured at a distance of 1.5m from the Hoist assembly.

Bidder sign & seal:

6.10 **SWITCHES**

Heavy-duty power switches with quick make and brake mechanism meeting relevant IS requirements shall be provided. The switches shall be adequately rated to get complete protection even under abnormal operating conditions.

6.11 **CONTACTOR**

All Contactors shall be suitable for DOL application of full voltage with coils suitable for the control voltage provided by the supplier. Contactor construction shall be rugged and such as to avoid ingress. For control purpose, only Auxiliary contactors shall be used. Relays are not acceptable in place of Auxiliary Contactors. The power contactors shall heave Mechanical interlocking in addition to Electrical interlocking so that at any point of time only any one of the two Power contactors (either Up of Down, Left or Right) will be energized.

6.12 **THERMAL OVER LOAD RELAYS**

Thermal over load relays wherever provided shall be ambient temperature compensated with suitable setting ranges. The relay shall be provided with a door mounted hand reset push button. The O/L relay shall have inbuilt single phasing protection as built-in feature.

6.13 **FUSES**

Only HRC fuses of plug-in type with Class-4 AC duty shall be provided. Fuse base shall be rugged. Adequate shrouding shall be provided for live accessible parts and it shall be possible to replace any fuse without damages of contacts when the circuit is alive.

6.14 **INDICATING LAMPS**

LED type indicating lamps of low watt consumption with suitable built-in series resistor shall be used. LED and lenses shall be inter-changeable and easily replace- able from the front. The indication lamps shall be properly shrouded so as to prevent the dust and water entry. Indicating lamp shall be provided for “Hoist motor ON”,”CT motor ON”, ”Hoist motor TRIP”, ” CT motor TRIP”, “Supply ON” etc.,

6.15 **WIRING**

The control panel wiring shall be complete in all respects and ready for connection of external power for terminating external cables. Necessary cable glands along with suitable terminal blocks and lugs to receive trailing cable and pendent push button cable shall be provided. The cable glands, lugs and terminal blocks shall not be supplied loose. Point to point wiring shall be adopted. Not more than two wires shall be terminated at each terminal. Wiring shall be neatly laid out and bunched together suitably. The wiring shall be done with min. 2.5 sq.mm multistranded copper, PVC insulated 650V/1100V wires.

Bidder sign & seal:

6.16 **TERMINATION**

All power and control wires shall be terminated on terminal block/component using crimping type tinned copper lugs/connectors.

Terminal block shall be used for control wiring. The terminal blocks shall be complete with insulated barriers, terminal studs, washers, nuts, lock nuts and identification strips with terminal numbering.

6.17 **PENDANT PUSH BUTTON STATION**

Pendant shall be provided with flourscent up, down, forward, reverse travel & Emergency stop push buttons. The Emergency Pus Button shall be Lockable type. Its power supply shall be limited to 24V AC.The Pendant Push Button station shall have the following LED type Indicating lamps. SUPPLY ON, HOIST MOTOR ON, CT MOTOR ON, HOIST MOTOR TRIP, CT MOTOR TRIP, EMEGENCY STOP.

The Pendant Push Button station shall be supported from the Control Panel with hot dip galvanized Link Chain.The Pendant Push Button Station shall be connected to the Control Panel using multi-core copper flexible control cable of 10m length.The Enclosure of Pendant Push button station shall be designed for IP 55 degree of protection.Push button shall be spring return type with 2NO+2NC self reset contacts rated for 5A at 415 volts AC.The push buttons for different operations like “HOIST/ LOWER, FORWARD/ REVERSE”, “STOP” shall have different colours. All push buttons shall be as per relevant Indian standard. The Push button shall be properly shrouded so as to prevent water & dust entry.

6.18 **LIMIT SWITCHES:**

Limit switches shall be provided for over hoisting, over lowering, extreme left and extreme right positions. Necessary Limit switch actuating arrangement shall be provided to actuate the limit switch at the above positions. The Limit switches shall have enclosures designed for IP 55 degree of protection. Proximity switches are not acceptable in place of Limit switches.

6.19 **FUSE SWITCH UNIT**

Metal enclosed, FOUR/THREE POLE as suitable fuse switch unit (SFU) of 63A, 415V, AC, rating suitable for indoor location shall be provided. Suitable Nickel-Chromium plated brass DOUBLE COMPRESSION glands and crimp type ATC lugs to receive purchaser's 3c-6 sq. mm AL unarmoured FRLS cable & vendor’s 4C-4 sqmm copper unarmoured cable shall be provided. Cable glands and lugs shall also be provided for the flexible trailing cable. The FSU shall be provided with 2 Nos of earthing terminals with M12 screws, nuts and washers. FSU with enclosure suitable for outdoor installation, **Wall mounted**.

6.20 **CABLES**

The trailing cable shall be 1100 V grade extra flexible having 4 cores and as per IS 9968. The trailing flexible cable shall carry the power supply to the Hoist from the Switch Fuse unit. The conductor cross section shall be minimum 4 sq.mm multi- stranded tinned copper of class 5 of IS

Bidder sign & seal:

8130. The insulation shall be heat resistant elastomeric compound based on ETHYLENE PROPYLENE RUBBER **(EPR)** with continuous withstanding temperature of 90 Deg C The inner sheath shall be heat resistant elastomeric compound with black colour. The outer sheath shall be marked with cable size, voltage grade by embossing, sequential marking at every one meter of length by embossing.

The power cables between HOIST / CT MOTORS to control box, the pendent cable and other control cables shall be as per IS 1554. The conductor shall be multi- stranded PLAIN ANNEALED copper with minimum cross section of 1.5 sqmm for control. The insulation shall be extruded PVC. The inner sheath shall be extruded PVC and the outer sheath shall be extruded-PVC. In addition, the outer sheath shall be marked with cable size, voltage grade, the word FRLS at every 5 meters and sequential marking of length at every one meter. The sheath shall be black in colour. Power cable supports shall be festoon type arrangement.

7.0 EARTHING

The structure, motor frames and enclosures of electrical equipment shall be effectively connected to earth complying with Indian Electricity rules and IS 3043. The earthing materials from hoist to FSU shall be in supplier's scope. BHEL will provide the earthing material from the Switch Fuse Unit to the nearest Earth Grid. Any other Items/components other than specified above, which are required for proper functioning of the Hoist are also part of the vendor Scope of Supply.

8.0 **MAKE OF COMPONENTS:**

Makes of all bought out items shall as per the Sub Annexure-2 of customer technical specification & data sheet of crane (ANNEXURE – C). Mix up of make for same item is not acceptable.

Make of various components for projects are subject to Customer approval. No additional delivery or price implication is acceptable due to Customer comment on make of components. Mix up of make for same item is not acceptable in any enquiry.

9.0 **PAINTING PROCEDURE:**

For Painting of Hoist Refer **ANNEXURE-E.**

10.0 **WARRANTY:**

The warranty period shall be twenty four (24) months from the date of Supply or eighteen (18) months from the date of commissioning, whichever earlier.

11.0 **START UP & COMMISSIONING SPARES:**

Start-up & Commissioning Spares shall be part of the main supply of the EWRH. Start-up & commissioning spares are those spares, which may be required during the start- up, and commissioning of the equipment/system. Bidder shall provide an adequate stock of such start up and commissioning spares to be brought by him to the site for the equipment erection and commissioning. The spares must be available at site before the equipment's are energized.

Bidder sign & seal:

Items/comenponets belong to a HOIST shall be send to site in a single packing as far as possible or traceable identical number mark needs to mention in sub-assembly /sub parts.

FIRST FILL OF CONSUMABLES:

Bidder's scope shall also include supply and filling of all chemicals, reagents, resins, lubricants, grease, filters and consumable items for operation up to COD including top up requirements at the time of issuance of PAC/declaration of COD. All lubricants proposed for the plant operation shall be suitable for all operating and environmental conditions that will be met on site consistent with good maintenance procedures as instructed in the maintenance manuals. First fill of consumable shall be part of the main supply.

RECOMENDATED SPARE

The Bidder shall offer electrical / electronic / mechanical spares for 2 years trouble free operation of the Electric wire rope Hoists. (Unit Price along with quantity of each item of spare shall be offered in the price bid)

12.0 Price of each item is to be given separately for **SUPERVISION OF ERECTION, TESTING AND COMMISSIONING**

Erection of EWRH will be done by owner as per vendor's Erection Manual and check List.
Supervision of Erection and Commissioning of the EWRH at project site is in bidder's scope. Bidder shall include towards supervision of erection, pre-commissioning & post- commissioning check-up, start-up, testing and trial runs. TA/DA, boarding and lodging shall be borne by the bidder and shall be inclusive in supply portion.

However, refer the **ANNEXURE- B** for complete supervision of Erection, testing and Commissioning EWRH.
The charges quoted for the supervision will be considered for L1 evaluation. However, BHEL reserves the right to engage the services of the bidder for supervision of E&C.

13.0 DOCUMENTS TO BE SUBMITTED DURING BID STAGE

Along with the offer

1. Clause by clause confirmation for this Technical specification.
2. In case, Deviations are considered essential by the Bidder (after exhausting all possible efforts), the same shall be separately listed, to be spelt out clearly in **Annexure-A.**
3. Typical GA of HOIST with BOM for the system.
4. Rating of cross travel and hoist motor.
5. Headroom of Hoist.

The bidders are instructed not to submit bidders' own technical specification and any other technical details.

Bidder sign & seal:

14.0 DOCUMENTS TO BE FURNISHED ON PLACEMENT OF ORDER:

Immediately on placement of order, the supplier shall submit the following Documents to BHEL for approval. Manufacturing shall be initiated only after obtaining approval from BHEL.

1. General Arrangement drawing of Hoist, Cross Travel arrangement, Auxiliary Girder & Trailing cable system, Control Panel, Pendant Push button station etc.
2. Bill of materials for the Hoist, Cross travel arrangement, Auxiliary Girder System, all cables under the scope etc.
3. Calculation for Factor of safety on selection of Steel wire rope.
4. Power and Control scheme.
5. Bill of material indicating description of the item, rating, make, quantity, type reference etc., for a) Panel mounted components, b) Pendent mounted components, c) Items covered in the system like trailing cable, trolley etc.,the make of components shall be separate and form part of vendor QP.
6. Hoist mounting arrangement.
7. Gasketting and locking arrangement of Control panel.
8. Justification for a) Motor rating selected, b) Rope selected, c) VA rating of control transformer.
9. List of items mounted in the assembly and list of loose item supplied along with weight.
10. Packing drawings.
11. Data sheet for Hoist, Data sheet for Hoist & cross travel motor, Data sheet for Brake and Data sheet for trailing & pendent cable.
12. Cable schedule for hoist indicating size, termination between which equipment, Rating, quantity, make etc.
13. Shipping list indicating items, quantity, and weight and package number to be submitted before inspection call is given. Despatch shall be maintained in line With the shipping list.
14. All the drawings shall be prepared in AutoCAD. After final approval the above documents shall be submitted in CD apart from hard copy.
15. The drawings and data sheets shall be submitted in soft media.pdf format, apart from 6 sets from hard copy. For BHEL approval.

Bidder sign & seal:

15.0 INSEPCTION:

The inspection will be carried out based on the following documents.

1. BHEL Purchase order
2. BHEL Technical specification
3. Quality plan, Quality checklist indicated in the Enquiry.
4. BHEL approved supplier drawing/data sheets.

16.0 O&M MANUAL:

O&M instruction manual in the required quantity as in enquiry shall be supplied directly to BHEL Ranipet in required numbers as per enquiry immediately after the despatch of the hoist. Instruction manual shall be submitted in soft media apart from hard copies. Hard copy of the O&M manual shall be sent along with the hoist. Ten (10) hard copies and five (05) sets of electronic copies of all documents are to be submitted in the English language.

The O&M manual shall include but not limited to the following.

1. Dos & Don'ts during receipt, storage, erection & commissioning.
2. Instruction to be followed on receipt, storage & erection.
3. Construction details of the hoist assembly.
4. Drawing indicating various parts of EOH assembly with part numbers.
5. Recommended lubrication & maintenance schedule.
6. Cut view drawing for the Gear box assembly.
7. As built drawings, BOM, cable schedule.
8. Disposal procedure for environmental hazardous material if any.

17.0 PACKING AND FORWARDING:

The ELECTRICAL HOIST and accessories shall be properly packed to avoid damage during transit & storage. Wooden crate (fumigated) shall be covered with GI sheet of minimum 1mm thickness and same shall be used for packing various equipment / items as per shipping list. Lining with plastic sheet (water Proof) shall be provided inside the crate to avoid water entry during transit / storage. Two sets of manual (hard copies) with drawing & data sheet shall be sent along with the packing box. Each packing shall be accompanied with packing slip & all relevant drawings.
Each package or shipping units shall be clearly marked or stenciled on at least two sides –

NTPC SITE (ADDRESS AS PER ENQUIRY), PO number, Supplier name. In addition, each package or shipping unit shall have the symbol painted in red on at least two sides of the package, covering one fourth of the area of the side.

Items/comenponets belong to a HOIST shall be send to site in a single packing as far as possible or traceable identical number mark needs to mention in sub-assembly /sub parts.

Bidder sign & seal:

18.0 NAME PLATE

The name plate shall be non-corrosive material (metallic) indicating manufacturer's name, serial number, rating, capacity type. Name plate to be written in English. Equipment identification number to be mentioned in the name plate. Hoists shall have permanent inscription in English on each side readily recognizable from floor level stating safe working load.

19.0 MARKING

As per IS 3938 latest.

20.0 ANNEXURES

ANNEXURE-A

LIST OF DEVIATIONS/EXCEPTIONS TO THE ENQUIRY DOCUMENT

Sl No	Clause No	Page No	Description of Deviation

Note: Enlarge the table to incorporate items

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

Bidder sign & seal:

ANNEXURES			**Bidders Acceptance / Comments**
ANNEXURE – A	**List of deviations / exceptions to the enquiry document**	Refer Enclosed specification.	
ANNEXURE - B	**Supervision of erection, testing and commissioning**	Refer Enclosed specification.	
ANNEXURE - C	**Customer technical specification & data sheet of crane**	Refer Enclosed specification.	
ANNEXURE - D	**HOIST details**	Refer Enclosed specification.	
ANNEXURE - E	**Painting of Hoist**	Refer Enclosed specification.	
ANNEXURE - F	**GA layout Drawing**	Refer Enclosed specification.	

SIGNATURE OF BIDDER ----------

NAME ----------

DESIGNATION ----------

Bidder sign & seal:

ANNEXURE-B

SUPERVISION OF ERECTION, TESTING AND COMMISSIONING

Price of each item is to be given separately for **SUPERVISION OF ERECTION, TESTING AND COMMISSIONING**

Erection of ELECTRIC WIRE ROPE HOIST (EWRH) will be done by owner as per vendor's Erection Manual and check List.

However, the Bidder/vendor shall make visit for the supervision of erection, pre-commissioning & post- commissioning check-up, start-up, testing and trial runs of all the items covered under the scope of supply.

The Bidder/vendor have to make two numbers of visit for the supervision erection & commissioning, testing for **Each electric Hoist** – 1st visit for the supervision of erection & 2nd Visit for pre-commissioning & post- commissioning check-up, start-up, testing and trial runs of all the items covered under the scope of supply for each Electric Hoist

SL NO	DESCRIPTION	QUANTITY (SET)
1	SUPERVISION OF ERECTION OF ELECTRIC WIRE ROPE HOIST AS PER SPEC FGD: EWRH:NALCO REV00 AT NALCO DAMANJODI SITE AS FRIST VISIT FOR EACH ELECTRIC HOIST.	As Per Enquiry.
2	SUPERVISION OF COMMISSIONING, INSPECTION AND TESTING OF ELECTRIC WIRE ROPE HOIST AS PER SPEC FGD: EWRH:NALCO REV00 AT NALCO DAMANJODI SITE AS SECOND VISIT FOR EACH ELECTRIC HOIST.	As Per Enquiry.

Vendor shall quotes charges for **complete work for supervision** for erection & commissioning, testing for each Electric Hoist.

Travel charges (visa/passport, all the to/fro travel charges to the site), TA/DA, boarding and lodging shall be borne by the bidder and shall be **inclusive in above supervision charges** portion for complete work for supervision for erection & commissioning, testing for each Electric Hoist.

The charges quoted for the supervision will be considered for L1 evaluation.
However, BHEL reserves the right to engage the services of the bidder for supervision of E&C.

Bidder Seal & Signed

ANNEXURE - C
- CUSTOMER TECHNICAL SCECIFICATION & DATA SHEET OF CRANE

SECTION-V

CRANES AND HOISTS

1.0 GENERAL

1.1 This section covers the design, engineering, manufacture, assembly, testing, packing, supply at site, storage at site, site handling, inspection, erection, testing and commissioning, carrying out performance guarantee tests and handling over of cranes and hoists for Boiler, Turbo generator and auxiliaries.

2.0 SCOPE OF WORK OF SUCCESSFUL TENDERER

The scope of work of the successful Tenderer with respect to cranes and hoists shall be generally in accordance with the relevant clauses of this section. The materials, equipment and services to be provided for the cranes and hoists shall include, but not be limited to the following:

2.1 Procurement of materials, manufacture/fabrication and supply of all equipment as specified in clauses 3.0 & 4.0 of this section.

2.2 All structural work complete with bridge girders, end carriage, crab frame as well as miscellaneous structures such as ladders, platforms, foot walks etc.

2.3 All mechanical equipment complete with hook, sheaves, rope drums, wire ropes, gear boxes, couplings, wheels etc.

2.4 All electrical equipment complete with motors, controls, VSD Panels, resistors, brakes, limit switches, isolator, etc. Complete cabling, lighting and earthing of all the electrical equipment with accessories etc.

2.5 Erection, testing and commissioning of crane, Hoists and crane power feeding system (DSL conductors).This includes the extension of DSL system in existing TG building and vice-versa.

2.6 Submission of As-built drawings (hard copies & soft copy), Operation & Maintenance Manuals, annual requirement of consumables and operating supplies such as grease, lubrication oil etc., along with brand names.

Bidder Seal & Signed

Section-V- Cranes & Hoists (cont'd)

2.7 Supply of spares for 2 years' normal operation and maintenance of the crane.

2.8 Submission of GA drawing of crane, hoist block with cross travel trolley, bridge girder selection/stress calculation, power & control circuit diagram and any other drawings/documents required by the Purchaser as indicated in Clause 10 of this section.

2.9 Supply of tools and tackles.

2.10 Makes of all bought- out items shall as per the Annexure-2.

3.0 REQUIREMENT OF EOT CRANES

3.1 One (1) No. Double Girder EOT Crane of 35/5 T capacity adequate to handle Turbo generator and its auxiliaries, during erection and subsequent maintenance, shall be required to be provided in the Turbo generator building of Power Plant. The crane span shall be so selected that the crane fits in the TG building and the crane hooks are accessible to all auxiliaries of TG to be handled. The crane shall have main and auxiliary hooks for lifting heavy loads at slow speed and light loads at higher speeds respectively. The technical parameters furnished below related to the above described Double Girder EOT crane.

Sl. No.	Description		
1.	Type	:	Double Girder EOT crane
2.	TG Building span, m	:	15.0
3.	Crane span, m	:	13.0
4.	Bay length of TG building, m	:	40.0
5.	Duty classification	:	M5, Indoor as per IS:3177, IS:807 & IS:800
6.	Purpose & Location	:	Maintenance of Turbo-generator and its auxiliaries in TG building (AB Bay)
7.	Gantry Rail level top, m	:	17.8
8.	Height of lift for MH, m	:	16.0

Bidder Seal & Signed

Section-V- Cranes & Hoists (cont'd)

3.	Capacity & Qty	:	3.0T & Two(2) No's	6.0T & One (1) No	4.0T & One(1) No	10.0T & One(1) No	3.0T & One(1) No	Tenderer to indicate& Two(2) No's	Tenderer to indicate& Three (3) No's
4.	Purpose	:	Mainten ance of ESP transfor mer	Maintena nce of PA fan	Maintena nce of FD fan	Mainten ance of ID fan	Mainten ance of trans-former	Maintenance of conveyor drive motor and bucket elevator drive motor	Mainten-ance of conveyor drive motor, screen and crusher
5.	Travel length & path, m	:	50.0, Straight & curved	30.0, straight	30.0, straight	30.0, straight	Tenderer to specify	Tenderer to specify	Tenderer to specify
6.	Duty classificatio n	:	Class 2, IS:3938	Class 2, IS:3938	Class 2, IS:3938	Class 2, IS:3938	Class 2, IS:3938	Class 2, IS: 3832	Class 2, IS: 3832
7.	Height of lift, m	:	+30.0	+12.0	+12.0	+12.0	+20.0	Tenderer to specify	Tenderer to specify
8.	Operating floor level, m	:	+0.0	+0.0	+0.0	+0.0	+13.50	Tenderer to specify	Tenderer to specify
9.	speeds								
	- Hoistin g, m/min	:	8	8	8	8	8	NA	NA
	- Travel, m/min	:	12	12	12	12	12	NA	NA
10.	Ambient temp, Deg C	:	50	50	50	50	50	50	50
11.	Operation through	:	Pendant push button unit	Pendant push button unit	Pendant push button unit	Pendant push button unit	Pendant push button unit	NA	NA
12.	Special require-ment, if any	:	Nil	Nil	Nil	Nil	Nil	Nil	Nil

In addition to the above, electric/mechanical hoists at other locations/areas, wherever, required shall be considered and the same shall be provided by the successful Tenderer.

Bidder Seal & Signed

flames. Two (2) spare clamps shall be provided on cable trolley for future requirement. The design of clamp shall be suitable for individual clamping of cables. Drag chain shall be provided in between cable trolleys to avoid stress on the cables while moving from one side to extreme side.

6.0 DESIGN BASIS FOR ELECTRIC HOISTS

6.1 Electric hoists shall be designed, manufactured and tested in accordance with the latest edition of IS: 3938 taking due note of various requirements laid down in this specification. The hoist shall be complete with drive motor, brake, limit switch, rope drum, gearbox, hoisting rope, rope guide, sheaves, hook block etc. The rope drum shall be deep grooved type and shall have adequate provision to prevent the rope coming off the drum. Trolley wheels shall be of forged/rolled/cast steel, single flanged tapered type with minimum hardness of 250 BHN. The trolley shall be provided with built-in type jacking device for jacking up the trolley in case of wheel removal. Opposite wheels of the trolley shall be positively driven. Gearboxes shall be oil lubricated and shall not be vertically split. Hoist block shall be provided with 4/2 rope fall arrangement. Power supply to the hoist block shall be through trailing cable system. Trailing cable system complete with guide beam, brackets, cable trolleys, cable etc.

6.2 The duty class of the electric hoist shall be Class-2 and the hoist shall be designed, manufactured and tested in accordance with the latest edition of IS: 3938. Both hoist and travel motions shall be operated from the operating floor level through push button station suspended from the hoist block. The geared trolley shall be suitable for moving on a straight or curved travel path of monorail depending upon the handling/operational requirement. The lifting capacity and lifting height shall be adequate for the purpose intended. All bearings shall be of anti-friction ball/roller bearings. No needle bearings and cast iron parts shall be used in the construction of hoists.

6.3 All motors shall be squirrel cage totally enclosed fan cooled, crane duty in IEC frame sizes with IP55 enclosure and shall conform to latest edition of IS: 9628. Motors shall be rated at 40% ED, duty type S4. Minimum pullout torque of the motors shall be 225% of the motor torque based on 40% ED rating. Hoist motor shall be foot mounted type with 6–pole construction and travel motor shall be flange mounted type. Travel motor may be of 4–pole construction.

Bidder Seal & Signed

Section-V- Cranes & Hoists (cont'd)

6.4 All motions shall be provided with brakes. Hoist brake shall be DCEM shoe type and CT brake shall be DC Disc type. Hoist motion shall be provided with one number rotary and one number gravity operated limit switch. CT and LT motions shall also be provided with two (2) no.s one way lever operated limit switches.

6.5 All control switchgears consisting of contactors, relays, fuses etc shall be enclosed in a dust tight cubicle mounted on the body of the hoist/operating platform. The enclosure shall generally conform to IP54 as per IEC.

6.6 The hoists shall be operated from pendant control units mounted on hoist body. Individual push buttons shall be provided for each direction of all motions and these shall be sufficiently shrouded to avoid inadvertent operation. Push button shall be metal enclosed of dust tight construction with 'START', 'STOP', 'HOIST' and 'LOWER" for hoist motion, with 'FORWARD' and 'REVERSE' for travel motion. Stop push buttons shall be lockable type.

6.7 Electricals

6.7.1 **Motors**

6.7.1.1 The motor shall be of totally enclosed fan cooled (TEFC) type for hoist and traverse and shall be suitable for operating on 415 V, 3-phase, 50 Hz AC power supply and shall conform to latest Indian Standard. All motors shall have anti-friction bearings. The motors shall be suitable for cranes duty, having a duty cycle rating of not less than 40% ED. They shall be class 'F' insulation with temperature rise limited to class 'B' insulation. Minimum pull-out torque of the motor at the rated voltage and frequency shall be at least 225% of the rated torque based on 40% ED rating. The motor shall be designed to withstand a safe running speed of at least 2 times synchronous speed. The hoist motor shall be designed for high starting

torque and frequent reversals. All motors shall have minimum six poles. Electric Hoist shall include 415V LT motors, 1.1kV grade cables, cabling accessories, pending push button station, earthing of all electrical equipment including earthing stations, lighting for all equipment covered under tenderer's scope of supply.

6.7.2 **Brakes**

The hoist shall be equipped with DC electromagnetic brakes both for hoisting and traversing drives. The hoist brake shall be so selected as to arrest and hold any load up to and including the test load (125% of the rated hoisting capacity) at any position of the lift, when the power supply to the motor is cut off or fails.

Bidder Seal & Signed

Section-V- Cranes & Hoists (cont'd)

6.7.3 **Limit switches**

One shunt limit switch to prevent over-hoisting and over-lowering shall be provided, in addition to one gravity operated limit switch for over-hoisting. The limit switch shall reset automatically by lowering of hoist by push button control.

Trolley shall also be provided with suitable limit switches. Limit switches shall be of heavy duty type.

6.7.4 **Controls**

6.7.4.1 The controls shall consist of moulded case (miniature) circuit breaker, heavy duty contactors, protective relays, fuses etc. in dust tight enclosures mounted on the body of the hoist and shall be easily accessible for repair and maintenance. All cables shall be brought to a terminal box and shall be clearly marked for identification.

6.7.4.2 The motor and controls shall be adequately protected and shall be so rated that the temperature rise above an ambient of 50^0C does not exceed the limits specified in the relevant Indian Standard Specifications.

6.7.4.3 All contactors shall be heavy duty type and shall be adequately rated to carry the rated current of the motors used for each of the drive. Directional contactors shall be interlocked electrically and mechanically. One suitably rated main line contactor with circuit breaker shall be provided for controlling the power supply to the hoist block. Power contactor shall be minimum 16 A (AC-3) rating.

6.7.4.4 Control circuit shall be designed for 110V AC conforming to IS: 3938. Duplicate transformers with manual change-over switch shall be provided. Necessary step-down transformer for reduced control voltage shall be provided.

6.7.4.5 Push-button station, metal enclosed, dust-tight construction and robust design with 'Start', 'Stop', 'Hoist' and 'Lower' buttons for the hoist motion and with 'Forward' and 'Reverse' buttons for the traverse motion shall be supplied. Stop push-button shall be lockable type. An emergency push-button with mush room type head shall also be provided for cutting power supply under emergency condition. An indicating lamp for 'Main Contactor ON' shall be provided. The push-button station shall be at a convenient height for operation from floor level and the multi-core control cables used for the push-button station shall be butyl rubber insulated with sheathing of PCP. The weight of pendant push-button station shall be supported independent of the electric cable by means of a chain or wire rope.

6.7.5 **Cabling**

6.7.5.1 All the fixed wiring for power, control etc., shall be carried out with 1.1kV grade heavy duty PVC insulated and PVC sheathed armoured copper cables laid on open racks and adequately clamped. If un-armoured cables are used, these shall be laid inside the cable troughs or shall run through conduits. Each motor feeder cable shall be laid in separate conduit.

6.7.5.2 Power supply to the hoist shall be through butyl rubber insulated PCP sheathed extra flexible trailing multi-core copper cable supported on rollers moving on a beam running parallel to the monorail on which the hoist will traverse. The trailing cable system shall be complete with guide beam, cable trolley, cable clamp, link chain, cable etc. A continuous earthing conductor shall be provided for the purpose of earthing. Electrical conductors of section smaller than 2.5 sq.mm copper shall not be used for power supply to the hoist or its motors. For wiring of hoist only copper cable of stranded construction shall be used.

6.7.5.3 Degree of protection of all electrical equipment enclosures shall be IP54.

7.0 DESIGN BASIS - MECHANICAL HOIST

All the mechanical hoists shall be designed, manufactured and tested in accordance with the latest edition of IS:3832 (Hand Operated Chain Pulley Block). The mechanical hoists shall be of a mono block type consisting of chain pulley block permanently suspended from a geared trolley suitable for moving on a straight or curved travel path of monorail depending upon the handling/operational requirement. Both hoist and travel motions shall be affected through pulling of hand chain over hand wheels. The lifting capacity and lifting height shall be adequate for the purpose intended. No cast iron parts shall be used in the construction of mechanical hoists. The cross travel trolley shall be fitted with wheels mounted on life lubricated antifriction bearings.

8.0 CABLING

All wiring for power, control, lighting etc. shall be carried out with 1.1 kV grade XLPE armoured cables except flexible cables where armouring shall not be provided. All power cables 10 sq. mm and above shall be of stranded aluminium conductor and size 6 sq. mm and below shall be of stranded copper conductor. Control cables shall be minimum 2.5 sq. mm copper. Cable cores shall be of stranded construction. All cables shall be laid on suitable size of GI cable trays.

Bidder Seal & Signed

Cable selection and routing on the crane shall form part of the crane design. Cable trays shall not be routed behind the panels as far as possible. Terminal connectors used shall be approved by the Purchaser. Cable selection shall take into consideration the ambient temperature specified, grouping factor, duty factor of the drive. The voltage drop on the crane shall not exceed 3% with the largest motor starting and the second largest running. Conduits and conduit fittings, if used on crane, shall be of standard design and shall be supplied with all accessories. Each motor shall be wired through separate conduits. Only 50% of the conduit inside space shall be occupied by the cables. All cables remaining live in open position of the isolator shall be shrouded separately. Cables carrying AC and DC power of different voltages shall be laid in different conduits. Power and control cables shall be laid separately and terminated in separate terminal boxes. For all flexible copper cables for cross conductor, double compression cable glands will be used.

9.0 EARTHING

The crane structure, motor frames and metal frames of all electrical equipment including metal conduits, cable trays etc. shall be effectively connected to the earth by independent earthing strips to conform to the requirements of the Central Electricity Authority (CEA) and Indian Electricity Rules. Equipment fed by flexible cables shall be earthed by means of spare core provided within the flexible cable. The earthing of the crane shall be effected through the fourth collector of the down shop leads. 50 X 6 mm GI strip have to be run throughout the walkway, repair cage, and for individual mechanism, motors, panels, resistor boxes, switches, junction boxes and all other electrical equipment have to be earthed with other GI strip/wire of adequate sizes. GI wires used shall be of stranded construction. The sizes of the GI strips selected for local earthing shall be approved by the Purchaser. Associated civil works related to earthing shall be included in Tenderer scope of work.

10.0 DRAWINGS AND DOCUMENTS

10.1 The Tenderer shall include in his offer for supply of all necessary drawings and other documents. The Tenderer shall specifically submit all the GA drawings/design & power calculations etc., for approval/information before taking manufacture of crane. The following drawings shall be submitted after the award of contract:

Bidder Seal & Signed

1. The detailed general arrangement drawing of EOT cranes (Double Girder & Single Girder), Electric wire rope hoists and Mechanical hoists with trolley containing all basic dimensions and all technical particulars of the equipment.
2. Crab assembly for DG EOT crane.
3. Structural Calculation for DG EOT Crane (Girder, End Carriage, Crab).
4. For EOT crane - Basis of selection of motor kW and brake selection, wire rope selection, sheaves, rope drum [Dia, length & shell], max & min LT wheel loads.
5. For Electric hoists - Sizing calculations includes motor selection, brake selection, wire rope selection.
6. Speed, torque characteristics curves for each drive/motion of crane.
7. Power & control circuit diagram for Crane.
8. Panel layout for Crane.
9. GA of crane DSL.
10. External wiring connection diagram for Crane.

11.0 TOLERANCES

The crane shall be manufactured as per the tolerance specified below.

a)	Span over LT wheels	:	± 6mm upto 40 Metres ± 7.5 mm above 40 Metres
b)	Diagonal on wheels	:	±5 mm
c)	Trolley track gauge	:	±3 mm
d)	Long travel wheel alignment (Horizontal and Vertical)	:	± 0.5 mm
e)	Tilt of wheels or balance axle	:	± 0.25 mm

Bidder Seal & Signed

f) Difference in height between trolley rails (H) in relation to the trolley track gauge (S) shall have the following tolerances:

S (mm)	H (mm)
Upto 2,500	4
2,500 to 4,500	6
Above 4,500	8

g) Speeds at full notch with rated load, voltage and frequency:

Hoist	:	± 10%
Lowering	:	+20%, -10%
Traversing	:	± 10%
Travelling	:	± 10%

h) Wheel load : ± 3% of the calculated value

Bidder Seal & Signed

ANNEXURE – 2-A

LIST OF PREFERRED VENDORS FOR BOILER AND TG PACKAGE

Sl. No.	Item		List of Vendors
I)	**MECHANICAL**		
1.	Fans And Accessories	:	ANDREW YULE/FLAKTWOODS/ ALSTOM/ BHEL
2.	Boiler Feed Water Pumps	:	KSB/ SULZER/BHEL
3.	Electrostatic precipitator	:	BHEL/THERMAX/ETS
4.	Pulveriser	:	BHEL
5.	Fuel feeder	:	SCHENCK/TRANSWEIGH/THERM-RAMSAY/KISTLER-MORSE
6.	Refractory	:	ACC (CALDERYS INDIA REFRACTORIES LTD)/ TATA REFRACTORIES/SAIL REFRACTORY
7.	Sample Coolers	:	BHEL/THERMAX /FORBESMARSHALL
8.	Bellows	:	ANUP ENGG./LONESTAR/FLEXICAN BELLOWS & HOSES PVT LTD.
9.	Air And Flue Gas Dampers	:	BACHMANN INDIA/FOURESS ENGINEERING INDIA LTD/KELD/BHEL
10.	Gear Box	:	ELECON/GREEVES/PREMIUM TRANSMISSION/ SHANTHI GEARS/TRIVENI/BHEL
11.	Geared Motors	:	PBL/REMI/SHANTHI GEARS/INTERNATIONAL COMBUSTION (I) LTD
12.	Couplings	:	EUROFLEX/FENNER/WELL MAN/RATHI/LOVE JOY/ROTEX/FLENDER
13.	Variable Speed Coupling	:	VOITH TURBO

Bidder Seal & Signed

Annexure-2A (cont'd)

Sl. No.	Item		List of Vendors
14.	Bearings	:	FAG/NTN/SKF
15.	Chemical Dosing System / Pumps	:	ENPRO/MILTON ROY/ASIA LMI/ SWELLORE/XL PUMPS AND SYSTEMS
16.	Chemical Dosing Equipment (Agitator, Flocculator, Flash Mixer)	:	REMI/DELKOR/FIBER & FIBER/CEECONS INDIA
17.	Deaerator	:	ALLIED ENGINEERING/TEMA INDIA/ GE GODAVARI/BHEL
18.	CBD / IBD TANK	:	SV ENGINEERING/ALLIED ENGINEERING
19.	Desuperheater	:	SAMASON/MAZDA/IMI-CCI/KOSO/SPX-FLOW
20.	Condenser	:	GEGODAVARI/L&T/MAZDA/TEMA/ BHEL
21.	Condensate Extraction Pumps	:	KSB/SULZER/KIRLOSKAR EBARA
22.	Gland Steam Condenser	:	MAZDA/L&T/BHEL/ESKAY
23.	Ejector	:	MAZDA/L&T/WIEGAND/ CHEMPROCESS
24.	Feed Water Heaters	:	TEMA INDIA / GE GODAVARI/ ALLIED ENGG/ /MAZDA
25.	Lube Oil System	:	SOUTHERN LUBRICATION/ENPRO INDUSTRIES/ PSI /LINCON HELIOS/TA HYDRAULICS / LEONARDO/BHEL
26.	Oil Purification System	:	ALFA LAVAL
27.	QCNRV	:	SEELAND ENGG/BHEL/WEIR/ ARMATURY
28.	Mechanical Seal	:	SEALOL/FLOWSERVE/BURGMANN
29.	Plate Heat Exchangers	:	ALFA LAVAL/KELVION INDIA/SWEP/IDMC

Annexure-2A (cont'd)

Sl. No.	Item	List of Vendors
30.	Lining	: AKZO NOBEL / KIRLOSKAR CORROCOAT / REMA TIP TOP
31.	Slurry Pumps	: WEIR / KSB / GRUNDFOS
32.	Wet Ball mills	: THYSSENKRUPP / FL SMIDTH / METSO MINERALS
33.	Horizontal centrifugal pumps	: KSB / KIRLOSKAR / SULZER / FLOW MORE
34.	Vertical sump pumps	: KIRLOSKAR / FLOW MORE
35.	Belt Vulcanizers	: NILOS / SHAW ALMEX / SYNERGY
36.	Belting	: DUNLOP / PHOENIX YULE / MRF / NORTH LAND / ORIENTAL / HINDUSTAN / YOKOHAMA
37.	Brake – Thruster operated	: ELECTROMAG / SIBRE / BUBENZER / ELDRO / JOHNSON BRAKE / STROMAG
38.	Brake – DC Electromagnetic	: ELECTROMAG / BCH / ELECTRONIC POWER CONTROL / STROMKRAFT
39.	Crusher	: L&T / TRF / ELECON / EASTMAN CRUSHER / MCNALLY SAYAJI /ECOMAN
40.	Idlers	: ELECON / TRF / L&T / KALI
41.	Pulleys	: ELECON / TRF / L&T / KALI
42.	Vibrating feeder	: ELECTROMAG / MCNALLY SAYAJI / IC / TRF / BHP / L&T
43.	Vibrating screen	: ELECON / MCNALLY SAYAJI / IC / TRF / BHP / L&T
44.	Chain pulley blocks	: INDEF / ANUPAM INDUSTRIES / BRADY & MORRIS / TRACTEL TRIFOR / ELECTROMECH / WMI / FAFECO / ARIMSEL MHE PVT LTD

Bidder Seal & Signed

ANNEXURE – 2-B

LIST OF PREFERRED VENDORS FOR UTILITIES

Sl. No.	Item		List of Vendors
1.	Pipes	:	TATA/BST/JINDAL/ /MAHARASHTRA SEAMLESS LTD/SAIL
2.	Pipe Fittings	:	N.L. HAZRA / SHYAM ENGG/M.S. FITTINGS / DEE DEVELOPMENT /TRUE FORGE/ TEEKAY TUBE /CHARGESON/VIVIAL FORGE PVT. LTD/ TUBE BEND /PROJECT TOOLING / ENGINEERING SERVICES
3.	Traps & Strainers	:	UNI KLINGER/ESCO/FORBES MARSHAL/ PENNANT
4.	Insulation	:	LLOYDS INSULATION/ROCKWOOL INDIA/ JAYASHREE INSULATORS
5.	Expansion Joints (Metallics & Non-Metallics)	:	METALLIC EXPANSION JOINTS – FLUIDYNE/LONESTAR / METALLIC BELLOWS/B.D ENGINEERS/ C.L ENGINEERS. NON-METALLIC EXPANSION JOINTS – KELD/ FLEXCON / CORI ENGINEERS PVT. LTD.
6.	Gaskets	:	CHAMPION/IGP/REINZ/TALBROS/ /UNIKLLNGER
7.	Hoses Including Rubber Steel Cladding	:	HYDROCRIMP/SENIOR INDIA/BENGAL INDUSTRIES/ PAREKH BROTHERS
8.	Gate, Globe & Check Valves		
i.	Valve Rating #800 And Above	:	BHEL/AUDCO/FISHER XOMOX SANMAR

Bidder Seal & Signed

Annexure-2-B (cont'd)

Sl. No.	Item		List of Vendors
ii.	Valve Rating Below #800	:	BHEL/AUDCO/KSB/FOURESS/ /FISHER XOMOX
9.	**Ball Valves**		
i.	Cast Iron	:	AUDCO/FOURESS/REYNOLDS/ VALTECH INDUSTRIES
ii.	Cast Carbon Steel	:	AUDCO/BDK/FOURESS/VIRGO/ FISHER-XOMOX SANMAR/ /REYNOLDS
iii.	Forged Steel	:	AUDCO/FOURESS/VIRGO/ REYNOLDS
10.	**Butterfly Valves**		
i.	Cast Iron	:	AUDCO/FOURESS/INTER VALVE (INDIA)/KSB
ii.	Cast Carbon Steel	:	AUDCO/FOURESS/INTERVALVE/ HI-TECH BUTTERFLY VALVES/ FLUID CONTROL EQUIPMENT
iii.	Forged Steel	:	AUDCO/BDK/FOURESS/ INTERVALVE/HI-TECH BUTTERFLY VALVES
11.	Plug Valves		
i.	Cast Iron	:	AUDCO/FISHER-XOMOX SANMAR/BHEL/KSB
ii.	Cast Carbon Steel	;	AUDCO/FISHER-XOMOX SANMAR/BHEL/KSB
iii.	Forged Steel	:	AUDCO/FISHER-XOMOX SANMAR/BHEL/KSB
12.	Other		
i.	Safety Valve/Pressure Relief Valve	:	TYCOSANMAR/AUDCO/ FAINGERLESER/ BHEL/ MAZDA
ii.	Pressure Reducing Valves	:	JNM/FISCHER XOMOX/ILP/MIL

Annexure-2-B (cont'd)

Sl. No.	Item		List of Vendors
iii.	Control Valves	:	JNM/FISCHERXOMOX/FISHER ROSEMOUNT/METSO/ R.K.CONTROL/TOSHNIWAL/ILP/ MIL
iv.	Pressure Release Valves	:	FISCHER XOMOX/AUDCO CROSBY
v.	Needle Valves	:	FISCHER XOMOX/TUFLIN/AUDCO
vi.	Float Valves	:	LEVCON/IVI/IVC/G.M.DALUI
vii.	Spring Supports	:	PIPE SUPPORTS / SUPPORTS SYSTEM /TECHNO INDUSTRIES
viii.	Valve Actuators	:	AUMA/LIMITORQUE/ROTORK CONTROLS
ix	Knife Edge Gate Valve / Double Eccentric Butterfly Valve	:	VAAS/FOURESS/KEY STONE/ JASH/VAG
x	Goggle Valve	:	FOURESS/JOSHI JAMPALA
xi	Positive Displacement Pump (For Fuel Oil)	:	UT / ROTO / TUSHACO / DELPD
xii	Strainer	:	HAWA / FLUID TECH / XICON /PRECEDENCY/ GROTTO
xiii	Oil Water Separator	:	K PACK SYSTEMS PVT. LTD, BANGALORE/ GRAND PRIX FAB PVT LTD HARYANA/ FIL SEP EQUIPMENTS PVT LTD GUJARAT

Bidder Seal & Signed

ANNEXURE – 2-C

LIST OF PREFERRED VENDORS FOR ELECTRICAL

Sl. No.	Item		List of Vendors
A.	**HIGH TENSION (HT) EQUIPMENT (INDOOR)**		
1	11 / 6.6 kV Vacuum Circuit Breakers (Indoor)	:	BHEL/SIEMENS/SCHNEIDER/ABB/ CGL/L&T
2	11/6.6 Kv PTs (Panel mounted type)	:	AEP/PRAGATI/SCHNEIDER/ PRAYOG ELECTRICALS/KAPPA /SILKANS/ABB/BHEL
3	11/6.6 Kv CTs (Panel mounted type)	:	AEP / PRAGATI / SCHNEIDER / PRAYOG ELECTRICALS/KAPPA/ SILKANS/ABB/BHEL
4	CT and PT (Outdoor type)	:	AEP/SCHNEIDER/CGL/NTL/ ABB/ GE
5	HT Busduct (Phase–Segregated)	:	C&S / ECC/KGSEL(STAR DRIVE)/ ENPRO/POWER GEAR/GE
6	Generator Transformer	:	ABB/BHEL/CGL/GE T & D INDIA LTD/EMCO/SCHNEIDER/SIEMENS/ TRANSFORMER & RECTIFIERS (INDIA) LTD/TOSHIBA
7	Generator Busduct	:	BHEL/C&S/GE/SCHNEIDER
8	HT Capacitors	:	BHEL/ABB/UNISTAR/MEHER/ EPCOS/PCPL/SAVIN/ GE/SCHNEIDER
9	11/6.6 Kv Vacuum Contactors	:	SCHNEIDER/BHEL/SIEMENS/ABB
10	11/6.6 Kv Lightning Arrestors & ZnO CR type surge suppressors	:	ELPRO / RAYCHEM / SCHNEIDER / SIEMENS AG (Imported)/PCEPPL/ABB
11	HT HRC Fuses	:	SCHNEIDER /PSPL(DP) / S&S / COOPER BUSSMAN/ SIEMENS/ABB /BHEL/JYOTI

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
12	Neutral Grounding Resistor	:	NARKHADE/PEFCO/ RESITECH/ NATIONAL/ LACHHMAN/GE
13	Outdoor HT Isolators	:	ELPRO (SIEMENS)/ALLIANCE / CONSOLIDATED/S&S/ TRANSELECTRICALS
14	Indoor HT Isolators	:	PSPL(DP)/A BOND STRAND / ESWARI/SIEMENS (13.1 KA, 800 A)
15	11 Kv and 6.6 Kv Power Transformers (Oil–filled) & Earthing Transformers	:	BHEL/CGL/SCHNEIDER/AREVA/ VOLTAMP/ KIRLOSKAR (KEC) /ABB/ SIEMENS
16	11Kv & 6.6Kv Cast Resin type power transformers	:	ABB/VOLTAMP/BHEL/KIRLOSKAR (KEC) /INDCOOIL/CGL/SIEMENS
17	11 Kv & 6.6 Kv Dry type power transformers	:	KIRLOSKAR(KEC)/ABB/BHEL/ VOLTAMP/BB/CGL
18	Winding and Oil Temperature Indicator	:	SKII/PRECI MEASURE/PRECISION INSTRUMENT/PERFECT CONTROL/ OSMADIAL
	a) Control and Relay Panel	:	SCHNEIDER/ABB/SIEMENS / GE
	b) Electromagnetic & Numeric Relay	:	SCHNEIDER/ABB/SIEMENS/GE
19	Magnetic Oil Level Indicator	:	SUKRUT/I&C/PRAYOG
20	Buchholz Relay	:	PRAYOG / ATVUS/VIAT/I&C/GE
21	On Load Tap Changer	:	EASUN / BHEL / CGL
22	Battery VRLA	:	CHLORIDE (EXIDE)/AMCO/ STANDARD/HBL–NIFE (SABNIFE)/ AMAR RAJA
23	Battery Charger	:	HBL–NIFE(SABNIFE)/CHHABI ELECTRICALS/CALDYNE/ AMAR RAJA
24	Power Socket outlets	:	BCH/INDO ASIAN/SCHNEIDER

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
B.	**MEDIUM VOLTAGE SWITCHGEAR AND CONTROL GEAR**		
1	L.T. Air Circuit Breaker Distribution Board, fully drawout, single front (including circuit breaker), for main substation (process)	:	L&T/SIEMENS/ABB/ SCHNEIDER/ GE
2	L.T. Busduct	:	ECC/C&S/BRIGHT ENGINEERS /POWERGEAR APE/GODREJ (SANWITCH TYPE) UNITED ELECTRIC/JACKSON / COSMIC/UNILEC/VENUS TRICOLITE/KGSEL(STARDRIVE)/ SCHNEIDER
3	415 V Air Circuit Breaker	:	SIEMENS/L&T/ABB / SCHNEIDER/GE
4	Moulded Case Circuir Breaker (MCCB)	:	SIEMENS/L&T/ABB / SCHNEIDER/GE
5	LT Switch board (semi drawout) for auxiliaries & Non process units	:	SIEMENS/L&T/SCHNEIDER/ABB/ GE
6	415V Motor Control Centre for process units	:	SIEMENS/L&T/ABB / SCHNEIDER/ GE
7	415V Motor Control Centre for non–process units/ Power Distribution Boards(Single front)/ Outdoor Distribution Boards	:	SIEMENS/L&T /SCHNEIDER/ABB/ GE
8	Power Distribution Boards (single front below 630A), Outdoor distribution boards (below 630A) and Lighting Distribution Boards	:	SIEMENS/L&T /SCHNEIDER/ABB/ GE
9	MPCB	:	SIEMENS/L&T/ABB / SCHNEIDER/ GE
10	Flameproof Switchgear	:	AY/FCG HITECH/ABB/ GE

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
C.	**MOTORS**		
1	HT AC Motor (1000 kW and above)	:	KEC/BHEL/CGL/MARATHON/ABB/ SIEMENS
2	HT AC Motor (200 kW – 1000 kW)	:	SIEMENS/CGL/KEC/BHEL/ MARATHON/ABB
3	Synchronous & Sq. Cage Motors above 3000 kW	:	BHEL/SIEMENS/ABB
4	LT AC Sq–cage induction Motor (General purpose)	:	SIEMENS/CGL/ABB/ MARATHON/ BBL/BHEL/ KIRLOSKAR
5	LT AC Motor (Flame proof)	:	KIRLOKAR (KEC)/CGL/SIEMENS / BBL /MARATHON/ABB
6	L.T. Geared Motor	:	KIRLOSKAR (KEC)/POWER BUILD/ IC/BB/SEW/FIMET/REMI/WEG/ ABB/SIEMENS
7	DC Motors	:	CGL/MARATHON/KIRLOSKAR/ BHEL /ABB/SIEMENS
D.	**DRIVES AND CONTROL EQUIPMENT**		
1	Converter duty cast resin transformer (6.6 kV)	:	BHEL/ABB/KEC/VOLTAMP/RPG RAYCHEM
2	Thyristor Converter Unit	:	BHEL/SIEMENS/ROCKWELL / SCHNEIDER/ABB/SCHNEIDER / NELCO/KEC/L&T/KELTRON
3	VVVF Drive	:	SIEMENS/ABB/ROCKWELL / SCHNEIDER/L&T/BHEL/CGL/GE–POWER
4	VVVF Drive (Flux Vector Control) – 2 level & 3 level Controller	:	ABB/SIEMENS/SCHNEIDER / HITACHI/ROCKWELL
5	Isolator	:	SIEMENS/L&T/SCHNEIDER/ABB
6	HRC Fuses	:	SIEMENS/SCHNEIDER/ABB/L&T/ GE POWER/BUSSMAN

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
7	AC Power Contactor	:	SIEMENS/L&T/BCH /ABB/ SCHNEIDER/GE–POWER
8	DC Power Contactor	:	BCH/BHEL/SIEMENS/ABB/L&T/ SCHNEIDER
9	Bimetallic Relay	:	SIEMENS/L&T/BCH/C&S/ABB/ SCHNEIDER/GE
10	Single Phase Preventer	:	L&T/MINILEC/SIEMENS/C&S/ABB/ SCHNEIDER/GE
11	Resistor	:	SIEMENS/BCH/RSI/PEFCO /ELECTROMAG/RESITECH / NARKHADE/KAKKU/INDUSTRIES SYNDICATE
12	L.T. Capacitor	:	UNISTAR/CGL/SCHNEIDER/SAVIN / KHATAU/MEHER/VPT/HAVELL'S/ PCPL/PE/AS/CEPL/EPCOS/ABB
13	Semiconductor Fuse	:	SCHNEIDER/SIEMENS/COOPER BUSSMAN/ABB
14	Thyristor	:	SIEMENS/BHEL/HIND RECTIFIER/ ABB
15	LT Vacuum Contactor	:	GE/SCHNEIDER/L&T / SIEMENS/ ABB
16	Soft-starter (LT)	:	ABB/ROCKWELL/SIEMENS / SCHNEIDER
17	UPS	:	GUJARAT HI-REL/SIEMENS/ EMERSON/KEC/DB ELECTRONICS/ L&T/IL KOTA/ABB/ APC
E.	**CONTROL DESKS AND CONTROL DEVICES**		
1	Control Desk / Control Panel / Control Station	:	SIEMENS/L&T/BHEL/SCHNEIDER/ GE/ABB
2	Control Switch	:	SIEMENS/KAYCEE/SCHNEIDER / L&T/VAISHNO/C&S/ABB

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
3	Push Button	:	SIEMENS/BCH/L&T/VAISHNO /C&S/SCHNEIDER/TECHNIC/ KAYCEE/ HOTLINE/ESSEN/ABB
4	Limit Switch	:	AG SYSTEMS/JAY BALAJI / TECHNOCRATS/KAKKU/SIEMENS/ BCH (may be considered only for light duty)/SCHNEIDER
5	Change Over Switch/Selector Switch	:	C&S/STANDARD/HHE/KAYCEE / SIEMENS/BCH/L&T / HAVELL'S/ ABB/SCHNEIDER
6	Discrepancy Control Switch	:	ABB/AG SYSTEMS
7	Timer/Time Delay Relay	:	BCH/L&T/SIEMENS/ABB/CGL/ EAPL/AG SYSTEM/GE/SCHNEIDER
8	Emergency Switch/Belt Sway Switch/Pull Cord Switch/ Belt Slip Switch	:	JSI/AG SYSTEMS/PB/JAI BALAJI/ BETA SYSTEMS/ IMSS/UIC/IS/ KAKKU
9	Semaphore Indicator	:	SIEMENS/SCHNEIDER/GE
10	Auxiliary Relay/ Control Contactor	:	SIEMENS/L&T/ABB/GE POWER/ SCHNEIDER/GE
11	Master Controller	:	SIEMENS/STROMKRAFT / ELECTROMAG/AG SYSTEMS/IS / PERFECT ELECTRICS/GE
12	Control Transformer	:	INDCOIL/SIEMENS/AEP/INDUSREE /KAPPA/UIC/BCH/UNIVERSAL MAGNETICS
13	Voltage/Power/Current/Frequency/Energy Transducers	:	ABB/SIEMENS/SCHNEIDER
14	Indicating Lamp (Including Cluster LED type)	:	SIEMENS/VAISHNO/TECHNIK/ BINAY/ESSEN/BCH/SWITCHING CIRCUIT/RISHAB/L&T/ABB/ SCHNEIDER
15	Temperature Scanner	:	APLAB/SYSTECH/MASIBUS/ECIL / ADVANI/ABB

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
16	Photo-cell transducer	:	SYSTECH/TSC/INSTRUMENT ENGG.
17	Hooter/Buzzer/Bell	:	GETCO/KHERAJ/EDISON/KAKKU
18	Solid State Annunciator	:	APLAB/L&T/PROCON/CONTROL AND DYNAMICS/PIRI/SEMUDA / MINILEC/ELECMECH/EAPL / SWITCHING CIRCUIT
19	Proximity Limit Switches (Non-contact type)	:	JSI/AG SYSTEMS/ROCKWELL /TELEMECHANIQUE/ACCENT/ SCHNEIDER/SIEMENS
20	Zero Speed Switches	:	JAYSHREE/TELEMECHANIQUE / AG MECHANICAL/KAKKU/ TECHNOCRATS/SIEMENS
21	Current Transformer	:	AEP/KAPPA/INDCOIL/SIEMENS/GE
22	Voltage Transformer	:	KAPPA / INDCOIL/SIEMENS/GE
23	Tachos/Encoders	:	SCHNEIDER/HUBNER/IFM / VURLEY–TELEDYNE/LEINE & LINDE/GLOBAL TECH
24	Pull chord and belt sway detection system	:	PARAMETERIC/JAYSHREE
F.	**PROTECTION RELAYS**		
1	a) Electronic Motor Protection Relays	:	L&T/SIEMENS/ABB/SCHNEIDER/ GE
	b) Microprocessor based Motor Protection Relays for LT Motors		L&T/SIEMENS/ABB/SCHNEIDER/ /GE
	c) Microprocessor based Protection Relays for HT Motors	:	L&T/ABB/SCHNEIDER/SIEMENS/ GE
2	Auxiliary Relays	:	ABB/L&T/SCHNEIDER/SIEMENS/ GE
3	Numerical Protection Relays (for HT system)	:	ABB/SIEMENS/SCHNEIDER/GE

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
4	Numerical Protection Relays (for LT system)	:	ABB/SIEMENS/SCHNEIDER / GE/SCHNEIDER/L&T
G.	**ELECTRICAL MEASURING AND TESTING EQUIPMENT**		
(i)	**ELECTRICAL MEASURING INSTRUMENTS**		
1	Ammeter/Voltmeter/Wattmeter/Var–meter	:	AEP/IMP/MECO/RISHAB/SIEMENS
2	Watt–hour meter	:	ALSTOM/BHEL/IMP/ RISHAB/ MECO/SIEMENS
3	PF meter	:	AEP/IMP/MECO/KAPPA/ RISHAB
4	Frequency meter	:	AEP/IMP/RISHAB
5	Multimeter	:	MECO/MOTWANE/RUTTONSHAW
6	Low resistance ohm–meter and kelvin double bridge	:	MOTWANE/AGRONIC/TOSHNIWAL
7.	Electronic energy meter	:	SCHNEIDER/SEMS/SATEC/PML/ L&T/SIEMENS
(ii)	**ELECTRICAL TESTING EQUIPMENT**		
1.	Insulation resistance tester	:	SHANTI/MOTWANE/MECO
2.	Earth resistance tester	:	SHANTI/UTMC
3.	Tong tester (AC/DC)	:	MECO
4.	Transformer oil testing set	:	NTPL/UDEY
5.	AC high voltage test set	:	AEP/AGRONIC/NTPL/UDEY
6.	DC hipot test set	:	NTPL
7.	Primary & secondary current injection relay testing set	:	AEP/NTPL/TOSHNIWAL/ALSTOM

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
8.	Cable fault locator & cable burn down instrument (for high resistance cable fault)	:	UTMC/SHANTI/APLAB
9.	Earth leakage current tester	:	NTPL/AEP
10.	Capacitance & tan delta measuring instrument	:	TELTEX AG (L&T)
11.	Phase Sequence indicator	:	AEP/MECO/NIPPEN
12.	Synchroscope	:	AEP
13.	DC Powerpack	:	ACESS ELECTRONICS
14.	Transformer winding Resistance Meter	:	SCOPE T&M PVT LTD
(iii)	**SPECIAL INSTRUMENTS**		
1.	Microprocessor based digital power meter	:	AEP/MECO/ALACRITY/DIGI
2.	Maximum demand meter	:	AEP
3.	True RMS' digital panel ammeter/voltmeter	:	AEP/MECO/ALACRITY
4.	Intelligent P.F. regulator	:	AEP/MECO/ALACRITY
5.	Computer aided cable fault analyser	:	APLAB/UTMC
6.	Transducer operated metering system	:	AEP
7.	Portable energy audit instrument	:	ALACRITY
8.	Energy meter Calibrator (ACCUCHEK)	:	SEMS
H.	**LIGHTING AND POWER WIRING EQUIPMENT AND ACCESSORIES**		
1	LED Lighting Fitting	:	PHILIPS/GE/BAJAJ/CGL/WIPRO/ HAVELLS

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
2	Flameproof LED Lighting Fittings and Accessories	:	BAJAJ/BALIGA/CGL/FLEX PRO/ PHILIPS
3	a) 240 V Switch Socket Outlet (10A & 20A)	:	HENSEL/HAVELL'S/BCH/ABB/ LEGRAND/INDO ASIAN/SCHNEIDER
	b) 415 V Switch Socket Outlet (30A, 63A & 100A)	:	BCH/ABB/HENSEL/LEGRAND/ INDO ASIAN/SCHNEIDER
4	Flame–proof Equipment	:	BALIGA/FLAME PROOF EQPT. MFG. CO./LUZ/CEAG/FCG HITECH /FLEXPRO
5	MCB	:	LEGRAND(MDS)/STANDARD/CGL/ SIEMENS/GE/HAVELL'S/MERLIN GERIN/ABB/INDO ASIAN/ SCHNEIDER
6	ELCB	:	LEGRAND(MDS)/SIEMENS/GE/ MARLINGERIN/HAVELLS/HPL/ HAGER /ABB/SCHNEIDER
7	MCB DB	:	LEGRAND(MDS)/HAVELL'S / MERLIN GERIN/SIEMENS/GE/ HPL/ ABB/INDOASIAN/SCHNEIDER
8	Single–core flexible copper wire	:	RAJNIGANDHA / HAVELL'S / FINOLEX/THERMO PAD/NICCO/ RPG/FINECAB/RADIANT/POLYCAB /LAPP/DELTON/UNIFLEX/KDK/KEI
9	High Mast Towers	:	BAJAJ/PHILIPS/CGL
10	Street Light Poles		
	Octagonal Type	:	BAJAJ/PHILIPS/CGL/BMW/ BP PROJECTS
	Tubular Type	:	ELECTRO STEEL/QUALITY STEEL/ CALCUTTA POLES &TUBES/STEEL POLE CORPORATION/BMW/JINDAL
11	Dry type Lighting Transformers	:	UNIVERSAL MAGNETICS/TRANSO INDIA/INDCOIL/INDUSREE/AE/ DEVIKA

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
12	Thermoplastic Junction Boxes	:	HENSEL/SYNTEX/RITTAL/ DEVI POLYMERS/ SHRENIK/ SPELSBERG/PUSTRON
13	Aviation Obstruction Light	:	BENOY/BALIGA/MICROTECH/ SPECTRUM
I.	**CABLES AND CABLING ACCESSORIES**		
1	33kV/ 11kV/ 6.6 kV XLPE Cable (Only Dry cured)	:	KECIL(RPG)/UNIVERSAL/CCI/ NICCO/TORRENT CABLES/ INDUSTRIAL/KEI/POLYCAB/RAVIN (PRIME CAB)
2	a) 1.1 kV PVC/XLPE/ HRPVC Cable (Power)	:	KECIL(RPG)/UNIVERSAL/CCI/ NICCO /TORRENT/INDUSTRIAL/ POLYCAB/FINECAB / RADIANT / CRYSTAL/KEI/SPECIAL/ PARAMOUNT/ RAVIN(PRIME CAB)/ RRK/GPIL/AVOCAB/SHYAM CABLES/LAPP
	b) 1.1 kV PVC/XLPE/ HRPVC Cables (Control)	:	KECIL(RPG)/UNIVERSAL/ NICCO/TORRENT/INDUSTRIAL /POLYCAB / DELTON /CCI / CORDS/SPECIAL/ CAPCAB/ FINECAB/RADIANT/CRYSTAL/LAPP /THERMOPADS/KEI/BELDEN/ DELTON/PARAMOUNT/RAVIN (PRIME CAB)/RRK/GPIL/ AVOCAB/ SHYAM CABLES/LAPP
3	Silicon Rubber insulated copper Cable	:	KECIL(RPG)/UNIFLEX/UNIVERSAL/ NICCO/INCAB/INDUSTRIAL/ POLYCAB/LAPP/TORRENT/ UNIFLEX/GOVIND/KEI/ SHYAM CABLES/LAPP
4	Flexible trailing copper cable	:	KECIL(RPG)/ UNIVERSAL/NICCO/ INCAB/CCI/LAPP/THERMOPADS/ INDUSTRIAL/POLYCAB/TORRENT / GOVIND/KEI/RRK/ SHYAM CABLES/LAPP
5	HT Cable Termination Kit/straight through jointing kits	:	TYCO(RAYCHEM) /3MECI(MSEAL-MECP)

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
6	LT Cable Termination Kit/straight through jointing kits	:	TYCO(RAYCHEM)/3MECI (MSEAL-MECP)/DENSION/CCI
7	Cable Reeling Drum (Stacker Reclaimer)	:	ELECTRO ZAVOD/ELECTROMAG/ TECHNOCRATS
8	Cable Reeling Drum (Cranes, Hoists, Transfer Trolleys)	:	ELECTRO ZAVOD/ELECTROMAG/ IS/TECHNOCRATS
9	Cable Lugs	:	DOWELLS/FORWARD/COMMET/3D /RATAN ENGG/ABB.
10	Cable Gland	:	ELECTROMAG/CC I/COMMET / PHOENIX/DOWELLS /RATAN ENGG.
11	Terminal Block	:	ELMEX/ESSEN/CONNECTWELL/ C&S/WAGO/PHOINEX/ABB.
12	Cable Coupler	:	A. BOND STRAND/ABB.
13	Weather proof outdoor Junction Box	:	ELECMECH/TECHNOCOM/ABB
14	Passive Fire Protection System	:	LLOYD/PROMAT/3-M/KBS/ SIGNUM/ HILTI
15	Cable Tray / Rack	:	RATAN ENGG./INDIANA/IDS COMPOSITES/INDIA ELECTRICALS SYNDICATE /PREMIER/ TECHNO
J.	**MISCELLANEOUS**		
1	Diode	:	HIND/USHA RECTIFIER/BHEL/ RUTTON SHAW/APEPL
2	Battery	:	EXIDE/HBL-NIFE/AMAR RAJA /AMCO
3	Braking Resistance Panel	:	RESISTEC / BCH
4	DC EM Brake	:	BCH/STROM KRAFT/ELECTROMAG/ ELECTROMECH CORPN./EPC/IS
5	Thrustor brake	:	IS/STROMKRAFT /ELECTROMAG /ELECTROMECH/EPCC

Bidder Seal & Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
6	Lifting Magnet	:	ELECTROMAG/SUPERLIFT/EPCC / ELECTRO ZAVOD
7	Power Pack for Magnet	:	ELECTROMAG/SUPERLIFT
8	Earthing Resistor	:	BHEL/BCH/IS/EEF/RESITECH / NARKHADE
9	MG Welding Set	:	KEC/ADVANI/PHILIPS
10	Portable Welding Transformer	:	ADVANI/IOL/KEC
11	Harmonic Filter	:	AMTECH/ABB
12	FRP/SMC, S/O outlet & PB STN	:	RITTAL/HENSEL/DEVI POLYMERS/ SHRENIK/SYNTEX/SPELSBERG/ PUSTRON
13	Autoglo safety posters/ photo Luminiscent signages	:	PROLITE

Bidder Seal & Signed

ANNEXURE – 2-D

LIST OF PREFERRED VENDORS FOR INSTRUMENTATION AND CONTROL SYSTEM

Sl. No.	Item		List of Vendors
A	**CONTROL ROOM EQUIPMENT**		
1.	Distributed Control System (DCS)	:	BHEL/YOKOGAWA/HONEYWELL/EMERSON/ABB/SIEMENS/SCHINDER
2.	Programmable Logic Controller (PLC)	:	ROCKWELL AUTOMATION- ALLEN BRADLEY/ SIEMENS/ABB/ SCHNEIDER
3.	Programmable Logic Controller Components/Remote IO (RIO)	:	ROCKWELL AUTOMATION- ALLEN BRADLEY/SIEMENS/ABB/ SCHNEIDER
4.	HMI PC/ Server/ Data storage system	:	IBM/HP/DELL/SIEMENS
5.	HMI Software (3rd Party)	:	WONDERWARE(INTOUCH)/INTELLUTION (FIX)/US DATA (FACTORY LINK)/ ABB/GE/SCHINDER
6.	TFT MONITOR	:	DELL/SAMSUNG/IBM-LENOVO/ NEC/HP
7.	LARGE SCREEN DISPLAY MONITOR	:	BARCO/DELTA/PLANER/ PYROTECH
8.	COMPUTER FURNITURE	:	ADARSH CONTROLS/COSMOS MEDIA/ FEATHER LITE/ GODREJ/ OTS/ PYROTECH/ RITTAL
9.	Printer	:	
	1. DOT Matrix Printer		TVS/WIPRO/HP/EPSON
	2. LASER Printer		CANON/HP/IBM/XEROX
	3. INKJET Printer		CANON/HP/IBM/XEROX/EPSON
10.	Controller	:	YOKAGAWA/HONEYWELL/ SIEMENS/ ABB/TOSHIBA/ INVENSYS (FOXBORO) / MASIBUS/MOORE/ FUJI/BHEL
11.	Bargraph & Digital Indicator (EDLI) /Panel Digital Indicators/Hydrastep	:	MASIBUS/EUROTHERM/YOKOGAWA/HONEYWELL/TELETHERM/ HI-TECH SYSTEM/ABB/LEVEL STATE/ YARWAY

Bidder Seal & Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
12.	Totalisers	:	YOKOGAWA/ABB/MASIBUS/ HONEWELL
13.	Scanner	:	MASIBUS/APLAB/ECIL/M.B. CONTROLS/ EUROTHERM/ ACCSYS/ABB
14.	Recorder	:	YOKOGAWA/ABB/HONEYWELL/MOORE/ DIGITAL/EUROTHERM/MOORE
15.	Alarm Annuniciator	:	IIC/MINILEC/PROCON/ACC SYS/AP LAB/ DIGICONT
16.	Signal Isolator/Multiplier	:	MTL/YOKOGAWA/MASIBUS/ PEPPERL & FOCHS/ PYROELECTRIC/ABB/GE
17.	Instrument Panel/Cabinet /Desk	:	RITTAL/RKC/SIMCON/ PYROTECH/ INDUSTRIAL CONTROLS/ SYSPRO
18.	Pneumatic actuators (cylinder or rotary)	:	ELOMATIC/KROMBACH/ MECCAIR/ NUCON /PRIMA
19.	Power Supply Unit	:	SIEMENS/PHONEX/MTL/ APLAB/ ELNOVA/MCTH/ CYBERNICS/ COSEL/ ABB
20.	Intrinsic Safety Barrier /Surge protection device	:	MTL/P&F/ABB/ENDRESS-HAUSER/ PHOENIX/SIEMENS
21.	Terminal Blocks (Power and Control)	:	PHOENIX/WAGO/ELMEX/ WEIDMULLER/CONNECTWELL/ SCHNEIDER-TELEMECANIQUE/ BECKHOFF/ELMEX/ BECKHOSS/ ABB/GE
22.	Plugs and Sockets	:	ANCHOR/CRABTREE/ABB/ SCHINDER
23.	Interposing Relays	:	OEN/JVOTI/PARAMOUNT/ ABB/GE/ SIEMENS
24.	Digital Indicators	:	ABB/FOXBORO/MASIBUS/ PTROTECH /GANZ/GOSSEN/WEIGEL/ RISHAB/AE
25.	Cables-Fibre Optic/ Co-axial/UTP	:	MOLEX/RPG/AT&T/LUCENT
26.	SCADA System	:	REPUTED AS PER OEM STANDARD

Bidder Seal & Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
27.	Operating System	:	REPUTED AS PER OEM STANDARD
28.	Data Base	:	REPUTED AS PER OEM STANDARD
29.	Control Desk (Instrument Panel/Cabinet /Desk)	:	ICA/PYROTECH/RADHA KRISHNAN CONTROLS/ RITTAL/INDUSTRIAL CONTROLS/SYSPRO/ABB/ SIEMENS/ ALSTOM/POWER & PROTECTION/ SCHINDER
30.	Power distribution system/ Marshalling/ Control Panels	:	RITTAL/SIEMENS/GE/ SCHINDER
31.	Push Buttons	:	BCH/L&T/SIEMENS/ SCHNEIDER-TELEMECANIQUE/ABB
32.	LED Lamp	:	GE/BCH/SCHNEIDER-TELEMECANIQUE/BINARY/ ABB/ SIEMENS
33.	Manageable Switches	:	REPUTED AS PER OEM STANDARD
34.	LIU Units	:	REPUTED AS PER OEM STANDARD
35.	Ni-Cd Batteries	:	REPUTED AS PER OEM STANDARD
B	**Network Components**		
1.	Switches/Routers	:	CISCO/3-COM/NORTEL/DLINK/GE/ SIEMENS
2.	Converts/Repeaters/Modems /Radio Modems	:	LOTUS/DLINK/US ROBOTICS/ NORTEL/MULTI TECH/ PRUDENT/ SIEMENS
C	**FIELD INSTRUMENTS**		
1.	Pressure Gauge	:	GIC/H.GURU/WAREE/INDUSTRIAL INSTRUMENTATION / WIKA/GENERAL INSTRUMENTS/GOA INSTRUMENTS/AN INSTRUMENTS
2.	Draught gauge & DP gauge	:	SWITZER /GIC/H.GURU/ WAREE/ WIKA

Bidder Seal & Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
3.	SMART Transmitters	:	YOKOGAWA/HONEYWELL/ ABB/ SIEMENS/ EMERSON/E&H/FUJI
4.	Pressure/DP/temperature & Flow Switches		SWITZER / H. GURU INDUSTRIES/ DANFOSS/ VARMA-TRAFAG/GENERAL INSTRUMENT/GEORGIN
5.	Temperature Gauge	:	WIKA/GIC/H.GURU/WAARE/ INDUSTRIAL INSTRUMENTATION/ GENERAL INSTRUMENTS/GOA INSTRUMENTS/AN INSTRUMENTS
6.	Temperature Elements (RTD & T/C)	:	NAGMAN/TEMPSENS/ TOSHNIWAL INDUSTRIES/PYROELECTRIC/ GIC/ GOA INSTRUMENTS/ALTOP/FUJI
7.	Temperature transmitters	:	HONEYWELL/EMERSON/ YOKOGAWA /E&H/ABB/FUJI
8.	Temperature Switch	:	SWITZER / INDFOS/ HONEYWELL/ VERMA TRAFAG /P& F / H. GURU INDUSTRIES/GEORGIN
9.	Level gauges and float type level switches	:	GIC//LEVCON/V. AUTOMAT/PLACKA/ TECKTROL/KHRONE/CHEMTROL (VEGA)/SWITZER/S.B. ELECTROMECHANICAL/ V.AUTOMAT/EIP/NIVELCO/EUREKA /V. AUTOMAT/Hi-TECH
10.	Level Switches (Conductivity/capacitance/Resonance)	:	LEVCON/ENDRESS-HAUSER/ EIP/S.B. ELECTROMECHANICAL / SAPCON/ NIVO/ABB
11.	Nucleonic Level Gauge	:	CONCORD (BERTHHOLD) / EMERSON (K.RAY)/ECIL/ CHEMTROL (VEGA) /ENDRESS HAUSER
12.	Ultrasonic/Rader type Level (Guided wave RADAR (SILO) etc) transmitter	:	TOSHBRO (MILTRONICS)/ ENDRESS-HAUSER/SIEMENS/ VEGA /EMERSON (SAAB)/SBEM/ABB
13.	Rotameter	:	IEPL/EMERSON(BROOKS) / EUREKA/ AL FLOW/KROHNE MARSHALL/PLACKA /ROTA/ABB

Bidder Seal & Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
14.	Vortex Flow Meter	:	ENDRESS HAUSER/ YOKOGAWA / KHRONE/EMERSON/ABB/ ROSEMOUNT/SIEMENS
15.	Mass Flow Meter	:	EMERSON/ ABB/ ENDRESS HAUSER/ YOGOKAWA/ KHRONE/SIEMENS
16.	Pollution Control & Stack Monitoring System	:	HONEYWELL/EMERSON/FORBE MARSHALL/ABB/CHEMTROL /AMETEK/SICK & LAND
17.	SWAS & other water analysers/meters	:	FORBES MARSHALL /ABB ANALYTICAL /YOGOKAWA / EMERSON/ STEAM EQUIPMENTS/HACH
18.	RF Capacitance (Hopper)	:	EIP / EIP ENVIRO/ABB/MAGNETROL
19.	Flow Elements (Orifice Plate, Flow Nozzle, Venturi Tube etc)	:	ENGG. SPL/MICRO PRECISION/IL/ BALIGA/GI/ STAR MECH/MECHANICAL ENGINEERS/GENERAL INSTRUMENT / STARMECH/EMERSON
20.	Control Valves /On-Off Valves	:	IL/ FISHER-XOMOX/ FORBES MARSHALL/MIL/ABB/KOSO/ EMERSON PROCESS MANAGEMENT/ SEVERN GLOCON INDIA PVT LTD/SPX-FLOW/FLOW SERVE/ IMI-CCI
21.	Motorised/Electric Actuators	:	AUMA/ IL / LIMITORQUE/ ROTORK/ DANFOSS
22.	Pneumatic Actuators (Cylinder or Rotary/Rack and Pinoin Type etc)	:	ELOMATIC/KROMBACK/MECCAIR/ NUCON/PRIMA/AUDCO/FISHER/ VIGRO/NORGREN/ASCO NUMATIC/ JANATICS/SMC/ROTEX/ SCHRADDER
23.	Air filter Regulator	:	PLACA/SHAVO NORGREN/ ABB/ CONTROL AIR/BELLS CONTROLS/ FAIR CHILD
24.	I/P Convertor	:	HONEYWELL/EMERSON/FORBE MARSHALL/ABB/CHEMTROL /AMETEK/FAIR CHILD/WATSON-SMITH

Bidder Seal & Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
25.	Terminal Block	:	CONNECTWELL/ELMEX/WAGO/ PHOENIX/WEIDMULLER/BECKHOFF/ ABB
26.	Solenoid Valves	:	ROTEX/ASCO/VICKERS/SMC/ NORGREN/SCHRADER BELLOW
27.	Magnetic Flow meter/Ultrasonic Flow meter	:	ENCDRESS-HAUSER/KHRONE/ABB/ INVENSYS (FOXBORO)/EMERSON/ YOKOGAWA/SIEMENS
28.	Positive Displacement Flow meter	:	TOSH. HYD(BOPP & FEUTHER) /ROCKWIN/ABB/SWITZER/ KRAL
29.	Encoder	:	P & F / ROCKWELL / HUBNER/MTL/ PHOENIX/SIEMENS
30.	Vibration Monitoring Systems	:	BENTLEY-NEVADA/FROBESMARSHALL (SHINKAWA)/ROCKWELL AUTOMATION /ABB
31.	UPS	:	EMERSON/HI-REL/APC/NUMERIC/ ABB
32.	Limit switches	:	ABB/JAY BALAJI/ ELECTROMAG/ KAKKU/ SIEMENS/HONEYWELL/ TELE-MECHANIQUE/ ALLEN-BRADLLEY/GO-SWITCH (EMERSON)/ SCHINDER
33.	Ultrasonic Level Switch (Measurement- Liquid/Solid)	:	ENDRESS-HAUSER/KHRONE/ EMERSON/SIEMENS/VEGA/ ABB
34.	Microwave Solid/Liquid Level Measurement	:	ENDRESS-HAUSER/KHRONE/ EMERSON/MILLITRONICS/VEGA/ SIEMENS/ABB
35.	Control Valve with Diaphragm Actuator (Critical Application)	:	MIL/KOSO/FISHER/DRESSER/IMI-CCI /EMERSON PROCESS MANAGEMENT/ SPX-FLOW/ SEVERN GLOCON INDIA PVT LTD/ IL
36.	Pull Chord/Belt sway/Zero Speed & Proximity Switches	:	JAYSHREE/JAI BALAJI/AG SYSTEM/ ROCKWELL/SCHNEIDER-TELEMECANIQUE/ SIEMENS

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
37.	Voltage/Power/Frequency/Current/Energy Transducers	:	ABB/SIEMENS/ALSTOM/SCHINDER
38.	Humidity Sensor	:	SIEMENS/HONEYWELL/ FOXBORO
39.	HART CONFIGURATOR (UNIVERSAL)	:	ROSEMOUNT/ABB/YOKOGAWA
40.	PVC coated copper Tubes/Copper Tubes	:	REPUTED AS PER OEM STANDARD
41.	Tank Level Indicator	:	NIVO/LEVCON/SWITZER/MEGNETROL
42.	Annubar	:	SWITZER/EMERSON/ ENGG.SPL
43.	Water Meter	:	KAYCEE/RAJKAMAL/CAPSTAN
44.	Flow meters	:	E & H / KHRONE / ROSEMOUNT / YOKOGAWA/ABB
D	**SPECIAL INSTRUMENTS**		
1.	Electronic Weighing System	:	ABB/SCHENCK/SARTORIOUS MECHATRONICS/TRANSWEIGH/METTLER-TOLEDO/NOVA WEIGH /IPA /KLISTER –MORSE/STOCK REDLER/ MERRIC INDUSTRIES/SIEMENS
2.	Gas Analysers/Meters (CO,Co2,O2 etc,.)	:	EMERSON /ABB ANALYTICAL /SIEMENS/YOKOGAWA/ FORBE MARSHALL/ HONEYWELL (TELEDYNE) /CHEMTROL/POTENCE/SICK/FUJI & LAND/METTLER TOLEDO
3.	Water Analysers/Meters (SWAS etc,.)	:	FORBES MARSHALL /ABB ANALYTICAL /YOGOKAWA /HACH/ION EXCHANGE / CHEMTROL/POTENCE/EMERSON
4.	Ph,DO and Conductivity Meter	:	EMERSON / YOKOAGAWA/ FORBESMARSHALL / INVENSYS (FOXBORO/ TOSHBRO CONTROLS\ION EXCHANGE/ POLYMETRON /HONEYWELL/ HACH/ABB

Bidder Seal & Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
5.	Infrared Pyrometer	:	MAGMAN (IRCON) / EUROTHERM (LAND) LAXSON (CHINO) / FLUKE / TEMPSENS/ABB
6.	Moisture Analyser	:	CONCORD (BERTHHOLD) /EMERSON K-RAY) ECIL/SHAW/ENDRESS HAUSER/ YOKOGWAWA/ CHINO-INSTRUMENTS
7.	Vibration Sensor & Monitor	:	BENTLEY-NEVADA/FROBESMARSHALL (SHINKAWA)/SHERMAN (SKF) / ROCKWELL AUTOMATION/SIEMENS
8.	Governor System	:	WOODWARD/TRISEN/BHEL
9.	Flame detector/Scanner	:	HONEYWELL/FIRE-EYE/DURG/ABB/ DURAG/ BHEL
10.	Gas Leak Detector	:	MSA / HONEYWELL
E	**INSTRUMENT CABLES/CABLE TRAYS (PERFORATED) AND ACCESSORIES**		
1.	Instrumentation Cables (Screened Cables, Control cables & Compensating Cables) Non Mineral Insulated /Insulated and Armoured/Unarmoured etc.	:	DELTON/FINOLEX/SPECIAL CABLES /CORDS / GOYOLENE/THERMOPADS /UNIVERSAL / LAPP / BROOKS CABLES/PYROCABLES/UDAY/HEAVEL STHERMO CABLES/KEI
2.	FIBER OPTIC CABLES/Co-axial/UTP	:	RPG/ FINOLEX/ MOLEX/ LUCENT
3.	Instrument (Isolation/root) Valves (BALL/GLOBE/GATE/ NIDDLE)	:	AUDCO/ KSB/ VIRGO / BDK/FLUID CONTROLS/XOMOX
4.	Instrument Fittings/Air Line Fittings	:	SWAGALOK/ PARKER /FLOW TECH/EXCEL-HYDRO/ASTEC/HP/ MET-LOCK

Bidder Seal & Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
5.	Junction Boxes	:	BALIGA/PYROTECH/HENSEL/EXPROTECTA/FLEXPRO/FLAMEPACK/SUDHIR SWITCHGEAR/ RITTAL/ABB
6.	Cable Gland	:	BALIGA/DOWELLS/CCI/ELECTROMAG/HUMMEL
7.	Cable Termination Kit	:	RAYCHEM/M-SEAL
8.	Testing and Calibration Instruments	:	NAGMAN/FLUKE
9.	Cable Lugs	:	CONNECTWELL/DOWELLS/ PHONEIX
10.	Cable Trays (Perforated Type) -GI Material & FRP	:	INDIANA/PROFAB/SADHANA/ ERCON/ SYNTEX
11.	Manifolds/Condensate Pots	:	REPUTED AS PER OEM STANDARD
F	**FIRE DETECTION AND ALARM SYSTEM**		
1.	Pressure Gauge	:	GIC/H.GURU/WAREE/GE GAUGES PVT LTD/INDUSTRIAL INSTRUMENTATION /MANOMETER/WIKA /FORBES MARSHALL/ PRECISION INDUSTRIES /GENERAL INSTRUMENTS/GOA INSTRUMENTS/AN INSTRUMENTS
2.	Temperature Gauge	:	WIKA/GIC/H.GURU/ WAARE/FORBES MARSHALPRECISION INDUSTRIES/ INDUSTRIAL INSTRUMENTATION/ GENERAL INSTRUMENTS/GOA INSTRUMENTS
3.	Temperature Elements (RTD & T/C)	:	NAGMAN/TEMPSENS/TOSHNIWAL INDUSTRIES/ PYROELECTRIC/ GIC/GOA INSTRUMENTS/ALTOP
4.	Detector (Intelligent & Addressable)	:	NOTIFIER/EDWARD/TYCO/ CERBERUS/HONEYWELL AND UL/FM/ LPC/ APPROVED
5.	All modules (Intelligent & Addressable)	:	NOTIFIER/EDWARD/TYCO/ CERBERUS/HONEYWELL AND UL/FM/LPC/ APPROVED

Bidder Seal & Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
6.	Fire Alarm Panel (Intelligent & Addressable)	:	NOTIFIER/EDWARD/TYCO /CERBERUS/HONEYWELL AND UL/ FM/LPC/ APPROVED
7.	Repeater Panels (Intelligent & Addressable)	:	NOTIFIER/EDWARD/TYCO/ /CERBERUS/HONEY WELL AND UL/ FM/LPC/ APPROVED
8.	Cables	:	DELTON/FINOLEX/SPECIAL CABLES /CORDS/GOYOLENE/THERMOPADS /UNIVERSAL/LAPP/BROOKS CABLES /PYROCABLES/UDAY/THERMO CABLES
9.	Battery	:	AMCO/STANDARD/EXIDE
10.	Manual Call Points	:	UL/FM/LPC AND TAC APPROVED
11.	Electronic Hooters (Addressable)	:	UL/FM/LPC AND TAC APPROVED
12.	HMI PC/ Server/ Data storage system	:	IBM/HP/DELL/SIEMENS
13.	Printer	:	
	1. DOT Matrix Printer		TVS/WIPRO/HP/EPSON
	2. LASER Printer		CANON/HP/IBM/XEROX
	3. INKJET Printer		CANON/HP/IBM/XEROX/EPSON
14.	Cables - Fibre Optic/Co-axial/UTP	:	RPG/ FINOLEX/ MOLEX/ LUCENT
15.	Networking Cables	:	DELTON/FINOLEX/CMI/RPG/ HCL/ RELIANCE/SIEMENS
16.	Manageable Switches	:	REPUTED AS PER OEM STANDARD
17.	Ni-Cd Batteries	:	REPUTED AS PER OEM STANDARD
18.	LIU Units	:	REPUTED AS PER OEM STANDARD

Bidder Seal & Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
G	**PLANT COMMUNICATION SYSTEMS**		
1.	Telecom Cables (PVC Armoured/Unarmoured and Jelly Filled etc)	:	DELTON/FINOLEX/CMI/RPG/ HCL/ RELIANCE
2.	Plant Telephone Systems	:	
	i) EPABAX System		GTL/SIEMENS/TADIRAN/AVAYA
	ii) Telephone handset		BEETEL/AVAYA/SONY/BPL/ SIEMENS/ITI
	iii) Power Supply Unit		AMARA RAJA/PULSE POWER/ SIGNOTRON
3.	Loud Speaker (PA) System	:	
	i) Selective calling system		INDUSTROINCS/NEUMANN/ FEDERAL/BOSCH/ PHILIPS
	ii) Page Party Type		MICO BOSCH(PHILIPS)/ INDUSTROINCS/NEUMANN
4.	Radio Communication System	:	MOTOROLA/KENWOOD/ SIMOCO
5.	Hooter/Buzzer/Bell	:	ALAN/PROCON/MASSIBUS/ PROCON

Bidder Seal & Signed

ANNEXURE – 2-E

LIST OF PREFERRED VENDORS FOR CRANES & HOISTS

Sl. No.	Item		List of Vendors
1.	Double Girder EOT Cranes	:	MUKAND/KONE/FAFECO/ DEMAG
2.	Single Girder EOT Cranes	:	KONE/FAFECO/MM ENGINEERS/GRIP ENGINEERS
3.	Electrical Hoist	:	BRADY & MORRIS/ MM ENGINEERS/ GRIP ENGINEERS/
4.	Mechanical Hoist	:	INDEF/TRACTOR TIRFOR/ BRADY
5.	Geared coupling	:	HICLIFF/FENNER/ELECON/ UNIVERSAL/FMG/NAW
6.	Wire rope	:	USHA MARTIN/BOMBAY WIRE ROPE/ FORT WILLIAMS/ UNITED WIRE ROPE
7.	Hook	:	MOZUMDAR & MOSUMDAR /HERMAN & MOHATTA/ EE KARACHIWALA/STEEL FORGINGS/FORGING ENTERPRISE
8.	Gear Box	:	NAW/ELECON/SHANTHI

Bidder Seal & Signed

ANNEXURE - 2-F

LIST OF SUB-VENDORS FOR BOILER & TG ELEVATORS

Sl. No.	Item	List of vendors
1.	Gear box	ELECON/GREAVES/NAW/FMG DAVID BROWN/ABB
2.	Gear Coupling	NAW/HI-CLIFF/ELECON/ BIBBY/ WELLMAN/GBM/LOVEJOY/CONCORD/ ABB
3.	Wire Rope	USA MARTIN BLOCK/FORT WILLIAM/ CASAR/BOMBAY WIRE ROPE
4.	Bearing	SKF/FAG/NTN/NBC/ASEAN BEARINGS /ABB
5.	AC Motor	SIEMENS/CGL/KEC/MARATHON (AREVA/ ALSTOM) /ABB
6.	DC brake with Rectifier Panels	BCH/ELECTROMAG METHODS
7.	MCCB	L&T/DTH/SIEMENS/SCHNEIDER/CGL/ GE
8.	Contactors	SIEMENS/L&T/EE/BCH
9.	Limit switch	UNION ENGG/MECH ENTERPRISES/ INDUSTRIES SYNDICATE/ AG MECHANICAL/JAI BALAJI
10.	Cables	ICC/UNIVERSAL/FORTGLOSTER/CCI/ NICCO/FINOLEX
11.	Variable Speed Drive(VFD)	ABB/SIEMENS/ALLEN BRADLEY/L&T - YASKAWA/AB CONTROLS/SCHNEIDER.
12.	Passenger & passenger cum goods elevator	KONE/OTIS/THYSSENKRUPP/ JOHNSON

Bidder Seal & Signed

ANNEXURE - 2-G

LIST OF PREFERRED VENDORS FOR COMPRESSED AIR SYSTEM

Sl. No.	Item		List of Vendors
1.	Compressor	:	ATLAS COPCO/ INGERSOLL RAND / KAESER/ ELGI
2.	Air Dryer	:	KAESER/ATLAS COPCO /TRIDENT /DELAIR
3.	Filters	:	DYNA/IMPEC/PUROFIL/ SPECTRUM /CHEMFARM
4.	Pipe	:	TATA TUBE /JINDAL/BST/ MAHARASHTRA SEAMLESS LTD
5.	Valves	:	AUDCO /BDK /KSB MCNEILL / LEADER/FOURESS/J.N. MARSHALL/ XOMOX
6.	Fittings	:	FLASH FORGE/SIVANANDA PIPE FITTING/TRUE FORGE/FITTING MFG. CO.

ANNEXURE - 2-H

LIST OF PREFERRED VENDORS FOR AIR CONDITIONING, AIR COOLING AND VENTILATION SYSTEM

Sl No.	Package		Supplier
1.	VAM Chillers	:	VOLTAS/CARRIER/ TRANE/ KIRLOSKAR/HITACHI/THERMAX
2.	Air Handling Unit	:	BLUE STAR/VOLTAS/EMERSON/ CARRIER/HITACHI/TRANE
3.	Split Air Conditioners	:	BLUE STAR/VOLTAS/ CARRIER/HITACHI
4.	Package type FRP cooling Tower	:	PAHARPUR/ HAMON SHRIRAM/ THERMOPAK/GEM/MIHIR/
5.	Pump	:	MATHER & PLATT / KIRLOSKAR / KSB / AKAY
6.	Insulation	:	BEARDSHELL/FGP/LLOYD/ ROCKWOOL/ TWIGA
7.	Centrifugal Fan/Axial flow Fan	:	C.DOCTOR/BATLIBOI/DUSTVEN/KLEENAIR/NADI/FLAKT/SK SYSTEM
8.	Roof extractors	:	C. DOCTOR / DUSTVEN / S.K. SYSTEMS / KHAITAN
9.	Filters	:	DYNA/IMPEC/PUROFIL/ SPECTRUM /CHEMFARM
10.	GI Sheet	:	TATA/JINDAL/SAIL/ISPAT
11.	Pipe	:	TATA TUBE/JINDAL/RSP/SAIL/ AJANTHA TUBES
12.	Valves	:	L&T /BDK/DEWRANCE/KSB MCNEILL/LEADER/FOURESS/J.N. MARSHALL/SAUNDERS
13.	Traps & Strainer	:	UNI KLINGER/ESCO/ FORBES MARSHAL
14.	Fittings	:	FLASH FORGE/SIVANANDA PIPE FITTING/TRUE FORGE/FITTING MFG. CO.

Bidder Seal & Signed

ANNEXURE - D

ELECTRIC WIRE ROPE HOIST (EWRH) WITH MOTOR DRIVEN TROLLEY										PROJECT: NALCO FGD PROJECT				
SL NO	AREA	TYPE OF HOIST	CAPACITY OF HOIST	SPEED		HOIST MONORAIL BEAM BOTTOM ELEVATIONS (Hoist Monorail BEAM in BHEL Scope)	FLOOR LEVEL	TRAVEL LENGTH	PATH	MINIMUM RADIUS OF TRAVEL	HOIST MONORAIL I-BEAM (Hoist Monorail BEAM in BHEL Scope)	HEIGHT OF BOTTOM OF MONORAIL I-BEAM TO HOIST HOOK	HEIGHT OF BOTTOM OF MONORAIL I-BEAM TO HOIST HOOK - HOIST HEAD ROOM - VENDOR TO SPECIFY	TOTAL QNTY
				HOSTING	CROSS TRAVEL									
			TON	METER PER MINUTE	METER PER MINUTE	(EL (+/-) IN METER)	(EL (+/-) IN METER)	(METER)	CURVED / STRAIGHT	(MM)	NPB / UB /ISMC/ISMB	(MM)	(MM)	(SET)
A. GDS BUILDING														
1	GDS EQUIPMENTS GROUND FLOOR	ELECTRIC WIRE ROPE HOIST	1.5	AS PER SPEC	AS PER SPEC	EL (+) 11.90M	EL (-)0.500M	45M	CURVED	1500 MM	ISMB 300 (Tentative) *EXACT SIZE BE PROVIDED IN DDE	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
2	GDS EQUIPMENTS FIRST FLOOR	ELECTRIC WIRE ROPE HOIST	1.5	AS PER SPEC	AS PER SPEC	EL (+) 21.50M	EL (-)0.500M	72M	CURVED	2000 MM	ISMB 300 (Tentative) *EXACT SIZE BE PROVIDED IN DDE	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
B. BALL MILL BUILDING														
3	BALL MILL INNER	ELECTRIC WIRE ROPE HOIST	4	AS PER SPEC	AS PER SPEC	EL (+) 12.50M	EL (+) 0.00M	40M	CURVED	2000 MM	ISMB 600 (Tentative) *EXACT SIZE BE PROVIDED IN DDE	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
4	BALL MILL OUTER	ELECTRIC WIRE ROPE HOIST	4	AS PER SPEC	AS PER SPEC	EL (+) 12.50M	EL (+) 0.00M	46M	CURVED	2000 MM	ISMB 600 (Tentative) *EXACT SIZE BE PROVIDED IN DDE	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
C. ABSORBER														
5	RC PUMP SUCTION VALVE	ELECTRIC WIRE ROPE HOIST	4	AS PER SPEC	AS PER SPEC	EL (+) 5.80M	EL (-)0.500M	8.7M	STRAIGHT	NA	NPB600X200X122.4 +ISMC 400	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
6	RC PUMP DISCHARGE VALVE	ELECTRIC WIRE ROPE HOIST	4	AS PER SPEC	AS PER SPEC	EL (+) 8.80M	EL (-)0.500M	13.5M	STRAIGHT	NA	NPB600X200X122.4 +ISMC 400	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
7	ABSORBER AGITATOR	ELECTRIC WIRE ROPE HOIST	1.5	AS PER SPEC	AS PER SPEC	EL (+) 3.40M	EL (-) 0.50M	3.5M	STRAIGHT	NA	ISMB 300	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry

NOTE : 1) Depending upon Hoist head room , the actual height of lift for hoist shall be arrived.

2) 2) For PATH & Radius of travel, Pls refer attached "ANNEXURE - F General Arrangement layout Drawing".

3) Vendor to specify the Hoist head Room during Tender stage.

Special Note: The respective Speed of Hoist & Travel for above HOIST shall be as specified in ANNEXURE C - CUSTOMER TECHNICAL SCECIFICATION.

Bidder Seal & Signed

ANNEXURE E - PAINTING SCHEME NALCO - HOIST

Sl No	Description	Surface preparation	Primer/ DFT in µm	Intermediate DFT	Finish DFT	Total DFT
	ABSORBER MISCELLANEOUS;FW322 ABSORBER SYSTEM-CASING INTERM; FW328 W/D INTERFACE (CARBON STEEL); FW380ELEVAIOR,COLURNN';FW381ELEVAT OR BEAM AND BRACING; FW385 ELEVATOR M/C ROOM & GUIDE ; FW386 INTER-CONNECTING PLTF TO ABS; FW612 GALLARIES AND RAILINGS FOR DAM;FW613 GALLARIES AND RAILINGS FOR DUC;FW701 SLURRY PUMPS & ACCESSORIES;FW702 WATER PUMPS & ACCESSORIES;FW709 TRENCH COVER PLATE;FW710 MONORAIL FOR HOIST & CRANES;FW711 SHIM PLATE FOR PIPE RACK;FW713 CHAIN PULLEYS;FW714 HOISTS;FW717 MAN HOLE DOOR;FW761 STRUCTURE FOR PIPERACKS;FW765 STR FOR SUB PIPE RACK;FW766 PLATFORM FOR PIPE RACK;FW767 PLATFORM SUB PIPE RACK;FW768 TRESTLE FOR MAIN PIPE RACK;FW769 TRESTLE-SUB PIPE RACK; FW789 TEMPLATE-MISC;FW798 AIR RECEIVERS;FW815 RC PUMP INLT & OUTLT VALVE;FW816 MANL BTRFLY VALV-UTLTY;FW817 MOTOR BTRFL VALV-UTLTY;FW818 PNEM BTRFLY VALV-UTLTY; FW819 MAN BTRFLY VALV-LS SLRY; FW820 MOTOR BTRFLY VALV-LS SLRY; FW821 PNEUM BTRFLY VALV-LS SLRY; FW822 MAN BTRFLY VALV-GYP SLRY; FW823 MOTOR BTRFLY VALV -GYP SLRY;	Power tool cleaning	Two coats of Red oxide Zinc phosphate primer as per IS 12744 DFT 2x30 =60 µm	NIL	Two coats synthetic enamel as per IS 2932 smoke grey shade 692 of IS 5. DFT 2x30=60µm	120 µm (min)

Bidder Seal & Signed

1367585/2023/BAP-9762_FGD

Ranipet	Painting schedule for APH, ESP, FAN, FGD and Gates & Damper for NALCO DAMANJODI, 1X18.5 MW Project (BHEL WO NO: R181 & R182)	Doc No: PS:NALC:R181 Rev 01 Date: 08/04/2021 Page 11 of 11

Sl No	Description	Surface preparation	Primer/ DFT in µm	Intermediate DFT	Finish DFT	Total DFT

Revision No	Date	Record of Revision
00	21/12/2020	Original Issue
01	08/04/2021	Revised Issue to include new PGMA released by BHEL Ranipet Engineering.

Notes

1. Painting of commissioning spares and Mandatory spares shall be as per respective items as above.
2. No painting for SS, Aluminium, non ferrous, stainless steel and Galvanized items.
3. In sub-assy, wherever the plates / sheets of thickness less than or equal to 5mm and rods are used, Power tool cleaning or Hand tool cleaning to SSPC- SP3/ SP2 shall be followed. Painting scheme for Sl no 2 of APH can be used in that case.
4. All components covered under different SL no. are to be painted. Incase any component is left out, the same shall be deemed to be included under the relevant section.
5. Painting of damaged surfaces will be same as the painting scheme in this specification with power tool cleaning.

Prepared by	Reviewed by	Approved by
8/4/2021	08/04/2021	8/4/2021
Abdul Ghani Senior Engineer/QA	K Renjith Manager/QA	R.Arunachalam DGM/QA(Mech)

REVIEWED FOR REFERENCE
SIGNATURE: K. Renjith
LETTER REF.: 28812-MD-PWR03-0077A
DATE: 15.04.2021
M. N. DASTUR & COMPANY (P) LTD
KOLKATA

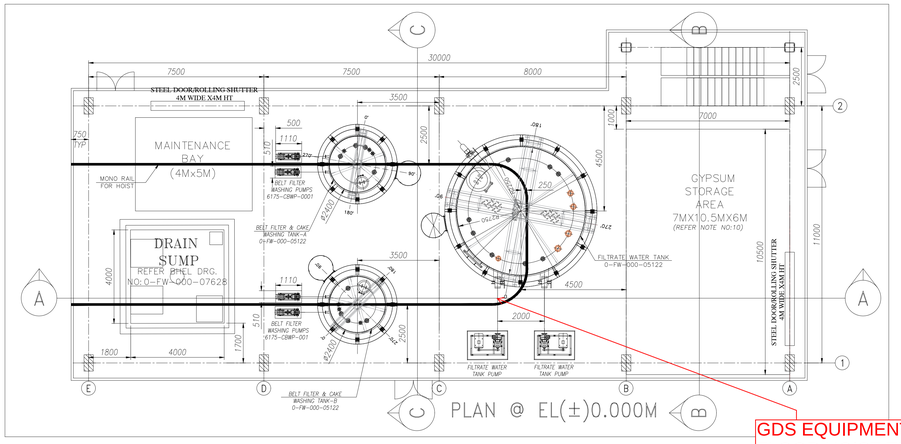
Bidder Seal & Signed

FIRST ANGLE PROJECTION

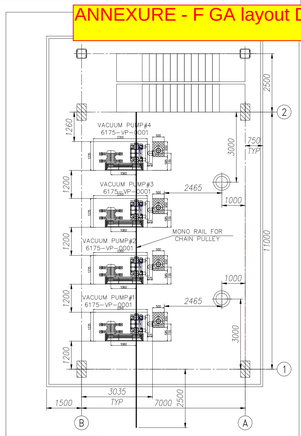
(ALL DIMENSIONS ARE IN mm)

SH. 01 OF 01 DRG. NO. 0-FW-000-04982

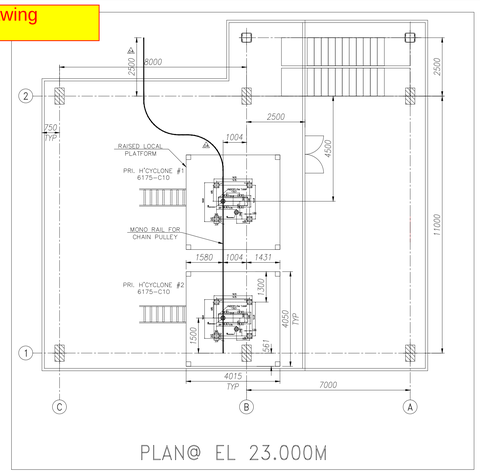
ANNEXURE - F GA layout Drawing



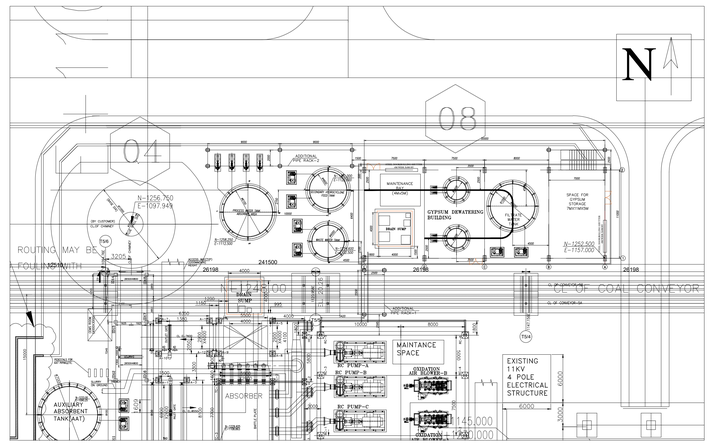
PLAN @ EL(±)0.000M



@ EL(±)8.500M

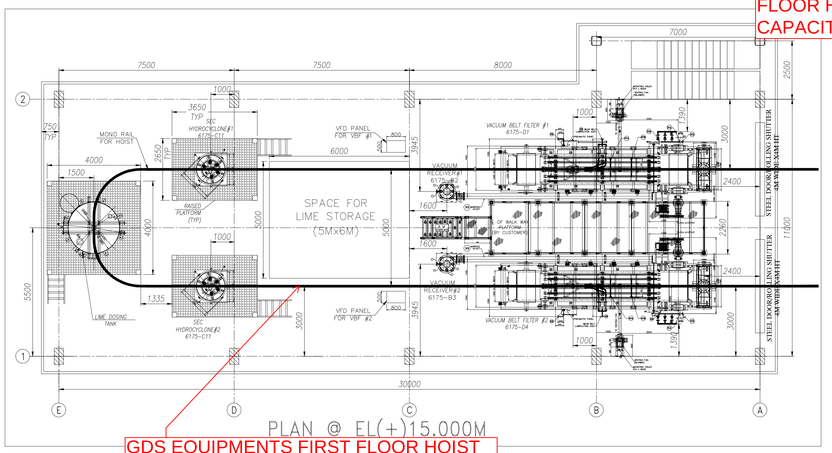


PLAN@ EL 23.000M



KEY PLAN

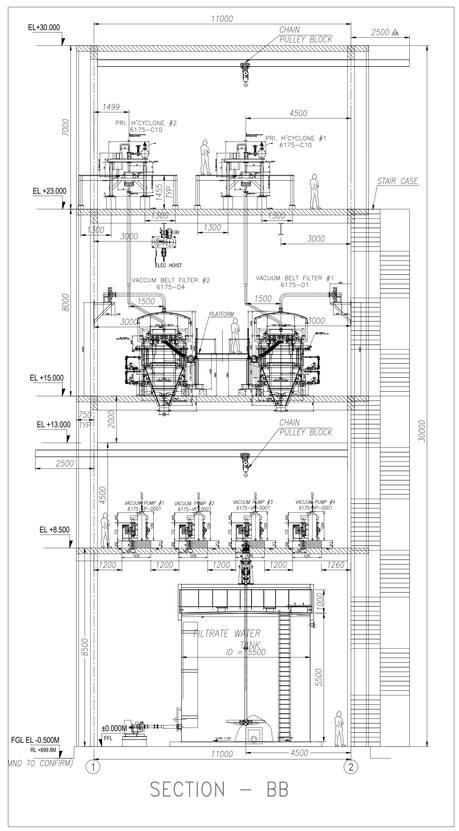
GDS EQUIPMENTS GROUND FLOOR HOIST TRACK , CAPACITY AS PER ENQUIRY



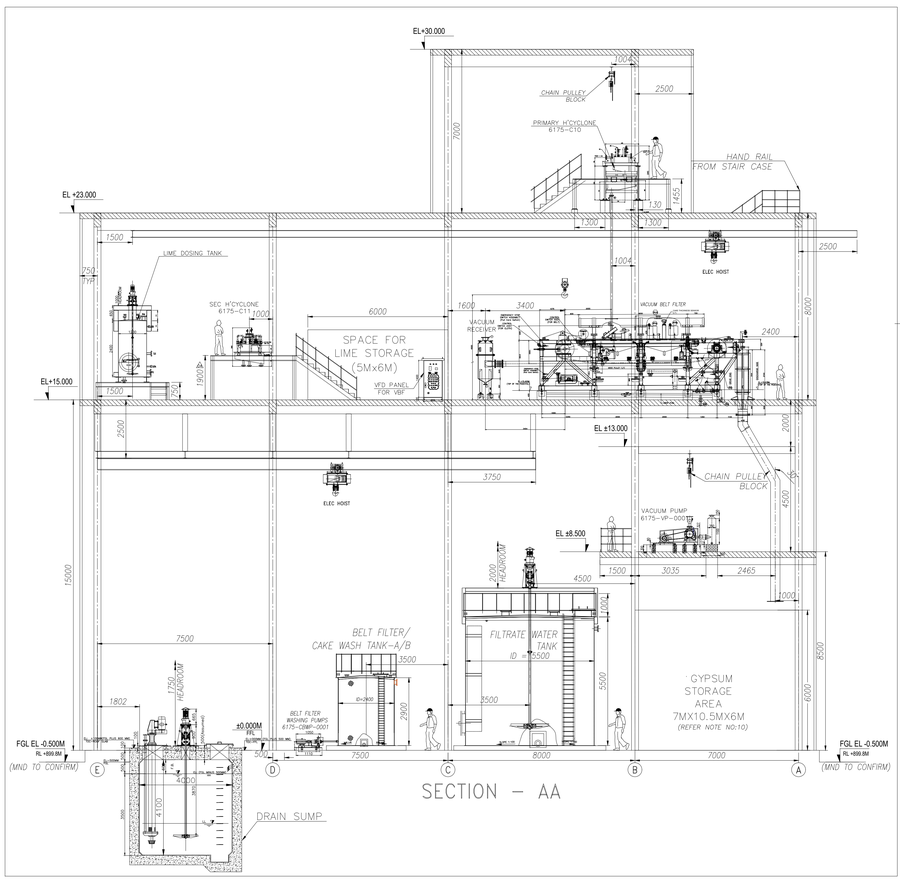
PLAN @ EL(+)15.000M

Bidder Seal & Signed

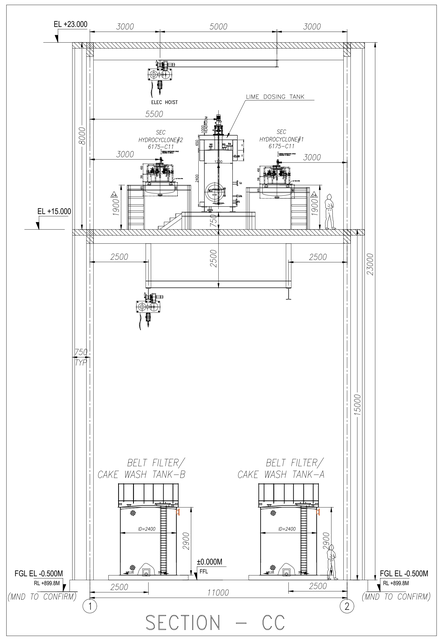
APPROXIMATE LOAD DUE TO PIPE CUM CABLE ROUTING AT ~9.0M FROM FFL.			
SL. NO.	COLUMN ID	VERTICAL LOAD	MOMENT LOAD
01	1A TO 1E	10 T	15 T-M
02	2A TO 2E	10T	15 T-M



SECTION – BB



SECTION – AA



SECTION – CC

GDS EQUIPMENTS FIRST FLOOR HOIST TRACK , CAPACITY AS PER ENQUIRY

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. EL(±)0.0M WHICH IS GROUND FLOOR(FFL) OF STG BUILDING, CORRESPONDS TO RL (+)900.3M(MND TO CONFIRM).
3. FINISHED GROUND/GRADE LEVEL NEAR GYPSUM DEWATERING BUILDING AREA SHALL BE RL(+)899.8M(MND TO CONFIRM) i.e. EL(−)0.50M.
4. INDICATED ORIENTATION OF COLUMNS,COLUMN,BEAM SIZES ARE SUGGESTIVE ONY,FOR EXACT ORIENTATION REFER STRUCTURAL DRAWINGS.
5. THE EQUIPMENT/MACHINERY SIZES SHOWN IN THIS DRAWING ARE INDICATIVE ONLY,THE SAME SHALL BE CONFIRMED BASED ON VENDOR DATA.
6. FLOOR OPENINGS,PIPE CROSSINGS AND PIPE SUPPORT DETAILS SHALL BE FURNISHED DURING DETAIL ENGINEERING STAGE.
7. ALL STRUCTURES,INCLUDING PLATFORMS,MONORAIL BEAMS,STAIRCASE, HANDRAILS,PEDESTALS AND ALL OTHER STRUCTURES ASSOCIATED WITH THIS BUILDING ARE IN CUSTOMER SCOPE.
8. REFER APPROVED DRAWING NO:4-FW-000-01205 "SELECTION OF MATERIAL FOR FGD SYSTEM" FOR MATERIAL DETAILS.
9. NOZZLE ORIENTATION FOR TANKS SHOWN IN ELEVATION VIEW,ARE INDICATIVE ONLY EXACT ORIENTATION SHALL BE AS PER FINAL PIPING LAYOUT.
10. LOAD DUE TO GYPSUM STORED IN SPACE MARKED AS "GYPSUM STORAGE AREA" SHALL BE CONSIDERED IN STRUCTURE AND FOUNDATION DESIGN.
11. DETAILS OF STAIRCASE,SUITABLE DOORS,WINDOWS,VENTILATORS SHALL BE CONSIDERED BY CIVIL DESIGNER FOR THIS TOTAL BUILDING.
12. LIVE LOAD OF 1.0 TON/M2 TO BE CONSIDERED FOR ALL FLOORS.

LIST OF EQUIPMENTS

SL NO	QTY	DESCRIPTIONS	APPX SIZE	LOCATION	REMARKS.
1	01	FILTRATE WATER TANK	5.5M DIA. X 5.5M HEIGHT	GROUND FLOOR @ EL(±)0.000.	–
2	01	LIME DOSING/NUETRALIZATION TANK	1.2M DIA. X 2.4M HEIGHT	ON FLOOR EL(+)15.750	SUPPORTED FROM EL(+) 15.0M MAIN FLOOR.
3	02	BELT FILTER WASHING TANK	2.4M DIA. X 2.9M HEIGHT	GROUND FLOOR @ EL(±)0.000	–
4	02	FILTRATE WATER TANK PUMP	LATER	GROUND FLOOR @ EL(±)0.000	–
5	04	BELT FILTER WASHING PUMP	LATER	GROUND FLOOR @ EL(±)0.000	–
6	02	VACUUM BELT FILTER	8.5M X 2.5M X 3.85M HT	ON FLOOR EL(+)15.00	THE EQUIPMENT COLUMNS WILL BE SUPPORTED ON THE FLOOR
7	02	SECONDARY HYDRO CYCLONE /WASTE WATER HYDRO CYCLONE	1.5M DIA. X 1.7M HEIGHT	ON FLOOR EL(+)16.400	SUPPORTED FROM EL(+) 15.0M MAIN FLOOR.
8	04	VACUUM PUMP	3.1MX1.3MX 1.6M HEIGHT	ON FLOOR EL(+)8.50	–
9	02	VACUUM RECEIVER	0.6M DIA. X 2.7M HEIGHT	ON FLOOR EL(+)15.00	FLOOR MOUNTED TANK
10	02	PRIMARY HYDROCYCLONE	1.7MX1.7MX 2.4M HEIGHT	ON FLOOR EL(+)24.455	SUPPORTED FROM EL(+) 23.0M MAIN FLOOR.
11	02	BELT FILTER VENT FAN	0.75MX0.75M	ABOVE VACUUM BELT FILTER	ABOVE VACUUM BELT FILTER
12	01	LCP	–	LATER	LOCAL CONTROL PANEL
13	01	MONO RAIL HOIST 5T	–	BELOW FLOOR @ EL(+)15.00	–
14	01	GYPSUM STORAGE SPACE	7.0 X 10.5 X 6.0	GROUND FLOOR @ EL(±)0.000.	RCC RETAINING WALL TO BE CONFIRMED
15	01	MONO RAIL HOIST 5T	–	BELOW FLOOR @ EL(+) 23.00	–
16	01	MONORAIL CHAIN PULLEY 2T CAPACITY	–	BELOW PRIMARY HYDRO CYCLONE AREA ROOF @EL(+)30.00	-
17	01	MONORAIL CHAIN PULLEY 2T CAPACITY	–	BELOW VACUUM PUMP TOP STRUCTURE @ EL(+) 13.000	-
18	01	GYPSUM AREA DRAIN SUMP	4M X 4M X4M	BELOW GROUND FLOOR @ EL(±)0.000	-

LEGEND:–

FFL : FINISHED FLOOR LEVEL
FGL : FINISHED GROUND LEVEL
BOB : BOTTOM OF BASE PLATE LEVEL
D : DOOR 1.2M WIDE
RS : ROLLING SHUTTER 4M X4M
TOPF : TOP OF PLATFORM
PL : PAVED LEVEL
TOG : TOP OF GRATING
TOC : TOP OF CONCRETE
VL : VERTICAL LADDER
CGL : CAGE LADDER
NVB : NO VERTICAL BRACING ALLOWED

REF. DWGS

1. PY-LQ-0-M166-2001-01 : PLOT PLAN
2. 3-FW-000-04139 : PROCESS FLOW DIAGRAM– GYPSUM DEWATERING BUILDING.
3. 3-FW-000-04143 : P&ID – PRIMARY HYDROCYCLONE,SECONDARY HYDROCYCLONE, VACUUM BELT FILTER,BELT FILTER WASH TANK & FILTRATE WATER TANK.
4. 0-FW-000-05122 : FOUNDATION LOADING FOR VARIOUS FGD TANKS.

PROGRESSIVE

BAP CUSTOMER NO: R182.

CLIENT	NATIONAL ALUMINIUM COMPANY LIMITED BHUBANESWAR, ODISHA
CONSULTANT	M. N. DASTUR & COMPANY (P) LTD CONSULTING ENGINEERS, KOLKATA
PROJECT	INSTALLATION OF STEAM AND POWER PLANT FOR 5th STREAM ALUMINA REFINERY EXPANSION AT DAMANJODI, ODISHA UNDER PHASE-3 EXPANSION OF M&R COMPLEX

BHARAT HEAVY ELECTRICALS LTD. UNIT: BOILER AUXILIARIES PLANT, RANIPET: 632 406.

	NAME	SIGN.	DATE
DRN.	ILAN/SUKUMAR	-sd-	03-04-2021
CHD.	K.KUMAR	-sd-	03-04-2021
APPD.	V.V.SUNDAR	-sd-	03-04-2021

NO. OF VAR.

DEPT.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEMS
CODE. UNTOL. DIMS. OR C/W/F.	N.T.S	–N.A.–	–N.A.–	–N.A.–	–N.A.–

TITLE: LAYOUT OF GYPSUM DEWATERING BUILDING (PLAN & ELEVATIONS)

CARD CODE: N.A.

BHEL DRG NO. 0-FW-000-04982

REV. 04

SHT. No 01 NO. OF SHT. 01

REV.	DATE	ALTERED	SUKUMAR
04	24.06.22	CHD/APPD	K.KUMAR
		MONORAIL UPDATED FOR PRIMARY H'CYCLONE & VACUUM PUMPS. SECONDARY H'CYCLONE PLATFORM HEIGHT UPDATED.	
03	09.06.22	CHD/APPD	K.KUMAR
		REVISED HVBF DETAILS,HVBF VENT FAN DETAILS UPDATED AS PER VENDOR.CAKE WASH TANK PUMP DETAILS UPDATED.CUSTOMER COMMENTS UPDATED. VARIOUS MONORAIL BEAM ARRANGEMENT UPDATED.	
02	01.03.22	CHD/APPD	K.KUMAR
		EQUIPMENT DETAILS UPDATED FROM VENDOR. CUSTOMER COMMENTS UPDATED.	
01	07.07.21	CHD/APPD	K.KUMAR
		TANK DETAILS UPDATED AS PER LOADING. RL LEVELS UPDATED IN NOTES NO:02 & 03.	

SIZE A0

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

NOTES:

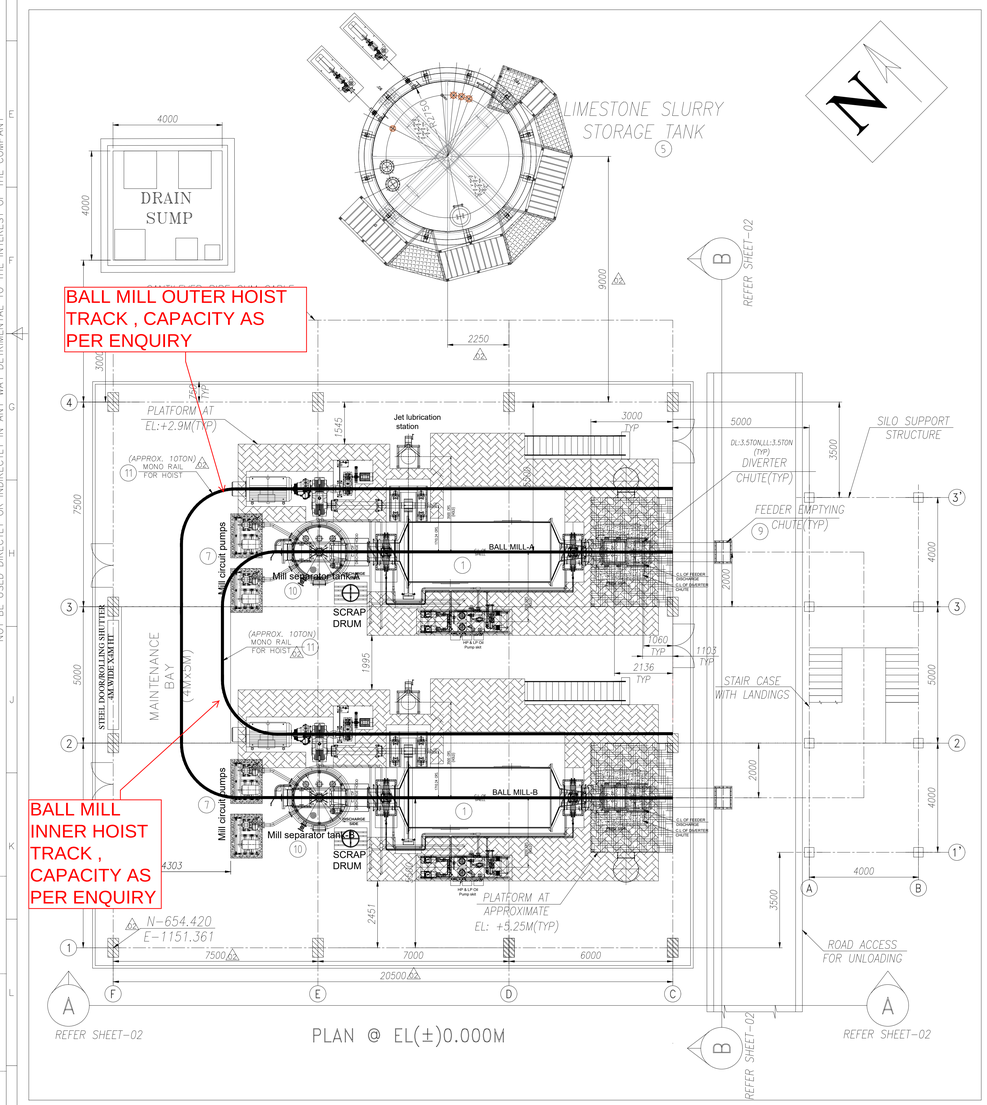
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. EL(±)0.0M WHICH IS GROUND FLOOR(FFL) OF BALL MILL BUILDING, CORRESPONDS TO RL (+)894.5M.
3. FINISHED GROUND/GRADE LEVEL NEAR BALL MILL BUILDING AREA SHALL BE RL(+)894.0M i.e. EL(−)0.50M OF BALL MILL AREA.
4. INDICATED ORIENTATION OF COLUMNS,COLUMN,BEAM SIZES ARE SUGGESTIVE ONY,FOR EXACT ORIENTATION REFER STRUCTURAL DRAWINGS.
5. THE EQUIPMENT/MACHINERY SIZES SHOWN IN THIS DRAWING ARE INDICATIVE ONLY.THE SAME SHALL BE CONFIRMED BASED ON VENDOR DATA.
6. FLOOR OPENINGS,PIPE CROSSINGS AND PIPE SUPPORT DETAILS SHALL BE FURNISHED DURING DETAIL ENGINEERING STAGE.
7. ALL STRUCTURES,INCLUDING PLATFORMS,MONORAIL BEAMS,STAIRCASE, HANDRAILS, PEDESTALS AND ALL OTHER STRUCTURES ASSOCIATED WITH THIS BUILDING & EQUIPMENT ARE IN CUSTOMER SCOPE.HOWEVER SILO STRUCTURE INCLUDING INTERCONNECTION FLOORS WITH BUILDING ARE IN BHEL SCOPE.
8. REFER APPROVED DRAWING NO:4-FW-000-01205 "SELECTION OF MATERIAL FOR FGD SYSTEM" FOR MATERIAL DETAILS.
9. NOT TO EXCEED PIPING LOAD OF 400 KG/M AND CABLE ROUTING LOAD OF ___ TO BE CONSIDERED.
10. DETAILS OF STAIRCASE,SUITABLE DOORS,WINDOWS,VENTILATORS SHALL BE CONSIDERED BY CIVIL DESIGNER FOR THIS TOTAL BUILDING.
11. NOT TO EXCEED STATIC LOAD(2.0 TON),DYNAMIC LOAD(2.5TONS) FOR EACH EQUIPMENT TO BE CONSIDERED.FINAL DETAILS WITH EXACT LOAD SHALL BE FURNISHED SHORTLY.
12. TENTATIVE STATIC LOAD(10.0 TON),DYNAMIC LOAD(10.0TONS) FOR EACH GRAVIMETRIC FEEDER TO BE CONSIDERED,FOR THE PORTION OF FEEDER INSIDE BUILDING(FROM GRID−D TO GRID−C).FINAL DETAILS WITH EXACT LOAD SHALL BE FURNISHED SHORTLY.
13. LIVE LOAD OF 1.0 TON/M2 TO BE CONSIDERED FOR ALL FLOORS.
14. BEAM TO BE LOWERED,TO CLEAR THE CHUTE SHOWN.ACCORDINGLY FLOOR BEAMS AT EL:+5.25M TO BE SUPPORTED FROM POSTS RAISED FROM THIS BEAM.

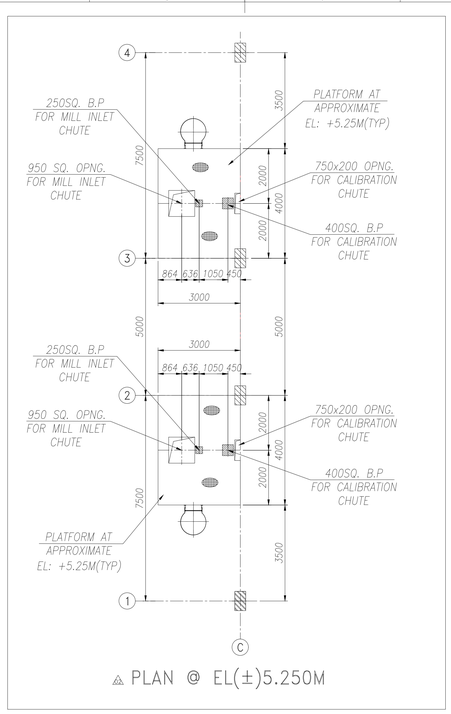
LEGEND:−

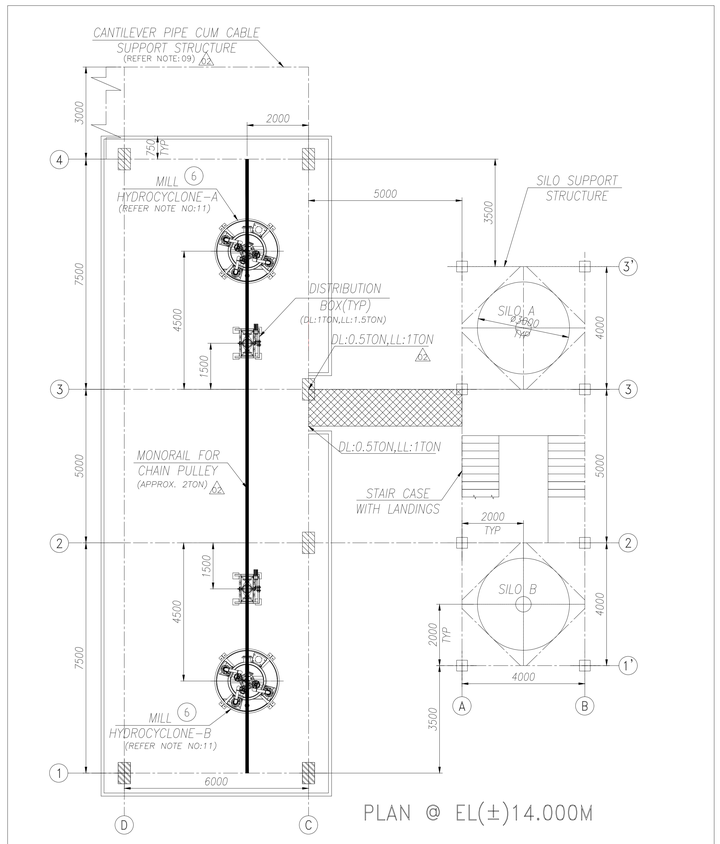
FFL	:	FINISHED FLOOR LEVEL
FGL	:	FINISHED GROUND LEVEL
BOB	:	BOTTOM OF BASE PLATE LEVEL
D	:	DOOR 1.2M WIDE
RS	:	ROLLING SHUTTER 4M X4M
TOPF	:	TOP OF PLATFORM
PL	:	PAVED LEVEL
TOG	:	TOP OF GRATING
TOC	:	TOP OF CONCRETE
VL	:	VERTICAL LADDER
CGL	:	CAGE LADDER
NVB	:	NO VERTICAL BRACING ALLOWED
DL	:	DEAD LOAD
LL	:	LIVE LOAD

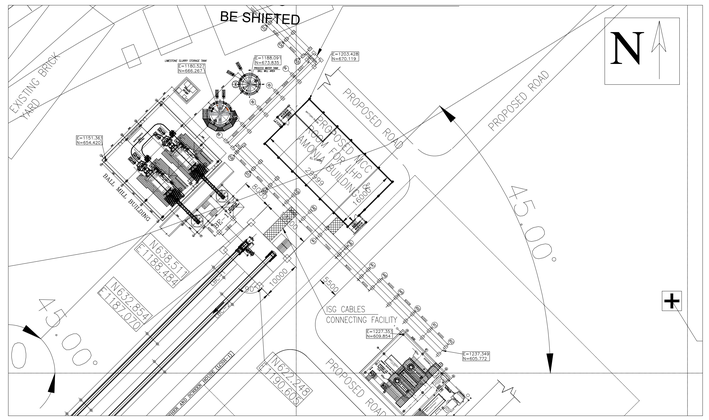
REF. DWGS

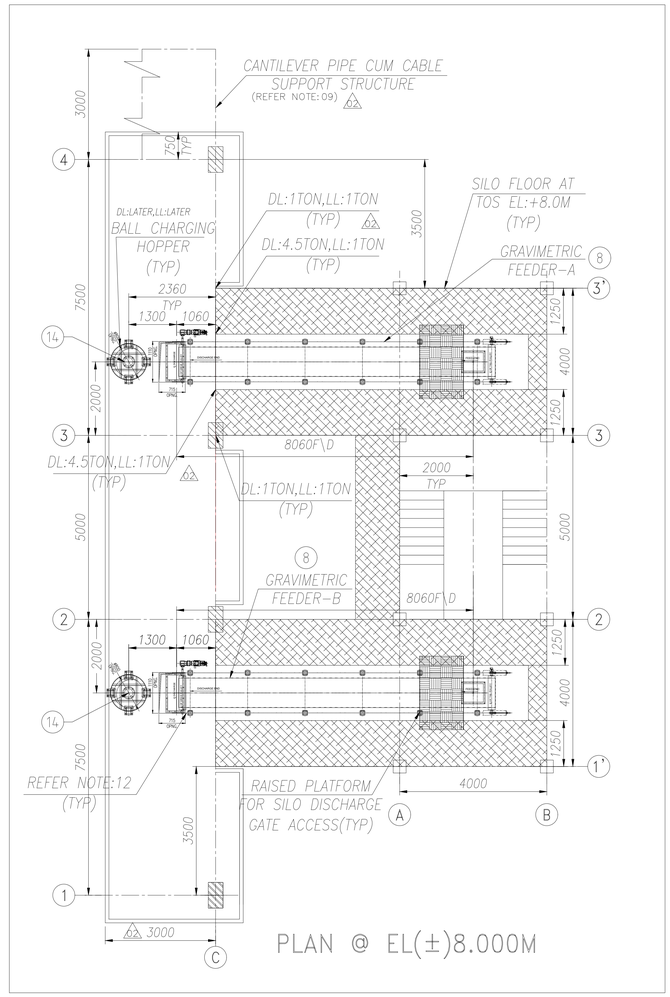
1. PY−LQ−0−M166−2001−01 : PLOT PLAN
2. 3−FW−000−04139 : PROCESS FLOW DIAGRAM−LIMESTONE GRINDING SYSTEM.
3. 3−FW−000−04142 : P&ID − LIMESTONE SILO,LIMESTONE PULVERIZER WET BALL MILL, & LIMESTONE SLURRY STORAGE TANK.
4. 0−FW−000−04994 : GA DRAWING OF LIMESTONE SILOS.
5. 0−FW−000−05122 : FOUNDATION LOADING FOR VARIOUS FGD TANKS.











Bidder Seal & Signed

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

REV.	DATE	ALTERED	CHD/APPD
02	02.03.22	SUKUMAR	CHD/APPD K.KUMAR
01	07.07.21	SUKUMAR	CHD/APPD K.KUMAR

ZONE 02: CO ORDINATES UPDATED AS PER PLOT PLAN. LSDT AND SUMP DETAILS UPDATED. DETAILS UPDATED AS PER VENDOR DATA.
ZONE 01: LSST DETAILS UPDATED AS PER LOADING. RL LEVELS UPDATED IN NOTES NO:02 & 03.

BAP CUSTOMER NO: R182.

CLIENT	NATIONAL ALUMINIUM COMPANY LIMITED BHUBANESWAR, ODISHA
CONSULTANT	M. N. DASTUR & COMPANY (P) LTD CONSULTING ENGINEERS, KOLKATA
PROJECT	INSTALLATION OF STEAM AND POWER PLANT FOR 5th STREAM ALUMINA REFINERY EXPANSION AT DAMANJODI, ODISHA UNDER PHASE−3 EXPANSION OF M&R COMPLEX

BHARAT HEAVY ELECTRICALS LTD. UNIT: BOILER AUXILIARIES PLANT, RANIPET:632 406.

	NAME	SIGN.	DATE
DRN.	ILAN/SUKUMAR	−sd−	15−04−2021
CHD.	K.KUMAR	−sd−	15−04−2021
APPD.	V.V.SUNDAR	−sd−	15−04−2021

NO.OF VAR.

DEPT.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE.	N.T.S	−N.A.−	−N.A.−	−N.A.−	−N.A.−

TITLE: LAYOUT OF BALL MILL BUILDING (PLAN & ELEVATIONS)

CARD CODE: N.A.

BHEL DRG NO.: 0−FW−000−04993

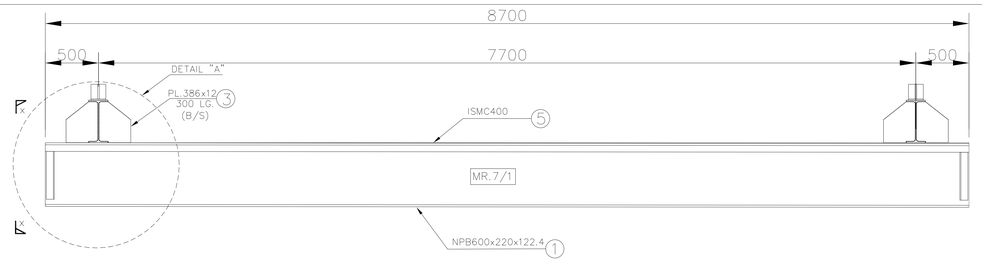
REV.: 02

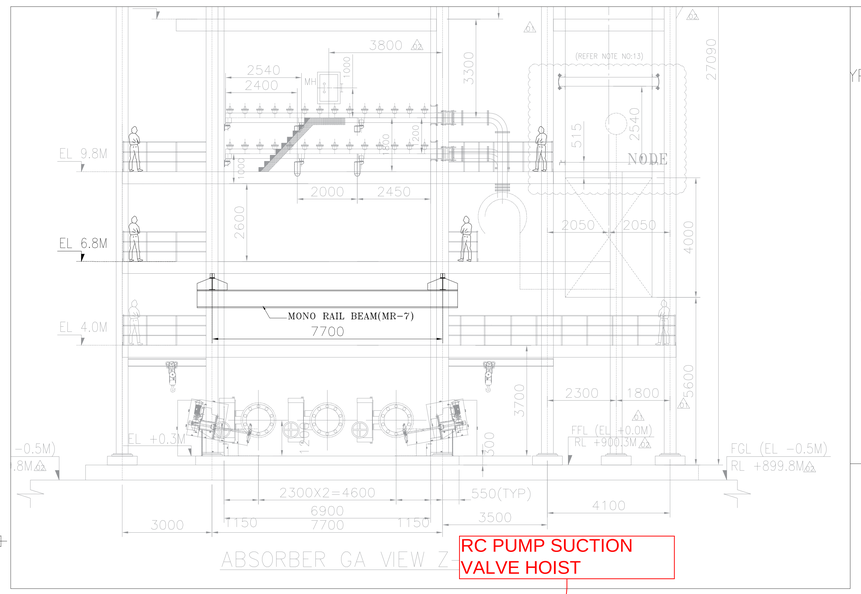
SHT. No 01 NO. OF SHT. 02

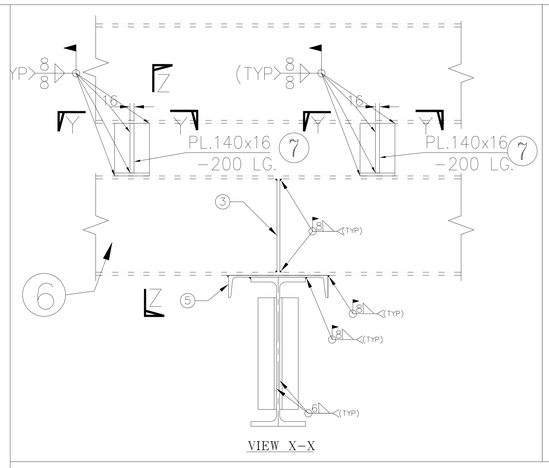
SIZE A0

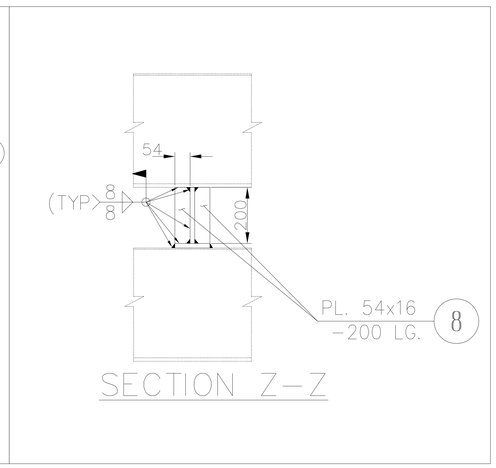
DRAWING NO 0-FW-710-12332

All dimensions are in millimetres

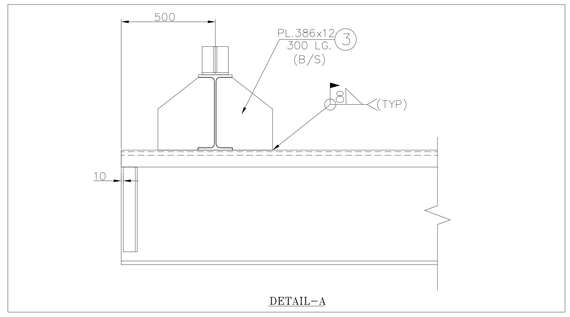


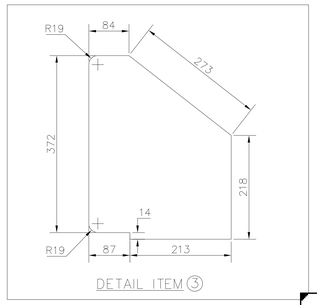


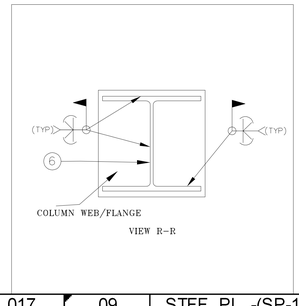


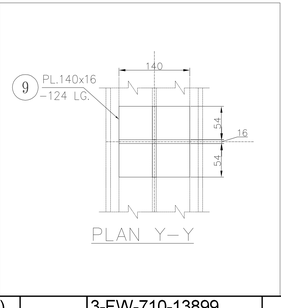


Bidder Seal & Signed









DU NO.	ITEM NO.	DESCRIPTION	STD	DRAWING NUMBER	VAR.NO	MATERIAL SPEC	A/C/P	D1	QUANTITY	GS	ZONE
					ITEM NO	MATERIAL CODE		UNIT	UNITWEIGHT		
017	09	STFF. PL. -(SP-10/1)		3-FW-710-13899				NO	2.18		
									4		
016	08	STFF. PL. -(SP-10/3)		3-FW-710-13899				NO	1.3575		
									8		
015	07	STFF. PL. -(SP-10/2)		3-FW-710-13899				NO	3.515		
									4		
014	06	NPB 400x180x66.3-1000				150095550000		NO	66.3		
						IS2062			2		
013	05	ISMC 400				AA1012708209		MR	10		
						IS2062			REFER GMS		
									9.0625		
012	03	GUSSET -(GS 7/3)		3-FW-710-13899				NO	4		
								NO	1081.34		
011	01	MONORAIL (MR-7/1)		3-FW-710-13899					1		

NOTES:-

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN M.
2. ALL MEMBERS AND GUSSETS PLATES TO BE CUT AFTER FULL SCALE SHOP LAYOUT BEFORE FABRICATION
3. ALL SHOP WELD ARE 8mm. THICK U.N.O.
4. STANDARD FABRICATION NOTES IN DRAWING NO: 4-00-000-32487 TO BE FOLLOWED
5. * TENTATIVE - CONFORM WITH ENGINEERING BEFORE ERECTION.
6. BOM FOR ALL UNITS (R182)
7. REFER ABSORBER GA 0-FW-000-03574 FOR EXACT LOCATION OF MONO RAIL

ISMC 400 SHALL BE SENT TO SITE IN RUNNING METRES.

--- ITEM NO

REV	DATE	ALTERED
00	-	-
ZONE		CHECKED

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.
UNIT: BOILER AUXILIARIES PLANT.
RANIPET - 632 406

	NAME	SIGN	DATE	NO OF VAR
DRN	KSS		17.02.2023	-
CHD	KNL K SAHAN		17.02.2023	-
APPD	K B PADHI		17.02.2023	-

DEPT	GRADE OF UNTOL DIM	SCALE	WEIGHT (KG)	REF TO ASSY/OLD DRG	ITEM NO	NO OF ITEMS
ASCS		NTS	-	-	-	-
CODE 862	PR AG 500					

TITLE: MONORAIL BEAM
(ABSORBER RECIRCULATION PUMP SUCTION VALVE)

CARD CODE U 01

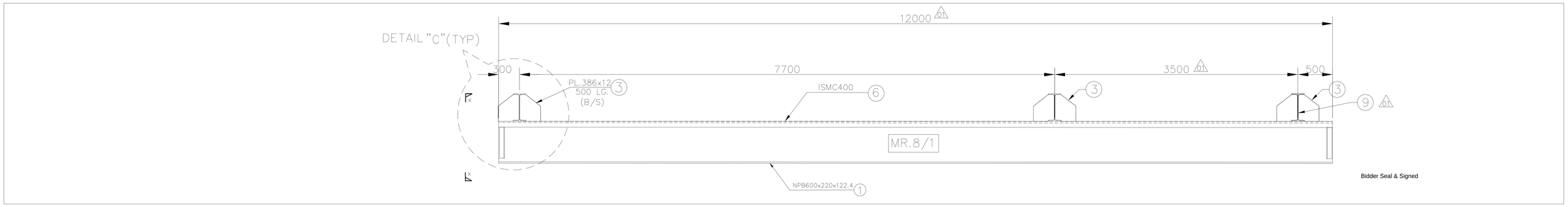
DRAWING NO 0-FW-710-12332

REV 00

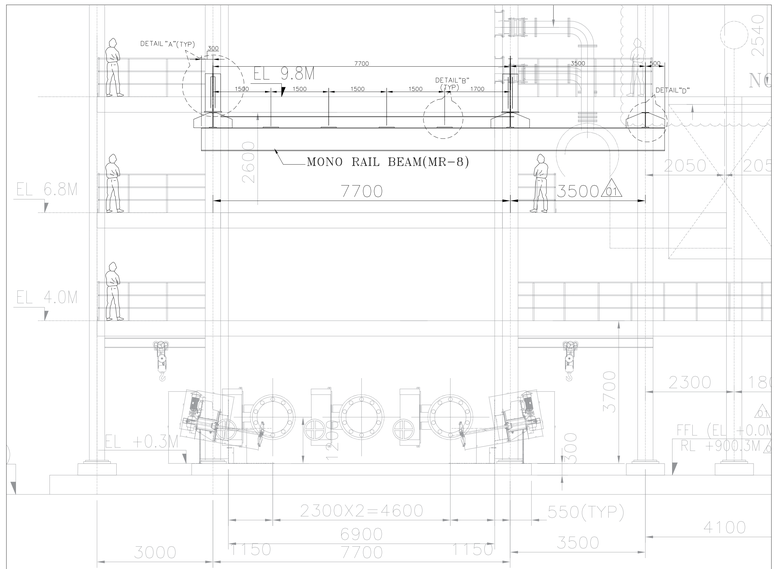
Size A0

DRAWING NO 0-FW-710-12333

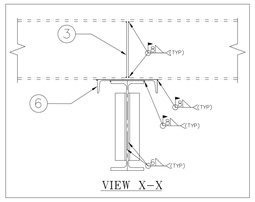
All dimensions are in millimetres

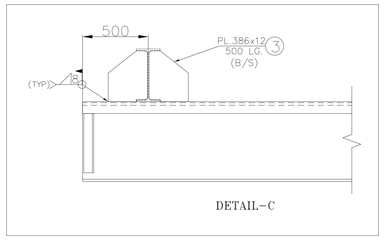


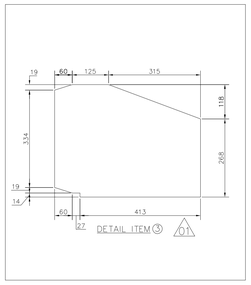
Bidder Seal & Signed

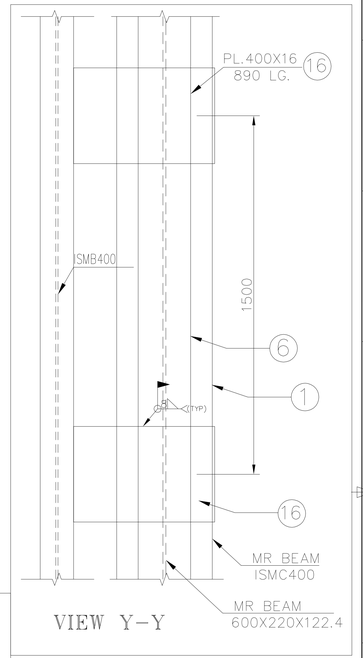


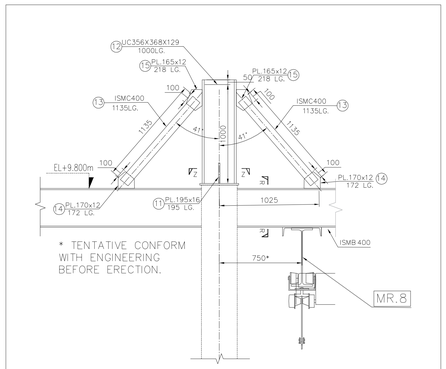
ABSORBER GA – VIEW Z–Z

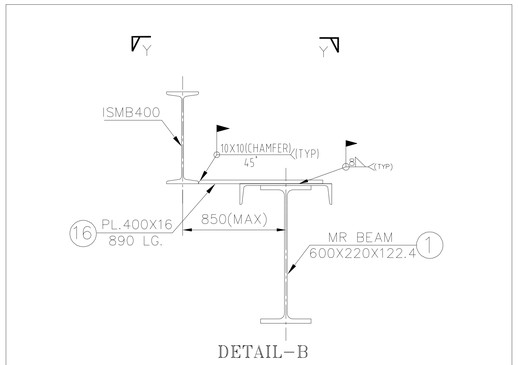


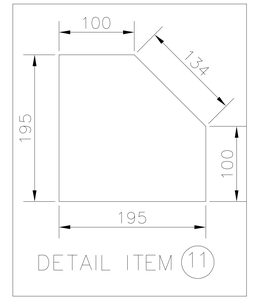


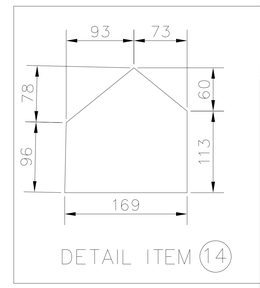


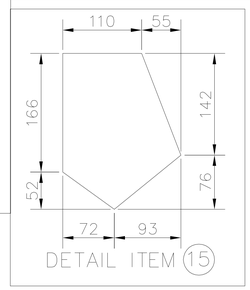


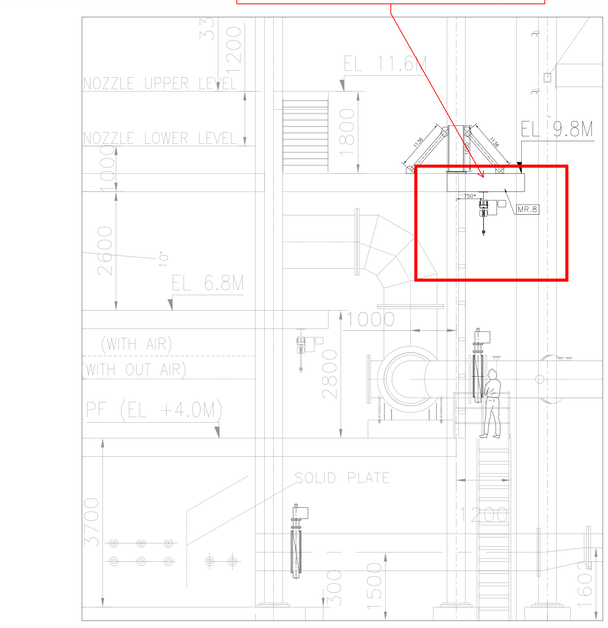




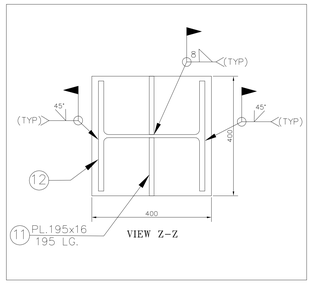


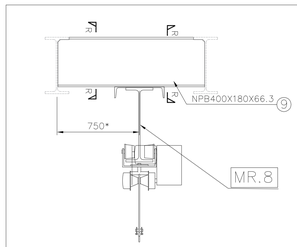


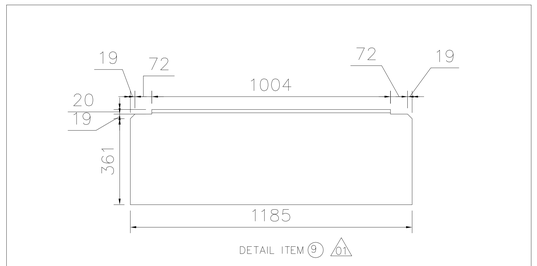


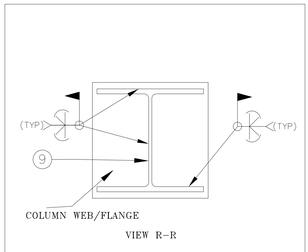


ABSORBER GA – VIEW X–X









DU.NO	ITEM NO.	DESCRIPTION	STD	DRAWING NUMBER	VAR.NO	MATERIAL SPEC	A/C/P	D1	QUANTITY	GS	ZONE
					ITEM NO	MATERIAL CODE		UNIT	UNITWEIGH		
004	09	NPB 400x180x66.3-1185				150095550000		NO	78.57 01		
						IS2062			2		
003	06	ISMC 400				AA1012708209		MR	14 01		
						IS2062			REFER GMS		
010	16	PL.16X400X890				AA1011808110		NO	4		
						IS2062			44.719		
007	13	CHANNEL MC 400-1135				AA1012708209		NO	56.8635		
						IS2062			4		
006	12	UC356X368X129-1000						NO	129		
									2		
009	15	GUSSET -(GS 8/15)		3-FW-710-13900				NO	2.509		
									4		
008	14	GUSSET -(GS 8/14)		3-FW-710-13900				NO	2.17		
									4		
005	11	GUSSET -(GS 8/11)		3-FW-710-13900				NO	4.209		
									4		
002	03	GUSSET -(GS 8/3)		3-FW-710-13900				NO	16.19 01		
									6		
001	01	MONORAIL (MR-8/1)						NO	1485.42 01		
				3-FW-710-13900					1		

BILL OF MATERIALS

ISMC 400 SHALL BE SENT TO SITE IN RUNNING METRES.

NOTES: –

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN M.
2. ALL MEMBERS AND GUSSETS PLATES TO BE CUT AFTER FULL SCALE SHOP LAYOUT BEFORE FABRICATION
3. ALL SHOP WELD ARE 8mm. THICK U.N.O.
4. STANDARD FABRICATION NOTES IN DRAWING NO: 4–00–000–32487 TO BE FOLLOWED
5. * TENTATIVE CONFORM WITH ENGINEERING BEFORE ERECTION.
6. BOM FOR ALL UNITS (R182)
7. REFER ABSORBER GA 0–FW–000–03574 FOR EXACT LOCATION OF MONO RAIL

--- ITEM NO

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.
UNIT BOILER AUXILIARIES PLANT
RANIPET - 632 406

	NAME	SIGN	DATE	NO OF VAR
DRN	KSS		17.02.2022	
CHD	ANL K SAHAN		17.02.2022	-
APPD	K B PADHI		17.02.2022	

REV	DATE	ALTERED	KSS
01	25.02.2023	CHECKED	AKS

ZONE: MR8/1 LENGTH REVISED, GS 8/3 QTY REVISED
ITEM NO 6 & 9 LENGTH MODIFIED

DEPT	GRADE OF	SCALE		WEIGHT (KG)	REF. TO ASSY/OLD DRG		
AGCS	UNTOL DIM				-	FORM	NO OF ITEM
CODE 862	PR.AQ.500	1:20,1:10,1:5		-	-	1	1

TITLE: MONORAIL BEAM
(ABSORBER RECIRCULATION PUMP DISCHARGE VALVE)

CARD CODE U 01

DRAWING NO: 0–FW–710–12333

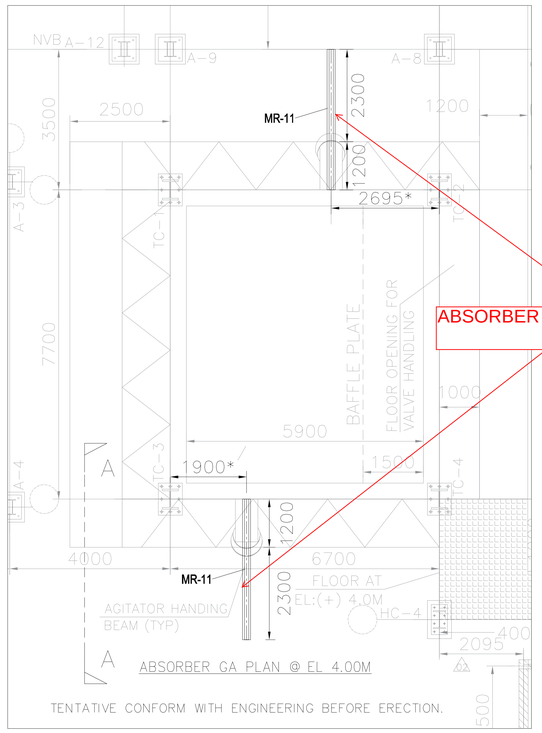
REV 01

Size A0

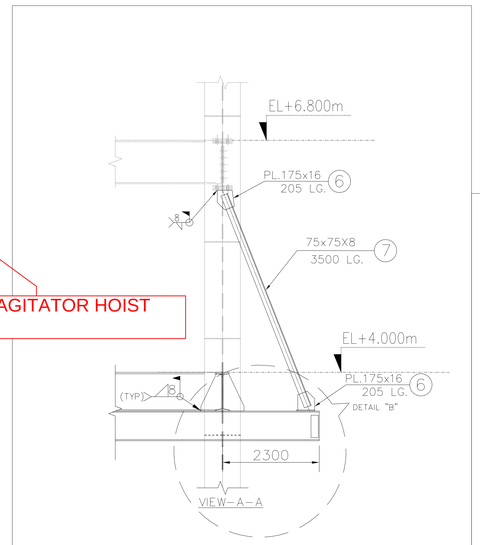
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

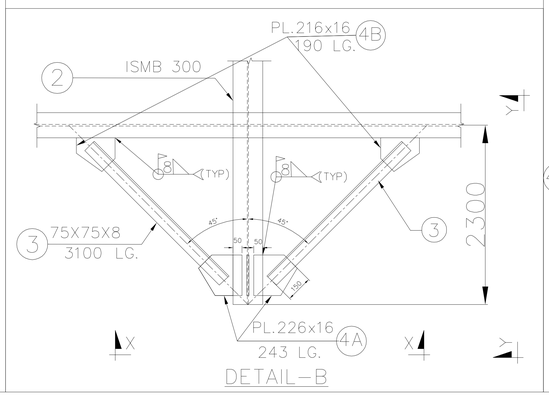
DRAWING NO 0-FW-710-12335

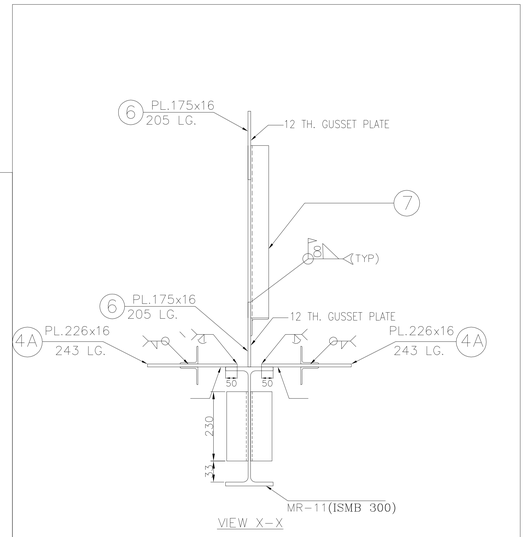
All dimensions are in millimetres

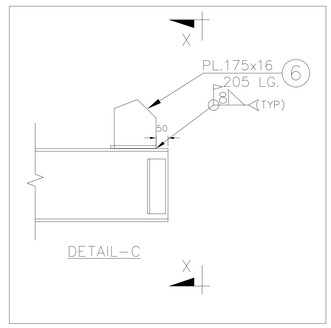


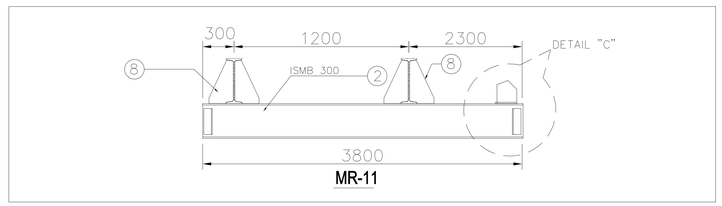
ABSORBER AGITATOR HOIST

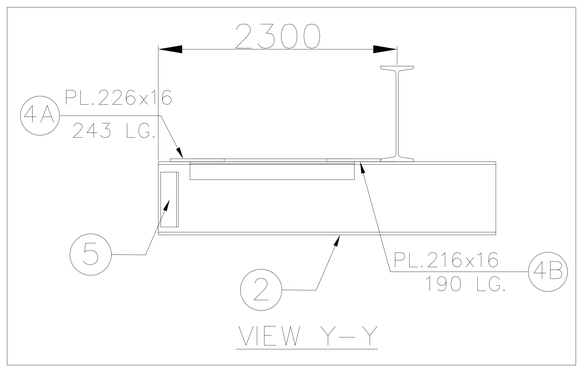


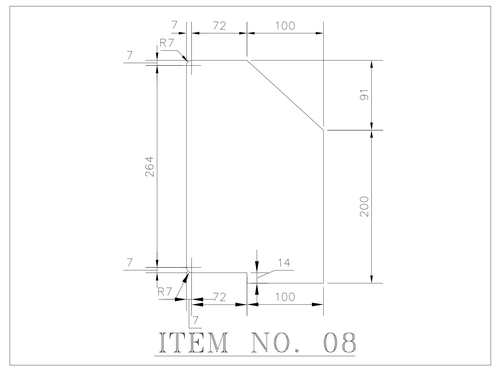


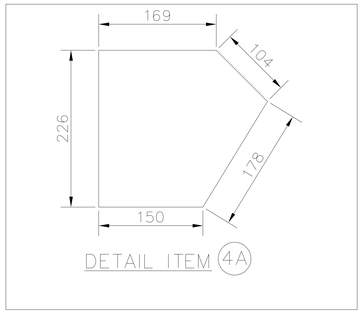


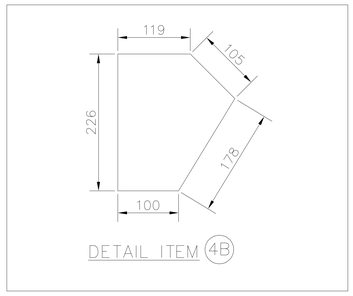


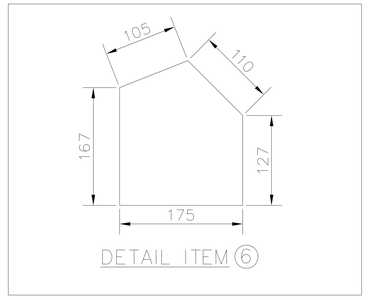












Bidder Seal & Signed

Arrangement shown is Indicative/ Tentative. Site can suitably adjust depending on interference and available space.
Raw Materials required are supplied as Erection materials DU NO. 23 to 29. The Raw materials can be cut to suite the requirement.

--- ITEM NO

NOTES: –

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN M.
2. ALL MEMBERS AND GUSSETS PLATES TO BE CUT AFTER FULL SCALE SHOP LAYOUT BEFORE FABRICATION
3. ALL SHOP WELD ARE 8mm. THICK U.N.O.
4. STANDARD FABRICATION NOTES IN DRAWING NO: 4-00-000-32487 TO BE FOLLOWED
5. * TENTATIVE CONFORM WITH ENGINEERING BEFORE ERECTION.
6. REFER ABSORBER GA 0-FW-000-03574 FOR EXACT LOCATION OF MONO RAIL

REV	DATE	ALTERED
ZONE		CHECKED

CAUTION: The information on this drawing is the property of BHARAT HEAVY ELECTRICALS LTD. It is not to be used directly or indirectly in any manner detrimental to the interest of the company

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.
UNIT BOILER AUXILIARIES PLANT
PANIPET - 132 106

	NAME	SIGN	DATE	NO OF VAR
DRN	KSS		22.02.2023	
CHD	M K BANSAL		22.02.2023	-
APPD	ANIL K SAHANI		22.02.2023	

DEPT	GRADE OF UNTOL DIM	SCALE	WEIGHT (KG)	REF. TO ASSY/OLD DRG	ITEM NO	NO OF ITEMS
AGCS						
CODE 862	PR AQ 500	NTS	-	-	1	1

TITLE: MONORAIL BEAM (ABSORBER AGITATOR)

CARD CODE: U 01

DRAWING NO: 0-FW-710-12335

REV: 00

Size A0

ANNEXURE - D

ELECTRIC WIRE ROPE HOIST (EWRH) WITH MOTOR DRIVEN TROLLEY										PROJECT: NALCO FGD PROJECT				
SL NO	AREA	TYPE OF HOIST	CAPACITY OF HOIST	SPEED		HOIST MONORAIL BEAM BOTTOM ELEVATIONS (Hoist Monorail BEAM in BHEL Scope)	FLOOR LEVEL	TRAVEL LENGTH	PATH	MINIMUM RADIUS OF TRAVEL	HOIST MONORAIL I-BEAM (Hoist Monorail BEAM in BHEL Scope)	HEIGHT OF BOTTOM OF MONORAIL I-BEAM TO HOIST HOOK	HEIGHT OF BOTTOM OF MONORAIL I-BEAM TO HOIST HOOK - HOIST HEAD ROOM - VENDOR TO SPECIFY	TOTAL QNTY
				HOSTING	CROSS TRAVEL									
			TON	METER PER MINUTE	METER PER MINUTE	(EL (+/-) IN METER)	(EL (+/-) IN METER)	(METER)	CURVED / STRAIGHT	(MM)	NPB / UB /ISMC/ISMB	(MM)	(MM)	(SET)
A. GDS BUILDING														
1	GDS EQUIPMENTS GROUND FLOOR	ELECTRIC WIRE ROPE HOIST	1.5	AS PER SPEC	AS PER SPEC	EL (+) 11.90M	EL (-)0.500M	45M	CURVED	1500 MM	ISMB 300 (Tentative) *EXACT SIZE BE PROVIDED IN DDE	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
2	GDS EQUIPMENTS FIRST FLOOR	ELECTRIC WIRE ROPE HOIST	1.5	AS PER SPEC	AS PER SPEC	EL (+) 21.50M	EL (-)0.500M	72M	CURVED	2000 MM	ISMB 300 (Tentative) *EXACT SIZE BE PROVIDED IN DDE	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
B. BALL MILL BUILDING														
3	BALL MILL INNER	ELECTRIC WIRE ROPE HOIST	4	AS PER SPEC	AS PER SPEC	EL (+) 12.50M	EL (+) 0.00M	40M	CURVED	2000 MM	ISMB 600 (Tentative) *EXACT SIZE BE PROVIDED IN DDE	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
4	BALL MILL OUTER	ELECTRIC WIRE ROPE HOIST	4	AS PER SPEC	AS PER SPEC	EL (+) 12.50M	EL (+) 0.00M	46M	CURVED	2000 MM	ISMB 600 (Tentative) *EXACT SIZE BE PROVIDED IN DDE	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
C. ABSORBER														
5	RC PUMP SUCTION VALVE	ELECTRIC WIRE ROPE HOIST	4	AS PER SPEC	AS PER SPEC	EL (+) 5.80M	EL (-)0.500M	8.7M	STRAIGHT	NA	NPB600X200X122.4 +ISMC 400	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
6	RC PUMP DISCHARGE VALVE	ELECTRIC WIRE ROPE HOIST	4	AS PER SPEC	AS PER SPEC	EL (+) 8.80M	EL (-)0.500M	13.5M	STRAIGHT	NA	NPB600X200X122.4 +ISMC 400	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry
7	ABSORBER AGITATOR	ELECTRIC WIRE ROPE HOIST	1.5	AS PER SPEC	AS PER SPEC	EL (+) 3.40M	EL (-) 0.50M	3.5M	STRAIGHT	NA	ISMB 300	As minimum as possible.- Vendor to specify Actaul value along with offer.	_____	As per Enquiry

NOTE : 1) Depending upon Hoist head room , the actual height of lift for hoist shall be arrived.

2) 2) For PATH & Radius of travel, Pls refer attached "ANNEXURE - F General Arrangement layout Drawing".

3) Vendor to specify the Hoist head Room during Tender stage.

Special Note: The respective Speed of Hoist & Travel for above HOIST shall be as specified in ANNEXURE C - CUSTOMER TECHNICAL SCECIFICATION.

CONTRACT QUALITY REQUIREMENTS (CQR) for ELECTRICALLY OPERATED HOISTS

1378135/2023/BAP-QA_MECH

PROJECT: **NALCO Damanjodi 1 x 18.5 MW** **(BHEL W.O no: R182)** **MAIN CONTRACTOR:** **BHEL - RANIPET** **SUB CONTRACTOR (OEM) & ADDRESS:** **(To be filled by OEM VENDOR)**	**CONTRACT QUALITY REQUIREMENTS (CQR) for ELECTRICALLY OPERATED HOISTS** **NALCO Damanjodi 1 x 18.5 MW** **(BHEL W.O no: R182)**	**DOC.NO:** **BAP/QR/R182/NALCO Damanjodi/EOH: 001** **Rev NO.: 00** **PAGE : Page 1 of 1** **DATE: 08.09.2022**	**##Enquiry No:** **## OEM Supplier Name & Address:** **##Offer reference:** **##Date:** **Contact Official Name:** **Mobile no:** **Email id:**

Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NALCO Quality Requirements	##Specific confirmations by the vendor
		ITEM: Electrically Operated Hoists	
01	**Quality Plan Requirement**	**1.** MQP is applicable for these and accordingly EOH shall submit the MQP for BHEL and ultimate customer NALCO and its consultant M.N Dastur approval. **2.** If any of Underslung Crane manufacturer is having, ultimate customer NALCO and its consultant M.N Dastur approved MQP (Manufacturing Quality Plan), the same is applicable for these EOH for inspection subject to obtaining ultimate customer NALCO and its consultant M.N Dastur formal approval in the event of an order. **3.** If EOH vendor does not have MQP/RQP, they should submit a fresh MQP to BHEL/NALCO (in BHEL format) for review & approval in line with the NALCO/M.N Dastur requirements (copy attached).	
02	**BHEL / Ultimate Customer – NALCO approved vendors**	BOIs including LT Motors are to be procured only from Ultimate Customer - NALCO approved vendors and no deviation on this specific customer requirement is acceptable.	
03	**Inspection Methodology to be adopted**	BHEL/ BHEL AIA (BHEL authorized inspection Agency) to witness / perform inspection Supplier works and submit all the inspection documents test reports as per approved MQP & approved data sheet / drg / spec / as per relevant BIS (Bureau of Indian Standard).	
		No material shall be dispatched without BHEL / BHEL AIA and Ultimate Customer – NALCO Inspection and dispatch clearance.	
04	**Painting Requirements**	Painting requirement like paint shade and painting thickness including no of coats if any are to be ensured by the OEM vendor as per BHEL/ Ultimate Customer - NALCO and its consultant M N Dastur approved data sheet/drg/spec (As applicable).	
05	**Packing**	Packing shall be as per Specification / Drg. / Data sheet to avoid any transit & handling damages.	
06	**For Inspection call**	Inspection call by Vendor for inspection at Manufacture works to be raised at https:/cqir.bhel.in	
07	**Document Package / Dossier**	Specific confirmation for Document Package in the event of an order (3 hard copies + soft copies in PDF file) is to be given containing the following with proper linkages (.) (i) Index Sheet (ii) MQP/RQP (iii) TCs identified by BHEL/NALCO for record for "CHP" (Customer Hold Point) Verification & Witness "W" portion as given in MQP / RQP / MQP (as applicable). (iv) Final Inspection Report + TC (v) BHEL AIA (BHEL Appointed Inspection Agency) / BHEL report + TC (vi) Ultimate customer NALCO CHP (Customer Hold Point) / MDCC (Material Dispatch Clearance Certificate)	

OEM Supplier signature with seal

 # Necessarily to be filled up & submitted by the OEM vendor at the time of offer itself otherwise the offer may not be considered w.r.t Quality Requirements against Underslung Cranes being BHEL/ ultimate customer – NALCO specific requirements.

1378135/2023/BAP-QA-MECH

OEM SUPPLIER WITH OEM MFGR.'s LOGO (TO BE FILLED BY OEM SUPPLIER)	MANUFACTURER'S NAME AND ADDRESS (TO BE FILLED BY OEM / EOH MANUFACTURER)	**MANUFACTURING QUALITY PLAN** ITEM: ELECTRICALLY OPERATED HOISTS SUB-SYSTEM: ESP	QP NO.:EOH:001 REV.NO.: 00 DATE: PAGE: …. OF….	PROJECT NALCO DAMANJODI 1 X 18.5 MW FGD PACKAGE (BHEL W.O no: R182) MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (TO BE FILLED BY OEM SUPPLIER)

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C / N					M	C	N	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	** 10.			11.

		LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** **M:** OEM MANUFACTURER **C:** MAIN SUPPLIER – BHEL/BHEL AIA , **N**: NALCO **P:** PERFORM **W**: WITNESS AND **V:** VERIFICATION. AS APPROPRIATE, **CHP:** SHALL IDENTIFIED IN COLUM "N" AS ' W"		DOC. NO.: REV…… CAT…..	
OEM MANUFACTURER	MAIN (BHEL) SUPPLIER		FOR CUSTOMER USE	REVIEWED BY	APPROVED BY / APPROVAL SEAL
SIGNATURE					

137813

Ultimate Customer NALCO/Consultant MN Dastur
Inspection requirements for Electrically Operated Hoists

INSPECTION PROCEDURE (IP) FOR MECHANICAL EQUIPMENT & STRUCTURES AT MANUFACTURERS' WORKS

Project : 18.5 MW Co-Generation Power Plant, NALCO Damanjodi
Contractor's Name : BHEL, Ranipet
Package Description : BTG Package for steam and Power Plant for 5th stream Alumina Refinery expansion Project of M & R Complex at NALCO Damanjodi

Contract/P.O. No. / L.O.A. No. : NBC/MMXP/SPP/STRM5/BTG/09 DT. 19.11.2020
Contract Specification Reference : NALCO CGPP-3CA01-PWR-01
IP No. & Rev. : IP-28812-M-06 (CHN) Rev.2 **Date** 03.06.2021

Status : Approved

List-A - Test & Test Certificate Codes (Add additional Codes , if required)						List-B-Documents (Add additional Codes, if required)			
Code	Tests & Test Certificates	Code	Tests & Test Certificates	Code	Tests & Test Certificates	Code	Documents		
1	Visual Inspection	15	Spark test for Rubber Lining	27	Manufacturer's Test Certificates	B1	Approved GA drawing	B10	Painting Certificate
2	Dimensional Checks	16	Adhesion Test		for Bought Out Items	B2	Information and other Reference drawings duly approved	B11	Conformity certificate
3	Fitment & Alignment	17	Performance Test	28	Painting/Galvanization Test/ Rust Preventive oil coating	B3	Fabrication drawings duly approved	B12	Match marking of site joints
4	Control Assembly Check		(with Characteristic Curve)	29	Strip test	B4	Data Sheet	B13	IBR/Other Statutory Agency Certificate
5	Raw material -Physical test.	18	Mechanical Run Test (MRT)/No Load/Free Run Test	30	Shaft runout test	B5	Bill of Materials		
6	Raw material-Chemical test.	19	Measurement of speed	31	Routine Test	B6	Manufacturer's Catalogue	B15	Unpriced P.O. Copy
7	Ultrasonic test	20	Vibration,Noise & Temperature	32	Tensile, Elongation & Full thickness breaking	B7	Approved Billing Schedule	B16	List of Valve
8	Magnetic Particle Test		Rise Measurement	33	Fire, Electrical resistance, Drum friction test	B8	Welding Procedure Specification (WPS), Procedure Qualification Record (PQR).	B 17	BHEL Drawing
9	Radiography Test	21	Pressure Test	34	Abrasion loss & Troughability		Welding Operator Performance Qualification (WPQ)	B 18	BHEL Standard Procedure
10	Dye Penetration Test	22	Leakage Test	35	Free Air Delivery	B9	Calibration Certificate of all measuring Instruments and Gauges from NABL Lab or Traceable to National / International Standards.		
11	Hardness Test	23	Load/Overload Test	36	Natural Frequency Test				
12	Water & Dust Ingress Test	24	Static Balancing Test	37	Spectroscopic Test				
13	Friction factor test	25	Dynamic Balancing Test	38	Run out Test				
14	Heat treatment/Stress Releiving	26	Operational & Functional Test	39	Centrifuging (Overspeed Test)				
				40	Clearance Check & Assembly Inspection				
				41	Tube Expansion Check				

General Note :-

1) Three sets of test certificates (2 sets hard & 1 set soft) duly verified and signed by the main Contractor shall be furnished.
2) IP number and revision status to be indicated by M.N.Dastur & Co. (P) Ltd.
3) Drawing approval authority shall be as per contract.
4) If quantity is in lot, substantial quantity shall be offered for economy of inspection.
5) For Structural items average quantity shall be offered in 100 MT lot.
6) Attempt shall be exercised to furnishIP for all the items if the package in single lot.
7) Painting to be done after inspection as per approved Painting Specification. Shop Painting Certificate as per format FM VIA shall be submitted; Unless otherwise specified, Painting Shall be as per Manufacturer Standard.
8) Vendor approved detail drawing shall be made available during inspection as required corelated with Dasturco approved GA drawing
9) All measuring instruments used for our inspection and testing shall have valid calibration certificate from NABL laboratory or traceable to national/international standards.
10) Pumps, Fans, Blowers and Compressors Performance test shall be conducted for one per type/model/capacity and remaining quantities shall be Mechanical Run Tested.
11) All manual, pneumatic, electrical operated valves upto and 100 NB size shall be cleared based on review of documents and valve size 150 NB and above shall be witnessed.
12) For Pumps, Blowers & Agitators which are offered with their own electrics (Motor & Controls) same will be interpreted / tested along with pumps and relevant tests certificates will be reviewed.
13)Raw material TC verification for plates of thickness above 40mm only. Certificate of compliance will be submitted for balance raw materials.

41	FW815	RC Pump Inlet & Outlet Valve		1, 2, 5, 6, 7 - P	---	---	1, 2 & 21 - P	1, 2 & 21 - W	1, 2 - W	B1/ B4/ B5/B17/B18	1, 2, 5, 6, 7, 10, 21, 27 & B10	Witness inspection by customer for 1no for functional testing(if it is applicable as per Note-11).
42	78473	Electrically operated Hoist & Accessories		1, 2, 10, 11, 18, 19, - P	---	---	1, 2, 19, 23 - P	1, 2, 19, 23 - W	---	B1/ B2/ B4/ B5/B17/B18	1, 2, 10, 11, 18, 19, 23, 27, 31, B10 & B11	10-Dye Penetrating test (As Applicable) 11-Hardness Test(As Applicable) 18-MRT/NO Load/Free run test(As App.) 31 - Electric Motor Routine TC Review 19 - Test for Hoist up, Down, CT & LT movement(As Applicable) 26-Operational & Functional Test (AS App.) B11-BHEL's Certificate of Conformity (COC)
43	FW293	Elevator and Accessories		1, 2 - P	---	---	1, 2, 19, 26, 31 - P	1, 2, 18, 19, 26, 31 - W	---	B1/ B2/ B4/ B5/B17/B18	1, 2, 18, 19, 26, 27, 31 & B11	18 - No Load Free ru test & brake function test for machinery unit (As App.) 26 - Tripping of over speed governor , controller operations, safety interlock, Push Buttons for Car Call, Landing Call(As App.) 31 - Electric Motor Routine TC Review B11-BHEL's Certificate of Conformity (COC)
44	FW714	Hoists		1, 2, 10, 11, 18, 19, - P	---	---	1, 2, 19, 23 - P	1, 2, 19, 23 - W	---	B1/ B2/ B4/ B5/B17/B18	1, 2, 10, 11, 18, 19, 23, 27, 31, B10 & B11	10-Dye Penetrating test (As Applicable) , 11-Hardness Test(As Applicable); 18-MRT/NO Load/Free run test(As App.);31 - Electric Motor Routine TC Review,19 - Test for Hoist up, Down, CT & LT movement(As Applicable) ,26-Operational & Functional Test (AS App.) B11-BHEL's Certificate of Conformity (COC)
45	Ref. Annexure-A	Non critical items as listed in Annexure-A		---	---	---	1, 2 - P	1, 2 - W	---	B1/ B4/ B5/ B6/ B7/B17/B18 (as applicable)	B11	Non critical items as listed in Annexure-A shall be cleared based om BHEL's Certificate of Conformity (COC)

Abbreviation:-

M : Manufacturer C : Contractor D : M.N.Dastur & Company (P) Ltd. P : Perform W : Witness R : Document Review

Prepared by Abdul Ghani
Reviewed by Renjith K
Approved by Arunachalam R

04/06/2021

Signature of Contractor & Seal
Name: BHEL BAP, Ranipet

RENJITH
Manager/Quality Assurance
BHEL/BAP/RANIPET-632 406.

Signature of Client & Seal
Name:

M.N. DASTUR & CO. (P) LTD. INSPECTION DIVISION

07.06.2021

Signature of Inspection Agency & Seal
Name: M.N. Dastur & Company (P) Ltd.

BHEL	***Bharat Heavy Electricals Ltd*** ***Boiler Auxiliaries Plant*** Ranipet-632 406	**FLUE GAS DESULPHURISATION** **TECHNICAL SPECIFICATION**

SPECIFICATION NO: FGD:USLCRANE01	**REV:00**

TECHNICAL SPECIFICATION OF UNDER SLUNG ELECTRIC CRANE

REF: FGD: USLCRANE01 REV: 00

00	10-08-20202	Fresh Release	Pradeep Kumar Behera (AE-I/EDC-FGD)	Jyotish Kumar Patel (DM/EDC-FGD)	Kesavan V (SDGM/EDC-FGD)
REV	**DATE**	**DESCRIPTION**	**PREPARED**	**CHECKED**	**APPROVED**

	Boiler Auxiliaries Plant, **Bharat Heavy Electricals Limited,** Ranipet - 632406, Tamilnadu, INDIA.	Enquiry No. & Dt.:	
		Due Date :	
		Supplier's Ref.:	
		Date :	

Specification cum Compliance Certificate for UNDER SLUNG ELECTRIC CRANES

Note:-

1. The 'Offered' Column and where applicable, the 'Deviations' & 'Remarks' Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous or unsustainable information against any of the clauses of the specifications / requirements shall be treated as non-compliance.

2. The offer and all documents enclosed with offer should be in English language only.

3.A Single or Double travelling Bridge / Grider (As per vendor design) Underslung Electric Crane shall be running on the lower flange of two runway Track or Beam for Long Travel.

Name & Address of the supplier:	
Telephone No.	
Fax No.	
e-mail :	

Scope: Supply,Testing,Installation, Supervision of Erection & Commissioning of UNDER SLUNG ELECTRIC CRANE complying with the following specification

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
A	**TECHNICAL DETAILS:**				
0.0	The requirement (s) specified under different sections of this specification shall be considered while quoting for this tender. **In case of variance between sections, the requirement of CUSTOMER TECHNICAL SPECIFICATION & DATA SHEET shall prevail. Customer contract specification & data Sheet of cranes provided as Annexure I to the specification & shall be referred strictly.**	Vendor to confirm			
1.0	**APPLICATION:**				
1.1	The subject crane is meant for the purpose of handling small to medium components (Recirculation Pump & Oxidation Blower) during maintanence	Vendor to note			
1.2	The Recirculation Pump house & Oxidation Blower room environment will be dust prone, humid, and ambient temperature going up to 45 to 50 º C.	Vendor to note			
2.0	**SCOPE OF SUPPLY:**				
2.1	Design, manufacture, supply, Supervision of erection & commissioning of Single Girder Underslung Cranes with Festooning type arrangement of feeding power to trolley assembly, shrouded DSL for long travel with mountings and suitable current collector system.	Vendor to confirm			
3.0	**QUANTITY REQUIRED:**	As per Enquiry			

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
3.1	**Under Slung Electric cranes as per Enquiry**	Vendor to confirm			
3.2	The Vendor shall Offer suitable Festooning type & shrouded typr DSL System	Vendor to confirm			
4.0	**MAIN FEATURES (Crane Operational Features):**				
4.1	**Speed System: CUSTOMER TECHNICAL SPECIFICATION - Annexure I**	Vendor to confirm			
4.2	**End Clearance:** End clearance to be fixed to suit the workshop building clearances as per the enclosed tender **ANNEXURE IV.**	Vendor to submit the clearance drawing .			
5.0	**CONTROL: CUSTOMER TECHNICAL SPECIFICATION - Annexure I**	Vendor to confirm			
5.1	**Type of Control / Operation:**	Vendor to confirm			
5.2	**Control Voltage: CUSTOMER TECHNICAL SPECIFICATION - Annexure I**	Vendor to confirm			
5.3	**Input Power Supply:** CUSTOMER TECHNICAL SPECIFICATION - Annexure I	Vendor to confirm			
5.4	**Duty Class: Class –** CUSTOMER TECHNICAL SPECIFICATION - Annexure I	Vendor to confirm			
5.5	**Mechanism Group Classification :** CUSTOMER TECHNICAL SPECIFICATION - Annexure I	Vendor to confirm			
5.6	**DESIGN STANDARD OF CRANE** : CUSTOMER TECHNICAL SPECIFICATION - Annexure I	Vendor to confirm			
5.7	**WIRE ROPE HOIST:** CUSTOMER TECHNICAL SPECIFICATION - Annexure I	Vendor to confirm			
6.0	**STRUCTURAL FABRICATION *(Constructional Details):***				
6.1	**Bridge/Girder: Under slung Electric crane for capacity as per Enquiry.**	Vendor to confirm			
6.2	The following shall be carried for Girders, end carriage, crab, gear box and rope drum	Vendor to confirm			
6.3	The Plates of thickness 25mm and above shall be ultrasonically tested.	Vendor to confirm			
6.4	NDT requirements on weldments shall be as follows : a) Butt weld in tensions : 100% RT and 100% DPT b) Butt weld in compression : 10 % RT and 100 % DPT c) Butt welds in rope drum : 100 % RT and 100 % DPT d) Fillets Welds : Random 10 % DPT	Vendor to confirm			
6.5	**Raw Material: S**teel plates confirming to IS 2062 tested and certified for quality by reputed inspection authorities, shall be used.	Vendor to confirm and produce certificates.			
6.6	**Welded Joints *(To be followed for Girder fabrication)*:**				
6.7	Welding Electrodes for all ***Horizontal Welding E 7018*** Electrode only should be used.	Vendor to confirm			
6.8	Welding Electrodes for all ***Vertical Welding E 7048*** Electrode only should be used.	Vendor to confirm			
6.9	**Welded Joint Testing:** All Butt Welded Joints (both compression/ tension and flanges / web joints) shall be subjected to 100% X-Ray Testing and X-Ray Films to be produced for BHEL evaluation and form part of the documentation.	Vendor to confirm			
6.10	**Splice Joints:** No splice joint is allowed in Girder Fabrication. ***[Girder shall be of single piece only].***	Vendor to confirm			
6.11	**Wheel Assembly:**				
6.12	The Wheel Assemblies of Cross Travel (CT) and Long Travel (LT) shall be of ***Live Axle System*** with L-Type Bearings only. Details to be submitted by the vendors.	Vendor to submit details			
6.13	**Heat Treatment & NDT Examination:**				
6.14	The Trolleys shall be stress relieved, if necessary, by thermal heat-treatment process after welding & NDT. All welding shall be tested by NDT means [MPI, LPI & RT] after stress relieving operation.	Vendor to confirm and produce necessary certificates			

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
6.15	**Machining Operation:**				
6.16	All mechanical mating surfaces and wheel seating areas are to be machined to the required finish and protected.	Vendor to confirm			
7.0	**Painting Instructions:**				
7.1	**As per ANNEXURE III**	Vendor to confirm			
8.0	**MECHANICAL ELEMENTS:**				
8.1	**Gears:** Gears in all the Stages shall be helical in design and to be of machined, lapped and hardened	Vendor to confirm			
8.2	**Gear Box Casing:** Shall be of fabricated type and stress relieved by thermal heat-treatment process, prior to machining.	Vendor to confirm			
8.3	Reduction gear shall be tested for reduction ratio, backlash & contact pattern. Gear box shall be subjected to no load run test, to check for oil leakage, temperature raise, noise and vibration.	Vendor to confirm			
8.4	**Rope Drum:** The hoist mechanism shall consist of a grooved rope drum driven by electric motor through gears. Rope Drum Shall be of fabricated type and stress relieved. The circumferential weld joints shall be tested by 100 % X-Ray quality. Each end of the rope shall be anchored to the drum in such a way as the anchorage is readily available for maintenance. Each rope shall have two (2) full turns of the drum when the hook is at its lowest position and one (1) spare groove when the hook is at its highest position. The leading rope taken by the drum should not slope sideways when slack and it should not be caught between the gear wheel.	Vendor to confirm			
8.5	**BOTTOM BLOCK** The bottom block shall be of enclosed type and shall have guard against rope jamming in normal use. It shall have standard forged swivel shank hook fitted on antifriction thrust bearing. Lock to prevent hook from rotation and locking arrangement to prevent accidental unlocking shall be provided. Pulley of the bottom block shall be provided with antifriction bearings	Vendor to confirm			
8.6	**ROPE GUIDE**: Rope guides shall have wear resistant property. It shall prevent slack rope and retain wire rope in the barrel grooves.	Vendor to confirm			
8.7	**Type of Coupling:** Only Geared Couplings to be used for ***a) Between Electric Motor and Gear Box, b) Between Gear Box and Rope Drum and c) Between Gear Box and Trolley Wheels.***	Vendor to confirm			
8.8	**Wheels:** Shall be of forged and Wheel Tread hardened to **300-350 BHN**. Wheels shall be fitted with L-Type Bearings	Vendor to confirm			
8.9	**Wheels:** Shall be of forged and Wheel Tread hardened to **300-350 BHN**. Wheels shall be fitted with L-Type Bearings	Vendor to confirm			
8.10	**Mechanical Joints:** Fit Bolts (as per IS 3640 –1982) for all joints coming in main members.	Vendor to confirm			
8.11	**Pulley Dimension:** Rope Pulley diameter shall be 23 times that of Rope diameter.	Vendor to confirm			
8.12	**Lifting Hook:** Hooks shall be of C-type as per IS 15560 & with antifriction bearing and provided with latches.	Vendor to confirm			
8.13	All test including proof load test as per relevent IS standard shall be carried out.Certificate shall be submitted to BHEL for review.	Vendor to confirm			

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
8.14	MPI/DPT shall be carried out after proff load test	Vendor to confirm			
8.15	**Lubrication:**				
8.16	Suitable lubrication system shall be provided for gear box, all rotating parts wherever applicable. One number grease gun shall be supplied per project.	Vendor to furnish			
8.17	Bidder's scope shall also include supply and filling of all chemicals, reagents, resins, lubricants, grease, filters and consumable items for operation up to COD including top up requirements at the time of issuance of PAC/declaration of COD. All lubricants proposed for the plant operation shall be suitable for all operating and environmental conditions that will be met on site consistent with good maintenance procedures as instructed in the maintenance manuals.	Vendor to furnish			
8.18	**Bumpers (End Stoppers):**				
8.19	Bumpers of adequate size shall be provided both in CT & LT to stop the crane in the event of an overshoot by the operation.	Vendor to provide			
8.20	**Guards:** Suitable guards shall be provided for all rotating parts like couplings, wheels etc..	Vendor to provide			
8.21	**FORGINGS(**wheel,gears,pinions,axle,hooks&hook trunion) **a)** All forgings greater than or equal to 50mm diameter or thickness shall be subjected to **ultrasonic** test **.b)** DPT/MPI shall be done after hardfacing and machining	Vendor to provide			
8.22	**WIRE ROPE:**				
8.23	Wire rope shall be of pre-formed type, hemp cored, regular lay 6/36 construction and Braking loads for the hoist rope shall not be less than six times the calculated load in the ropes at the drum, based on rated load on hook plus the weight of the bottom block plus the weight of the rope. The rope shall be of sufficient length so that two full wraps shall remain on the drum at the extreme low position of the hook. Minimum number of falls of rope shall be four (4).Hoisting rope shall confirm to IS 2266.The rope shall be hot dip galvanised. The rope shall be free from kinks and shall be continuous.	Vendor to confirm			
9.0	**ELECTRICAL ELEMENTS:**				
9.1	Electrical system comprises of 63A Fuse or to Suit Switch Unit/MCB, Control panel,Pendent Push Button Station, DSL, Pendent cable, Hoist, Long travel & Cross travel motors with brake, other electrcal item etc., to make the system complete. All these items are included in the scope of supply of the vendor.	Vendor to confirm			

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
9.2	**Motors:** The motors shall meet IS 325 or equivalent international standards.The motor shall be designed for frequent reversal, braking and acceleration similar to crane duty. The motor shall be rated for S4 duty 40% cyclic duration factor. Maximum continuousrating shall have at least 10% margin over maximum load demand including voltage and frequency variations, temperature rise and other variations. The body shall have two earthing points on opposite sides. The motor shall be provided with an enclosure fully meeting the requirements of IP 55 as per IS 4691 meant for outdoor service. In addition rain-hood shall be provided for the motors. The motor shall be Totally Enclosed Fan Cooled (TEFC) type or Totally Enclosed Surface Cooled (TESC) type. Motors shall have minimum class "F" type insulation with temperature rise limited to class “B”. The winding shall be suitable for successful operation in hot, humid, & tropical climate with the ambient temperature of 50 degree centigrade. The temperature rise shall be limited to 70 degree C (by resistance method) over an ambient of 50 degree C. The insulation shall be given fungicidal and tropical treatment as per IS 3202. The frame shall be cast and rigid. The motors shall be designed for both directions of rotation. The terminal box shall be weather and water tight and suitable for outdoor service, having a degree of protection of IP 55. It shall be provided with removable front cover for making connections. Neoprene gaskets at cover joints shall be provided. The terminal box shall be suitable to withstand 31 MVA for 0.25 seconds without damaging the box with fuse protection. Nickel-plated brass doublecompression cables glands and ATC lugs shall be provided to receive the power cables. If the hoist motor is placed inside the rope drum, then the motor lead wires can also be taken out without necessity of a terminal box.The motor vibration and noise shall be within the limitsspecified in IS 12065 and IS 12075. **The noise level shall be limited to 85dB.**	Vendor to confirm			
9.3	**SWITCHES:** Heavy-duty power switches with quick make and brake mechanism meeting relevant IS requirements shall be provided. The switches shall be adequately rated to get complete protection even under abnormal operating conditions.	Vendor to confirm			
9.4	**PUSH BUTTONS:** The Pendant Push Button station shall have the following Push Buttons: a) Hoist, b) Lower, c) Forward, d) Reverse & e) Emergency Stop. The Emergency stops Push Button shall be Lockable type. The Pendant Push Button station shall have the following LED clustered type indicating lamps: a)SUPPLY ON, b)HOIST MOTOR Raise/Lower, c)CT MOTOR Forward/Reverse, d)HOIST MOTOR TRIP and e)CT MOTOR TRIP.The Pendant Push Button station shall be supported from the Control Panel with hot dip galvanized Link Chain. The Pendant Push Button Station shall be connected to the Control Panel using multi -core copper flexible control cable of 10 m length. The Enclosure of Pendant Push button station shall be designed for IP 55 degree of protection. Push buttons shall be spring return type with 2NO+2NC self-reset contacts rated for 5A at 415volts AC. The push buttons for different operations like “HOIST/ LOWER, FORWARD / REVERSE”, “STOP” shall have different colours. All Push buttons shall be as per relevant IS. The Push buttons shall be properly shrouded so as to prevent water & dust entry.	Vendor to confirm			

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
9.5	**CONTACTOR:** All Contactors shall be suitable for DOL application with coils suitable for the control voltage provided by the supplier. Contactor construction shall be rugged.For control purpose, only auxiliary contactors shall be used. Relays are not acceptable in place of Auxiliary Contactors. The power contactors shall have Mechanical interlocking in addition to Electrical interlocking so that at any point of time only any one of the two Power contactors (either up or Down, Left or Right) will be energized.The contactor shall be AC4 duty for inching operation.	Vendor to confirm			
9.6	**THERMAL OVER LOAD RELAYS:** Thermal over load relays wherever provided shall be ambient temperature compensated with suitable setting ranges. The relay shall be auto reset type. The relay shall be provided with a door mounted hand reset push button. The O/L relay shall have inbuilt single phasing protection as built-in feature.	Vendor to confirm			
9.7	**FUSES** Only HRC fuses of plug-in type with Class-4 AC duty shall be provided. Fuse base shall be rugged. Adequate shrouding shall be provided for live accessible parts and it shall be possible to replace any fuse without damages of contacts when the circuit is alive.	Vendor to confirm			
9.8	**INDICATING LAMPS:** LED clustered type indicating lamps of low watt consumption with suitable built-in series resistor shall be used. LED and lenses shall be inter-changeable and easily replaceable from the front. The indication lamps shall be properly shrouded so as to prevent the dust and water entry. Indicating lamp shall be provided for “HOIST MOTOR ON”,”CT MOTOR ON”, ”HOIST MOTOR TRIP”, “CT MOTOR TRIP”,“SUPPLY ON” ETC.	Vendor to confirm			
9.9	**WIRING:** The control panel wiring shall be complete in all respects and ready for connection of external power for terminating external cables. Necessary double compression Nickel plated Brass cable glands along with suitable terminal blocks and lugs to receive trailing cable and pendent push button cable shall be provided.The cable glands, lugs and terminal blocks shall not be supplied loose. Point to point wiring shall be adopted. Not more than two wires shall be terminated at each terminal. Wiring shall be neatly laid out and bunched together suitably. The wiring shall be done with minimum 2.5 sq.mm multi stranded copper, PVC insulated 1100V wires. Crab wiring: Junction box shall be avoided for wiring of crab and in bridge end.	Vendor to confirm			
9.10	**TERMINATION** All power and control wires shall be terminated on terminal block/component using crimping type Annealed Tinned Copper lugs/connectors. CLIP-ON type terminal block shall be used. The terminal blocks shall be used for control wiring. The terminal blocks shall be complete with insulated barriers, terminal studs, washers, nuts, lock nuts and identification strips with terminal numbering.	Vendor to confirm			

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
9.11	**CONTROL PANEL** Control panel shall be provided to house the electrical components like fuses/MCB, contactors, relays, isolators, switches, and control supply transformers etc along with necessary wiring. The components shall be clearly identified by labels. The panel shall be made of sheet steel of minimum 2mm thick and shall be dust and vermin proof, suitable for outdoor condition. Adequate number of DOUBLE COMPRESSION type cable glands (heavy duty) of brass with nickel plating and Annealed Tinned Lugs shall be provided for incoming and outgoing power and control cables. The cable glands shall be provided with dummy plugs. The door, removable cover plates, and metal-to-metal joints shall be fully neoprene gasketted. The control panel shall be designed for IP 55 degree of protection.	Vendor to confirm			
9.12	**PAINTING OF CONTROL PANELS: (The below details areTentataive, Final details will be given in during drawing approval stage)** 1) Surface treatment with minimum seven tank process 2) Panel 2 coats of synthetic Enamel paint. 3) Shade- Siemens Grey 4) The minimum coating thickness of power coated surfaces shall be minimum of 80 microns. Paoint Shade shall be as per **ANNEXURE-VI.**	Vendor to confirm			
9.13	**CONTROL SUPPLY TRANSFORMER:** Dry type, step down control supply transformer 415V / 110V AC shall be provided to derive control supply for starter operation & indication. The transformer shall have minimum class 'B' insulation. The rating of the transformer shall be decided based on maximum power consumption plus 25% margin. The transformer shall meet IS 12021.	Vendor to confirm			
9.14	**FUSE SWITCH UNIT/MCB:** Metal enclosed, FOUR POLE fuse switch unit (TPN)/MCB of 63A, 415V, 3 phase 4 wire AC, rating suitable for outdoor location shall be provided to receive purchaser's supply. The enclosure shall be suitable for IP 55 degree of protection. Suitable Nickel-Chromium plated brass DOUBLE COMPRESSION glands and crimp type ATC lugs to receive purchaser's 4C-16 sq. mm Al armoured/ unarmoured FRLS cable & vendor's 4C-4 sqmm copper un-armoured cable shall be provided. Cable glands and lugs shall also be provided for the flexible trailing cable. The FSU/MCB shall be provided with 2 No's of earthing terminals with M12 screws, nuts and washers. The FSU/MCB shall be located at a fixed location about 5 m away from the start position of the hoist.The Fuse Switch unit/ MCB shall be wall mounted.	Vendor to confirm			
9.15	**CABLE: AS PER ANNEXURE-VI**	Vendor to confirm			
9.16	**Crane Operation: CUSTOMER TECHNICAL SPECIFICATION - Annexure I**	Vendor to confirm			
9.17	**The Crane Control Voltage shall be 110 V AC**	Vendor to confirm			
9.18	**Type of Brakes:**				
9.19	**Hoist Brakes:** CUSTOMER TECHNICAL SPECIFICATION - Annexure I	Vendor to confirm			
9.20	**CT & LT Brakes:** CUSTOMER TECHNICAL SPECIFICATION - Annexure I	Vendor to confirm			

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
9.21	**BRAKES:** The brakes shall apply when either the motor starter or the main power switch is in OFF position or in the event of "power failure". The braking capacity of the brakes shall be 150% of the rating of the hoist.	Vendor to confirm			
9.22	**Protection:** All Panels, Limit-Switches and Motors shall have IP 54 protection.	Vendor to confirm			
9.23	**Electric Contactors:** All Panels shall have SIEMENS/L&T/GE contactors suitable for Crane operations.	Vendor to confirm			
9.24	**Contactors Rating:** The rating of all Contactors shall be at least 50% higher than the respective electric motor full load current, at the specified duty cycle.	Vendor to confirm			
9.25	**Long Travel Motion:** A Dual Drive Mechanism shall be provided for LT (Long Travel) Motion.	Vendor to confirm			
9.26	**Illumination:**				
9.27	2 Nos. of 400 Watts HPMV Lamps & fittings shall be provided under the Bridge and 1 No. shall be provided under CT Trolley. Fittings shall be of non-integral type. (Total lights 3 Nos.)	Vendor to confirm			
9.28	All Electric Panels shall be provided with suitable illumination for visibility and trouble shooting.	Vendor to confirm			
9.29	**Drives : CUSTOMER TECHNICAL SPECIFICATION - Annexure I** a) Main Hoist, c) Long Travel and d) Cross Travel.	Vendor to confirm			
9.30	**Limits:** Each hoist shall be provided with both rotary and counter weight limits. Limit switches shall be provided for both CT & LT. The limit switches shall have enclosures designed for IP 55 degree of protection. Proximity switches are not acceptable in place of Limit Switches.	Vendor to confirm			
9.31	**DSL & Current Collector System: CUSTOMER TECHNICAL SPECIFICATION - Annexure I**				
9.32	Supervision of Erection of DSL and supply of fixing elements are vendor's scope.	Vendor to confirm			
9.33	Current collection system suitable for the above cranes shall be offered along with the crane.	Vendor to confirm			
9.34	**PENDANT PUSH BUTTON STATION** The Pendant Push Button station shall have the following Push Buttons. Hoist, Lower, Forward, Reverse & Emergency Stop. The Emergency Pus Button shall be Lockable type.The Pendant Push Button station shall have the following LED type Indicating lamps.SUPPLY ON, HOIST MOTOR ON, CT MOTOR ON, HOIST MOTOR TRIP, CT MOTOR TRIP.The Pendant Push Button station shall be supported from the Control Panel with hot dip galvanized Link Chain. The Pendant Push Button Station shall be connected to the Control Panel using multi-core copper flexible control cable of 10m length. The Enclosure of Pendant Push button station shall be designed for IP 55 degree of protection. Push button shall be spring return type with 2NO+2NC self reset contacts rated for 5A at 415 volts AC. The push buttons for different operations like “HOIST/LOWER,FORWARD/REVERSE”, “STOP” shall have different colours. All push buttons shall be as per relevant IS.The Push button shall be properly shrouded so as to prevent water & dust entry.	Vendor to confirm			
9.35	**EARTHING:** The structure, motor frames and enclosures of electrical equipment shall be effectively connected to earth complying with Indian Electricity Rules and IS 3043. The earthing materials from hoist to FSU/MCB shall be in supplier’s scope.	Vendor to confirm			

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
9.36	**WARRANTY:** The warranty period shall be twenty four (24) months from the date of Supply or eighteen (18) months from the date of commissioning, whichever earlier.	Vendor to confirm			
10.0	**START UP & COMMISSIONING SPARES:** Start-up & Commissioning Spares shall be part of the main supply of the EOH. Start-up & commissioning spares are those spares, which may be required during the start-up, and commissioning of the equipment/system. Bidder shall provide an adequate stock of such start up and commissioning spares to be brought by him to the site for the equipment erection and commissioning. The spares must be available at site before the equipments are energized	Vendor to confirm			
10.1	**FIRST FILL OF CONSUMABLES:** Bidder's scope shall also include supply and filling of all chemicals, reagents, resins, lubricants, grease, filters and consumable items for operation up to COD including top up requirements at the time of issuance of PAC/declaration of COD. All lubricants proposed for the plant operation shall be suitable for all operating and environmental conditions that will be met on site consistent with good maintenance procedures as instructed in the maintenance manuals. First fill of consumable shall be part of the main supply.	Vendor to confirm			
10.2	The vendor shall offer electrical/ electronic / mechanical spares for **2 years** trouble free operation of the crane. ***(Unit Price along with quantity of each item of spare shall be offered in the price bid)***	Vendor to offer			
10.3	**SPECIAL TOOLS & TACKLES:** Any special tools & tackles required for the entire equipment to disassemble, assemble or maintain the units, they shall be included in the quotation and furnished as part of the initial supply of the machine. List of special tools & tackles shall be decided by bidder as per his proven practice. When special tools are provided, they shall be packaged in separate, boxes with lugs and marked as "Special Tools for (tag / item number)." Each tool shall be stamped or tagged to indicate its intended usage. Levers and eye bolts for the removal of parts to be serviced shall be submitted with special tools.	Vendor to offer			
11.0	**MAKES OF BOUGHT OUT ITEMS:** Vendor to incoporate their BOI Makes in their QAP.	Vendor to confirm			
	NOTE: Makes of all bought out items shall as per the **ANNEXURE-I -** CUSTOMER TECHNICAL SCECIFICATION & DATA SHEET OF CRANE Mix up of make for same item is not acceptable. Make of various components for projects are subject to End CUSTOMER approval. No additional delivery or price implication is acceptable due to CUSTOMER comment on make of components. Mix up of make for same item is not acceptable.	Vendor to confirm			
12.0	**DOCUMENTS/DETAILS for APPROVAL:** The following documents / details shall be submitted to BHEL for Approval within *20 days of PO placement* , prior to taking up the manufacture of the crane.	Vendor to confirm			
13.0	**Drawings / Documents:**				
13.1	GA Drawing of the Crane.	Vendor to submit			
13.2	GA Drawing of Crab with Trolley.	Vendor to submit			

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
13.3	GA Drawing of Individual Mechanisms.	Vendor to submit			
13.4	Sub-Assembly Drawing for Wheels, Hook Blocks, Gear Boxes & Hoist Drums.	Vendor to submit			
13.5	Calculations for Selection of Electric Motors, Gear Reducers, Brakes, Couplings, etc.	Vendor to submit			
13.6	Calculations for Bridge Girder, Crab, End - Carriage and their connections.	Vendor to submit			
13.7	Calculations for Steel wire rope selection	Vendor to submit			
13.8	Wiring Diagram with Logic Circuits.	Vendor to submit			
13.9	Cable Selection based on current rating.	Vendor to submit			
14.0	**Technical Details:**				
14.1	Total Weight of the Crane including all Electrical Equipments.	Vendor to specify			
14.2	Total Weight of Trolley including all Electrical Equipments.	Vendor to specify			
14.3	Weight of each Bridge assembled and ready for erection with and without Mechanical and Electrical Equipment.	Vendor to specify			
14.4	Weight of each End - Carriage: In assembled and ready for erection condition.	Vendor to specify			
14.5	Total Weight of Structural, Mechanical and Electrical Equipments. (To be indicated separately)	Vendor to specify			
15.0	**INSPECTION:** The following Schedule of Stage Inspections shall be strictly adhered prior to dispatch from the Supplier's Works.	Vendor to confirm			
16.0	**STAGE-I Inspection:**				
16.1	Verification of Test Certificate for Raw Materials used for Girders, Trolleys, Gear Box Casings, etc.	Vendor to confirm			
16.2	Verification of X-Ray Report of Butt-Joints coming in the Girders and Random Testing on the Welds, by physical examination.	Vendor to confirm			
16.3	Trolley Frame Fabrication before setting the Mechanisms.	Vendor to confirm			
16.4	**Steel Casting**				
16.5	DPT and machined surface shall be carriedout	Vendor to confirm			
17.0	**STAGE- II Inspection:**				
17.1	Inspection of Bridges and End – Carriages with Wheel Assembly and Alignment checking	Vendor to confirm			
17.2	Verification of Span & Diagonal Dimensions, Checking of Wheel Alignment, Mechanical Assemblies and Total Alignment as per IS-3177	Vendor to confirm			
17.3	Free running of the all the Mechanisms.	Vendor to confirm			
18.0	**STAGE- III (Final Inspection):**				
18.1	Measurement of CAMBER in the Bridges.	Vendor to confirm			
18.2	Full / Rated Load Test and Deflection Test.	Vendor to confirm			
18.3	Deflection and Permanent Set Measurement.	Vendor to confirm			
18.4	25% OVER-LOAD Lifting Ability Check.	Vendor to confirm			
18.5	Electric Hoist shall be tested as per IS 3938				

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
19.0	**SUPERVISION OF CRANE ERECTION & COMMISSIONING:**				
19.1	**Supervision of Crane Erection & Commissioning:** Supervision for Crane Erection & Commissioning of the Crane and Performance Prove –Out for 100% of Crane's Capacity , 125% lifting/ holding test and Smooth Functioning of the Crane (at BHEL site / Customer site) shall also be the RESPONSIBILITY of the supplier.	Vendor to confirm			
19.2	**Crane Erection & Cabling:**Supervision for Complete crane erection/installation, wiring/cabling of the various components at BHEL shall be the scope of the supplier.	Vendor to confirm			
19.3	**Supervision for DSL current collector fixing** and cabling from current collector to crane main switch also shall be the scope of the supplier. Current collector and its holding brackets, Cable is crane supplier scope.	Vendor to confirm			
19.4	All safety equipments like safety boot, safety belt, helmet, gloves, goggles etc. required for erection personnel shall be brought by the vendor.	Vendor to confirm			
19.5	Erection of Cranes and its accessories will be done by owner as per vendor's Erection Manual and check List. The bidder has to send their supervision for two numbers of visit for erection & commissiong, testing for each crane - 1ST visit for the supervision of erection & 2ND Visit for pre-commissioning & post- commissioning check-up, start-up, testing and trial runs of all the items covered under the scope of supply for each Crane. Vendor shall quotes charges for complete work for **supervision** for erection & commissiong, testing for each Under slung cranes. Travel charges (visa/passport, all the to/fro travel charges to the site), TA/DA, boarding and lodging shall be borne by the bidder and shall be inclusive in above supervision charges portion for complete work for supervision for erection & commissiong, testing for each Under slung cranes. **The charges quoted for the supervision will be considered for L1 evaluation.** However, BHEL reserves the right to engage the services of the bidder for supervision of E&C.	Vendor to confirm			
20.0	**O & M MANUALS: 10 Copies** of Erection, Operation & Maintenance Manual, containing the following technical drawings & details shall be submitted.	Vendor to confirm			
21.0	**Drawings & Details:**				
21.1	Crane GA Drawing	Vendor to confirm			
21.2	Crab Assembly Drawing	Vendor to confirm			
21.3	Total Crane Wiring Schematics	Vendor to confirm			
21.4	Detailed Wiring Diagrams for Sub-Systems / Panels	Vendor to confirm			
21.5	Wheel Assembly Drawings	Vendor to confirm			
21.6	Bottom Block Assembly Drawing	Vendor to confirm			
21.7	Gear Box Assembly Drawings	Vendor to confirm			

S No.	Description - BHEL's Requirement	Specified	Offered	Deviations	Remarks
21.8	Coupling Drawing and Details	Vendor to confirm			
21.9	Specifications/Ratings of All Bought-Out-Items	Vendor to confirm			
21.10	Warranty / Guarantee Card for all Bought-Out-Items.	Vendor to confirm			
21.11	Trouble Shooting Chart for Main and all Sub-Systems	Vendor to confirm			
22.0	**PERFORMANCE GUARANTEE:**				
221.	The Performance of the Total Crane and / or the Components / Sub-Assemblies / Bought-Out-Items shall be guaranteed for a minimum period of 24 months from the date of acceptance of the crane at CUSTOMER site.	Vendor to confirm			
23.0	**PACKING & FORWARDING**				
23.1	The Under slung cranes and accessories shall be properly packed so as to avoid damage during transit &storage. Wooden crate shall be covered with GI sheet of minimum 1mm thickness and same shall be used for packing various equipment / items as per shipping list. Lining with plastic sheet (water Proof) shall be provided inside the crate to avoid water entry during transit / storage. Two sets of manual (hard copies) with drawing & data sheet shall be sent along with the packing box. Each packing shall be accompanied with packing slip & all relevant drawings.	Vendor to confirm			
23.2	Each package or shipping units shall be clearly marked or stenciled on at least two sides - END CUSTOMER SITE (ADDRESS AS PER ENQUIRY). In addition, each package or shipping unit shall have the symbol painted in red on at least two sides of the package, covering one fourth of the area of the side.	Vendor to confirm			
24.00	ANNEXURE I - **CUSTOMER TECHNICAL SCECIFICATION** & DATA SHEET OF CRANE	Vendor to confirm			
25.00	ANNEXURE II - DEAILS OF CRANES	Vendor to confirm			
26.00	ANNEXURE-III - PAINTING SCHEME FOR MATERIAL HANDLING EQUIPMENTS	Vendor to confirm			
27.00	ANNEXURE-IV- RC PUMP & OXIDATION BLOWER UNDER SLUNF CRANE SHED GA	Vendor to confirm			
29.00	ANNEXURE-V- TYPICAL GA OF UNDER SLUNG ELECTRIC CRANES	Vendor to confirm			

SECTION-V

CRANES AND HOISTS

1.0 GENERAL

1.1 This section covers the design, engineering, manufacture, assembly, testing, packing, supply at site, storage at site, site handling, inspection, erection, testing and commissioning, carrying out performance guarantee tests and handling over of cranes and hoists for Boiler, Turbo generator and auxiliaries.

2.0 SCOPE OF WORK OF SUCCESSFUL TENDERER

The scope of work of the successful Tenderer with respect to cranes and hoists shall be generally in accordance with the relevant clauses of this section. The materials, equipment and services to be provided for the cranes and hoists shall include, but not be limited to the following:

2.1 Procurement of materials, manufacture/fabrication and supply of all equipment as specified in clauses 3.0 & 4.0 of this section.

2.2 All structural work complete with bridge girders, end carriage, crab frame as well as miscellaneous structures such as ladders, platforms, foot walks etc.

2.3 All mechanical equipment complete with hook, sheaves, rope drums, wire ropes, gear boxes, couplings, wheels etc.

2.4 All electrical equipment complete with motors, controls, VSD Panels, resistors, brakes, limit switches, isolator, etc. Complete cabling, lighting and earthing of all the electrical equipment with accessories etc.

2.5 Erection, testing and commissioning of crane, Hoists and crane power feeding system (DSL conductors).This includes the extension of DSL system in existing TG building and vice-versa.

2.6 Submission of As-built drawings (hard copies & soft copy), Operation & Maintenance Manuals, annual requirement of consumables and operating supplies such as grease, lubrication oil etc., along with brand names.

Bidder's Seal and Signed

Section-V- Cranes & Hoists (cont'd)

2.7 Supply of spares for 2 years' normal operation and maintenance of the crane.

2.8 Submission of GA drawing of crane, hoist block with cross travel trolley, bridge girder selection/stress calculation, power & control circuit diagram and any other drawings/documents required by the Purchaser as indicated in Clause 10 of this section.

2.9 Supply of tools and tackles.

2.10 Makes of all bought- out items shall as per the Annexure-2.

3.0 REQUIREMENT OF EOT CRANES

3.1 One (1) No. Double Girder EOT Crane of 35/5 T capacity adequate to handle Turbo generator and its auxiliaries, during erection and subsequent maintenance, shall be required to be provided in the Turbo generator building of Power Plant. The crane span shall be so selected that the crane fits in the TG building and the crane hooks are accessible to all auxiliaries of TG to be handled. The crane shall have main and auxiliary hooks for lifting heavy loads at slow speed and light loads at higher speeds respectively. The technical parameters furnished below related to the above described Double Girder EOT crane.

Sl. No.	Description		
1.	Type	:	Double Girder EOT crane
2.	TG Building span, m	:	15.0
3.	Crane span, m	:	13.0
4.	Bay length of TG building, m	:	40.0
5.	Duty classification	:	M5, Indoor as per IS:3177, IS:807 & IS:800
6.	Purpose & Location	:	Maintenance of Turbo-generator and its auxiliaries in TG building (AB Bay)
7.	Gantry Rail level top, m	:	17.8
8.	Height of lift for MH, m	:	16.0

Bidder's Seal and Signed

Section-V- Cranes & Hoists (cont'd)

9.	Height of lift for AH, m	:	16.5
10.	Gantry Rail size	:	Tenderer to specify
11.	Operating speeds		
	- Main Hoist, m/min	:	1 & 0.1
	- Auxiliary Hoist, m/min	:	8 & 0.8
	- Cross Travel, m/min	:	15 & 1.5
	- Long Travel, m/min	:	30 & 3.0
12.	Lifting hooks		
	- Main Hoist	:	Standard single point Trapezoidal shank hook
	- Auxiliary Hoist	:	Standard single point Trapezoidal shank hook
13.	Ambient temp, Deg. C	:	50
14.	Operation from	:	Through Pendant push button station travelling on separate track and Radio Remote Control.
15.	Operating floor level, m	:	+0.00
16.	Any other crane operating in the same bay	:	Yes

❖ **Note:**

1. The parameters furnished above are indicative only. Tenderer to decide on the parameters, based on the arrangement proposed by him.

3.2 Tenderer has to study the existing TG building facility for design of DG EOT crane before taking up manufacture. Tenderer has to consider the extension of DSL up to existing TG building for a distance of about 52m. Tenderer has to include anti-collision device in his scope of supply. Tenderer has to study existing GA of Crane in TG building and consider provision and extension of Crane Power Conductors i.e. Down shop leads for about 40 m bay length in proposed TG building.

Section-V- Cranes & Hoists (cont'd)

Other Requirements

1. The controls for Main Hoist, Auxiliary Hoist, Long and Cross Travel shall be with Variable speed drive/panels with squirrel cage motors. For all motions speed range of 10% to 100% of rated speed shall be obtained through control from pendant push button station.

2. Control for the Crane shall be from pendant push button and Radio Remote control.

3. Crane shall be provided with Group lubrication system.

4. The derating of all equipment shall be done for an ambient temperature of 50^{0}C.

5. Hoist motor shall have six numbers thermisters, two numbers per phase, embedded in the stator winding to protect the same from over heating. Thermister connections shall be provided in a separate terminal box of motor. Thermister protection relay shall be provided in the respective hoist control panel, which will trip the motor power contactor at the critical stator temperature.

6. All motors shall be of S4 duty, TEFC, suitable for 40% CDF and 150 starts/hr.

7. Audio and Visual Alarms shall be provided for warning during starting of the crane.

8. Emergency switches shall be provided at four corners of the bridge to cut-off the power supply by tripping the main circuit breaker.

9. Safety guards, covers, electrical safety items etc., shall be provided for all rotating drive machinery and controls.

10. The crane shall be provided with one (1) set of synthetic webbing slings made of polyester and one (1) set of wire rope slings. Elongation of webbing slings shall not be more than 3%.

3.3 One (1) No. each Single Girder under slung EOT Crane shall be provided for pump bay of TG building, mill bay and chilled water plant during erection and subsequent maintenance. The technical parameters furnished below related to the above described Single Girder EOT cranes.

Bidder's Seal and Signed

Section-V- Cranes & Hoists (cont'd)

Sl. No.	Description				
1.	Type	:	Single Girder U/S EOT crane	Single Girder U/S EOT crane	Single Girder U/S EOT crane
2.	Capacity & Qty		7.5T & One (1) No.	15T & One (1) No.	5T & One (1) No.
3.	Building span, m	:	11.0	10.5	12.0
4.	Crane span, m	:	9.0	7.0	10.0
5.	Bay length, m	:	37.5	40.0	20.0
6.	Duty classification	:	M5, indoor as per IS:3177, IS:807 & IS:800	M5, indoor as per IS:3177, IS:807 & IS:800	M5, indoor as per IS:3177, IS:807 & IS:800
7.	Purpose & Location	:	Maintenance of mills in Mill bay	Maintenance of boiler feed pump in BC bay	Maintenance of chiller equipment in Chilled water plant
8.	Bottom of monorail, m	:	12.0	7.5	8.65
9.	Height of lift for MH, m	:	10.5	6.0	6.5
10.	Monorail size	:	Tenderer to specify	Tenderer to specify	Tenderer to specify
11.	Operating speeds				
	- Main Hoist, m/min	:	8.0	8.0	8.0
	- Cross Travel, m/min	:	10.0	10.0	10.0
	- Long Travel, m/min	:	30.0	30.0	30.0

Bidder's Seal and Signed

Section-V- Cranes & Hoists (cont'd)

Sl. No.	Description				
12.	Lifting hooks				
	- Main Hoist	:	Standard single point Trapezoidal shank hook	Standard single point Trapezoidal shank hook	Standard single point Trapezoidal shank hook
13.	Operation through	:	Movable Pendant push button station	Movable Pendant push button station	Movable Pendant push button station
14.	Operating floor level, m	:	+0.0	+0.0	+0.0
15.	Any other crane operating in the same bay	:	No	No	No

❖ Note:

1. The capacity of crane and other parameters furnished above are indicative only. Tenderer to decide on the parameters, based on the requirement proposed by him.

4.0 REQUIREMENT OF ELECTRICAL AND MECHANICAL HOISTS

Handling facilities namely Electrical/Mechanical hoists at all strategic locations mentioned below shall be provided in accordance with design requirement to meet the purposes intended.

1.	Type	:	Electric wire rope hoist	Electric wire rope hoist	Electric wire rope hoist	Electric wire rope hoist	Electric wire rope hoist	Mechanical hoist	Mech-anical hoist
2.	Location/ Unit	:	Boiler area	Boiler area	Boiler area	Boiler area	Chiller building and ESP control room	Transfer house, bucker elevator drive/ Limestone handling system	Screen and crusher house/ Limestone handling system

Section-V- Cranes & Hoists (cont'd)

3.	Capacity & Qty	:	3.0T & Two(2) No's	6.0T & One (1) No	4.0T & One(1) No	10.0T & One(1) No	3.0T & One(1) No	Tenderer to indicate& Two(2) No's	Tenderer to indicate& Three (3) No's
4.	Purpose	:	Mainten ance of ESP transfor mer	Maintena nce of PA fan	Maintena nce of FD fan	Mainten ance of ID fan	Mainten ance of trans-former	Maintenance of conveyor drive motor and bucket elevator drive motor	Mainten-ance of conveyor drive motor, screen and crusher
5.	Travel length & path, m	:	50.0, Straight & curved	30.0, straight	30.0, straight	30.0, straight	Tenderer to specify	Tenderer to specify	Tenderer to specify
6.	Duty classificatio n	:	Class 2, IS:3938	Class 2, IS:3938	Class 2, IS:3938	Class 2, IS:3938	Class 2, IS:3938	Class 2, IS: 3832	Class 2, IS: 3832
7.	Height of lift, m	:	+30.0	+12.0	+12.0	+12.0	+20.0	Tenderer to specify	Tenderer to specify
8.	Operating floor level, m	:	+0.0	+0.0	+0.0	+0.0	+13.50	Tenderer to specify	Tenderer to specify
9.	speeds								
	- Hoistin g, m/min	:	8	8	8	8	8	NA	NA
	- Travel, m/min	:	12	12	12	12	12	NA	NA
10.	Ambient temp, Deg C	:	50	50	50	50	50	50	50
11.	Operation through	:	Pendant push button unit	Pendant push button unit	Pendant push button unit	Pendant push button unit	Pendant push button unit	NA	NA
12.	Special require-ment, if any	:	Nil	Nil	Nil	Nil	Nil	Nil	Nil

In addition to the above, electric/mechanical hoists at other locations/areas, wherever, required shall be considered and the same shall be provided by the successful Tenderer.

Section-V- Cranes & Hoists (cont'd)

5.0 DESIGN BASIS FOR EOT CRANES

5.1 All the cranes shall be designed, manufactured and tested in accordance with the latest edition of IS: 800 (General Construction in Steel - Code of Practice), IS: 807 (Design, Erection and Testing {Structural Portion}) of Cranes and Hoists-Code of practice), IS: 3177 (Code of Practice for Electric Overhead Travelling Cranes and Gantry Cranes other than Steel Works Cranes), taking due note of various requirements laid down in this section. Detailed instructions on the aspects not indicated in this specification shall be as per the standards mentioned above.

5.2 Selection, design and manufacture of the cranes shall be suitable in every way for the service intended and shall be oriented towards maximising interchangeability of components and minimising maintenance. Cranes shall be complete in all respects including all accessories, safety features essential for proper installation, operation and maintenance irrespective whether such items are specifically mentioned in the Technical Specification or not.

5.3 The design aspects, basic dimensions, hook approaches and clearances with the building and location of various devices on the cranes such as motors, gearboxes, wheels, rope drum, control panel etc. shall be properly coordinated. The cranes shall be designed so as to provide access for easy maintenance and replacement of components wherever required.

5.4 Standardisation and unification shall be carried out to the maximum extent for various sub–assembly constituting the mechanism of various motions. Cranes sub-assemblies shall be designed such that they can be dismantled quickly without disturbing the installation of the neighboring units with which they are connected. Cranes sub-assemblies, as a whole, like wheel assembly, gearbox, brake, brake drum, coupling rope drum assembly, snatch block etc. shall be replaceable and interchangeable with other identical units. In design, care shall be taken so that the inventory is kept low and the down time becomes minimum. Sizes for all equipment viz. LT and CT wheels, brake drum, sheaves, couplings, rope drums shall be selected from preferred number services.

5.5 Electric power for the cranes and hoists will be available at 415 V, 3 phase, 50 Hz, AC. The following standard voltage shall be adopted for cranes, and equipment shall be suitable for operation on +10%, -15%, & ±5% anticipated voltage and frequency variation respectively. Necessary step down transformers and converters shall be provided on the cranes and hoists:

Bidder's Seal and Signed

Section-V- Cranes & Hoists (cont'd)

i)	415V 3–phase, 50 Hz, AC	:	For motor and electro-hydraulic thrustors.
ii)	110V 1–phase, 50 Hz, AC	:	For control circuit of pendant operated crane.
iii)	24V 1–phase, 50 Hz, AC	:	For hand lamp socket outlet and indicating lamps.
iv)	220V DC	:	For brakes wherever specified.

5.6 The bridge shall consist of main girder which shall be of steel section and with an auxiliary structure where necessary. Girders shall be sufficiently strong and rigid to withstand the most severe combination of loads that may develop under different working conditions. The end carriages shall be made from rolled structural steels which shall be joined with main girder by turn fitted bolts. The end carriage shall be provided with substantial safety devices to prevent crane from falling more than 25 mm in event of breakage of a track wheel or axle. Suitable jacking pad shall be provided on each end carriage. Full length MS chequered plate platform shall be provided along the bridge girder for mounting control panel, long travel drive assembly, current collectors etc.

5.7 The crane wheels shall be of double flanged straight tread type for rail mounted cranes and single flanged tapered tread type for under slung cranes. For rail mounted cranes, the wheels shall be fitted to the end carriage with 'L' type bearing housing in a manner that will permit easy replacement. Minimum diameter of LT wheel shall be 320 mm for rail mounted crane. Long travel drive shall be consist of two AC squirrel cage motors mounted on the driving girder platform at either end of end carriages and suitable gear reducer unit. Gear reducers shall be oil lubricated. Worm gear reducer shall not be used. Output shaft of the gear reducer shall be connected to the long travel wheel assemblies through flexible gear couplings.

5.8 LT motors shall be squirrel cage totally enclosed fan cooled crane duty, foot mounted in IEC frame sizes with IP55 enclosure and shall conform to latest edition of IS: 9628. Motors shall be rated at 40% ED, duty type S4. Minimum pullout torque of the motors shall be 225% of the motor torque based on 40% ED rating. For long travel drive, AC electro hydraulic thrustor brakes shall be used for individual motors. LT motions shall be provided with suitable lever operated limit switches.

Bidder's Seal and Signed

5.9 The hoisting and cross travel drives shall be obtained from trolley hoist block which shall be generally as per details given. Suitable stops shall be provided for stopping the trolley motion such that required hook approaches are obtained.

5.10 Control equipment for all drives consisting of contactors, relays, fuses etc shall be enclosed in a dust tight cubicle mounted on one end of the driving girder platform. The enclosure shall generally conform to IP54 as per IEC. Pendant control unit consisting of push buttons for individual drives shall be suspended from the bridge girder as per requirement of the shop.

5.11 Power supply to the crane shall be through MS conductor/ shrouded bus bar system/trailing cable arrangement. The power supply to the crane at 415V AC 3-phase, 4-wire, 50 Hz shall be through Down Shop Lead (DSL) conductors. The size of conductors shall be so selected for maintaining a voltage drop within ±3%. Provision of incoming feeder and termination of DSL cable to the incoming feeder shall be part of the Tenderer's scope of work.

5.12 Cranes shall be provided with safety devices such as limit switches, spring loaded case buffers, platform with hand rails, toe guards and guards over rotating parts, emergency switches, red warning lights etc.

5.13 Cranes shall be provided with necessary service and back-up limit switches for hoists, limit switches for long travel and cross traverse motions.

5.14 Cranes shall be provided with group grease lubrication system.

5.15 The derating of the equipment shall be done for an ambient of 50^{0}C.

5.16 Electrical Equipment

5.16.1 All items of the electrical equipment starting from the local isolator of the crane shall be included in the offer. The crane electrics shall include power disconnecting switch immediately after the main collecting gear, emergency switches at four corners of the crane, protective switchgear, motors, motor control panels, VFD drive panels, resistors, DCEM shunt brakes, limit switches, power and control cables, socket outlets, lighting distribution panel and lighting fixtures with lamps, bridge current collector system, indication lamps, pendant push-button, equipment for radio remote control system and equipment earthing materials. All sundry erection materials required for laying and fixing accessories shall also be included in the scope of supply. For each

Bidder's Seal and Signed

motion separate control panel including one (1) no. protective panel shall be provided. All control panels shall be mounted on the crane bridge walkway platform with anti vibration rubber mats.

5.16.2 **Motors**

5.16.2.1 General

The motors shall be totally enclosed squirrel cage induction type with anti-friction bearings. The motors shall be designed for speed control of 10 to 100% with Variable Speed Drive, heavy duty reversible crane service, fan cooled depending on the manufacturer's standard and fully conforming to latest Indian Standard.

The Degree of protection of motors shall be minimum IP-55 as per IS/IEC 60034-5.

5.16.2.2 Duty cycle

All the motors offered shall be suitable for heavy duty reversible crane service having duty cycle rating not less than S4, 40% CDF, 150 starts/hour unless otherwise specified.

5.16.2.3 Motor ratings

5.16.2.3.1 The motor rating shall be computed as per IS: 3177 such that they meet the duty cycle requirements specified. The ambient temperature derating and slip factor shall be considered while selecting hoist and travel motors.

Calculation for the selection of the crane motor ratings shall be submitted along with wheel skidding calculation, where required.

5.16.2.4 Torque

The starting torque of the motor shall be 2.25 times the full load torque of the motors.

The pullout torque of the motors at rated voltage and frequency shall be minimum 225% of the rated torque.

5.16.2.5 Class of insulation

The squirrel cage motors shall have minimum Class "H" insulation with temperature rise of the motor limited to Class "B" insulation. Insulation of the motor shall be 64 VPI process.

Proper de-rating shall be provided, where specified, for motors operating in higher ambient temperature and also for inverter control application.

Bidder's Seal and Signed

5.16.2.6 Speed selection

Synchronous speed of motors shall be limited to a maximum of 1000 rpm. The selection of motor speeds shall be generally as follows:

Hoist : 750 rpm

Cross traverse / Long travel : 1000 rpm

All motors shall be selected for a safe running speed of at least two times the synchronous speed or 2000 revolutions per minute whichever is lower.

5.16.2.7 Other features

5.16.2.7.1 The motors shall be continuously rated and amply dimensioned to withstand frequently repeated current surges.

5.16.2.7.2 All motors will be provided with top terminal box and will be suitable for 360 degree rotation in horizontal plane. The terminal boxes shall be properly insulated and of adequate size for terminating aluminium conductor cables. The terminals shall be easily accessible when the motor is installed on the crane trolley and preferably be located on the top.

5.16.2.7.3 All brakes shall have a separate brake drum and coupling face shall not be used as a brake drum. Brakes shall be mounted on the load side of the drive.

5.16.2.7.4 All motors shall be adequately braced to withstand the repetitive starting /stopping and accelerating forces.

5.16.2.7.5 Motors will be suitable for inverter duty and will be selected as per recommendation of drive supplier.

5.16.3 **Controls**

5.16.3.1 The crane shall be controlled through pendant push button station depending upon site requirement from different floors. Also the crane shall be controlled from radio remote system. Control scheme shall be designed to meet the above condition avoiding simultaneous operation of both. A suitable selector switch shall be provided for selection of either pendant control or radio remote control. Separate buttons shall be considered for each and every control action operating through pendant control and radio remote control. No common buttons shall be used for various control action from pendant control and radio remote control operation.

Bidder's Seal and Signed

5.16.3.2 Pendant Control Push button Station

5.16.3.2.1 Push button station, metal enclosed, dust-tight and oil proof (IP 65) construction and robust design with `start', `stop', hoisting and lowering, with `forward' and `reverse' for travel motions. Stop buttons shall be lockable type. An emergency push button with mushroom head shall be provided for cutting of power supply under emergency conditions. The push button station shall be at a convenient height for operation from floor level and the multi-core control cables used for the push button station shall have suitable tough sheathing of PCP or equivalent materials. The pendant cable shall have two (2) Nos. spare cores and two (2) Nos. separate cores for two distinct earthing. The weight of pendant push button station shall be supported

independent of the electric cable by means of a chain or wire rope. The pendant shall have lighting switch, indication lamps for CONTROL `ON' & POWER `ON'.

5.16.3.3 Control panels

5.16.3.3.1 Individual control panels shall be provided for each motion of the crane. The panels shall be of fabricated cubicle type made of 2 mm thick sheet. The panels shall be completely dust and vermin-proof by having rubber gaskets at all joints and openings including the panel doors. Ventilation openings where provided shall have screen protection. All power and auxiliary contactors, magnetic overload relays, time delay relays etc. shall be housed in the cubicles in which time delay relays shall be electronic or digital timers only. HRC fuses in the power circuit are not preferred. For each mechanism, all the accessories shall be accommodated in separate cubicles. The degree of protection of panel enclosure shall be IP-54 as per IS/IEC 60947-1.

5.16.3.3.2 All panels shall have a lockable type front hinged door which can be lifted and removed to have an easy access for maintenance whenever necessary.

5.16.3.3.3 The terminations which are going to the hinged door such as signaling lamp etc., shall be provided with separate terminal block so that when the door is lifted these can be opened.

5.16.3.3.4 The panels shall have door interlocking switch connected with the control circuit to ensure positive isolation of the power to the panel for the safety of maintenance personnel. For control panels comprising more than one cubicle for each mechanism, the doors of each cubicle shall be provided with suitable interlocking switch such

Bidder's Seal and Signed

that power to the panel is cut-off if any of the cubicle door is opened. With interlocked front doors, means shall be provided for defeating interlocks for testing the circuit with doors open during maintenance.

5.16.3.3.5 Arrangement of contactors, terminal blocks etc. inside the panels shall be in an approved manner with due consideration to the vibration encountered in the operation of the crane. The terminals shall be so located that chances of flashovers between live terminals are minimized due to falling and accumulation of conducting dust on the terminal blocks.

5.16.3.3.6 Contactors shall be selected based on operational current indicated by the manufacturer for different utilisation categories. Operational current shall be higher than the full load current of motor. The minimum operational current of the contactor shall be 25A for motors and 16A for brake unless otherwise specified in the specification. Auxiliary contactors less than 6A shall not be used.

5.16.3.3.7 Power and control contactors shall not be located together inside the panel.

5.16.3.3.8 All contactors shall be provided with two (2) spare "NO" and two (2) spare "NC" auxiliary contacts whether auxiliary contacts are used in the circuit or not.

5.16.3.3.9 Open type terminals or bus bar with insulator arrangement shall be provided to terminate outgoing power cables. There shall be provision of at least four spare terminals in the terminal blocks. Power and control cables shall be segregated. All the equipment and power/control terminals shall have proper identification labels in accordance with the circuit diagram. The power/control cables shall have white interlocked type ferrules having black engraved numbers for easy identification at the time of replacement and maintenance. Open type terminals shall be used for power and control termination with suitable transparent shrouding arrangement.

5.16.3.3.10 The electrical clearance between all live parts of different polarity and voltages and between live parts and earth shall be minimum 75 mm.

5.16.3.3.11 All plates, springs washers, bolts, etc. used in the panels shall be galvanised for protection against corrosion.

5.16.3.3.12 Control panels shall be well braced to the crane structure leaving at least 350 mm clearance at the bottom and shall be provided with adequate lifting lugs. Anti-vibration pads shall be provided for control panels and resistor boxes.

Bidder's Seal and Signed

5.16.3.3.13 Electric insulating mats shall be provided in front of the control panels. Insulating mat will be provided as per IS: 15652.

5.16.3.3.14 Hand gloves – 1 lot , Danger/caution notice boards/shock treatment charts in English, Hindi and Local Language shall be provided.

5.16.3.3.15 Only one make of devices shall be used for all control panels such as isolators, fuses, contactors, overload relays, auxiliary contactors, actuating devices etc. Where one-make devices cannot be used because of reasons beyond the control of control panel supplier, necessary test certificate shall be furnished to ensure type "2" co-ordination as per IS/IEC 60947-4.

5.16.3.3.16 The electrical panels shall be located on the walkway preferably on girder side.

5.16.3.3.17 Radio Remote Control (RRC) shall be proven design with highly functional and user friendly. Radio Remote Control shall be for all the three motions viz., Hoists, Cross Travel and Long Travel. The RRC unit shall generally be comprises of Terminal unit, Rechargeable battery, Battery Charger, Base unit, Transmitter, Radio and all other associated accessories as required for completeness of the system for operation. Different operating speeds in all the motions shall be achievable through RRC. Suitable status LEDs and emergency stop shall be provided. Recommended spares for radio remote control system shall be included in the tenderer's scope of supply.

5.16.3.4 *Hoist, Long and Cross travel controls*

5.16.3.4.1 For hoist and lowering motions, long and cross travel motions speed control shall be achieved by Variable Speed Drive panels.

5.16.3.5 *Variable speed Controls*

The Variable Speed Drive controls shall have the following basic features:

i) The drive controls shall be of pulse width modulation (PWM) type with vector control for closed loop speed control without tacho feed back.

ii) The unit shall comprise incoming load break isolator, line fuses, input choke, three phase diode bridge rectifier acting as the line converter and three phase inverter as the load converter interconnected through

Bidder's Seal and Signed

DC link reactor and capacitor unit. This unit shall have overload capacity of 150% of rated load for a period of 60 sec.

iii) The PWM inverter shall have fully digital microprocessor based regulation and control system with suitable interfaces for communication with higher level automation system, as well as field level instruments and signals. The microprocessors shall carry out all the functions required from the unit including triggering, protection, self-diagnostic and operator interface. Suitable dynamic harmonic filters shall also be included in each drive panel so that no harmonics of the inverter shall be supplied to the system.

iv) Variable speed drive for hoist motions shall be suitable for hoisting, lowering and regenerative braking conditions.

5.16.3.5.1 For all the motions, the brakes provided shall come into operation immediately in the event of tripping of main contactor.

5.16.4 **Contactors**

The current rating of all the contactors shall be at least 25% higher than the respective computed motor mechanical kW full load current at the specified duty cycle but not lower than the current rating for electrical kW. While computing the rating of the contactors, proper allowance shall be made for high currents that may be encountered on account of single phase dynamic braking, as per the control scheme chosen. The duty of contactors shall be as per IS/IEC 60947-4. Contactors for stator and rotor offered shall have adequate rating to meet the duty requirements of the equipment.

5.16.5 **Brakes**

5.16.5.1 Hoist motions shall be provided with double shoe DC electromagnetic shunt brakes as per the requirement and travel motions shall be provided with AC electro hydraulic thrustor brakes unless otherwise specified. All the brakes shall be of dust-tight construction. All brakes shall have a separate brake drum and couplings shall not be used as brake drum.

5.16.5.2 The design of brakes shall be such that braking action in the OFF position and release with current are provided. The hoist brakes shall be designed for minimum of 150% static moment

Bidder's Seal and Signed

considering that the full load can be held safely. The hoist brake shall be capable of arresting the rated load while lowering, within a distance of not more than 1/150 of the hoist speed in m/min.

5.16.5.2.1 Brakes for long travel and cross travel motions shall be designed based on the following considerations:

a) Braking against travelling shall be capable of arresting the motion within a distance in metres equal to 10% of the speed in m/min. when travelling with rated load at rated speed.

b) The retardation due to braking shall not exceed the values given below to avoid skidding of wheels.

Working Condition of the Crane	**Retardation in m/sec² according to Percentage of Driving Wheels**		
	100%	**50%**	**25%**
Indoor	1.5	0.75	0.40

5.16.5.2.2 The brake shoes shall be of hinged type. Brake levers shall be forged or fabricated or of cast steel. Hinge pins shall be of hardened alloy steel and shall be lubricated. The hinged pins shall be provided with steel bushes at bearing points. Brake drums shall be of forged or cast steel and completely machined and dynamically balanced. The rubbing surfaces of brakes shall be smooth and free from defects. The temperature attained by the rubbing surfaces under service conditions shall be such that their operation is not impaired. The temperature of rubbing surfaces of all brakes shall not exceed 100°C for fabric lining and 200°C for asbestos or metal lining. All brakes shall be provided with a simple and accessible means of adjustment to compensate for wear and removal of brake lining. The width of the brake drum shall be 5 to 10 mm more than the width of the brake shoes.

5.16.6 **Limit Switches**

5.16.6.1 All hoist motions shall be provided with heavy duty limit switches to prevent the crane hook from over hoisting and over lowering. The limit switch shall be screw type with self-resetting feature and be incorporated in the control circuit of the respective drive motor. Apart from this, one counter weight operated back-up limit switch shall also be provided in the under voltage release circuit of the incoming air circuit breaker.

Bidder's Seal and Signed

5.16.6.2 Limit switches for travel motions shall prevent over-running in either direction. These limit switches shall be so provided as to prevent excess travel. The degree of protection of limit switches shall be IP-54 as per IS/IEC 60947. Each travel motion shall be provided with 2 Nos. one way lever/roller type limit switches.

5.16.7 **Circuit Protection**

5.16.7.1 One main metal-clad triple-pole load break isolating switch shall be provided as close as possible to the main current collectors. This load-break switch shall be in addition to the circuit-breaker provided in the protective panel.

5.16.7.2 Four emergency switches shall be provided in a totally enclosed metal enclosure with an operating lever outside at the four corners of the bridge, to cut-off the power supply under emergency condition by tripping the main circuit breaker. The degree of protection for the enclosures for the isolators, emergency switches etc. shall be IP-54 as per IS/IEC 60947-1.

5.16.7.3 Main protective panel

A central protective panel, which shall be of totally enclosed type shall be mounted in a convenient position on the crane walk way platform. This protective panel shall be provided to control the main incoming power to the crane and shall be capable of quick removal of the power to all the drives of the crane over a single emergency control pushbutton provided in the pendant station. The protective panel shall be provided with all necessary control devices including the following:

i) Triple-pole automatic air circuit-breaker complete with instantaneous magnetic over-current release and shall have a minimum short-circuit capacity of 50 kA. The rating of the magnetic over-current release shall be adjustable and shall have a minimum rating equal to 2.5 times the rated full load current of the two largest motors for two motions. The breaker shall be manually operated with the handle protruding out of the panel. The breaker shall be designed for operation in a vibrating service and the supplier shall guarantee that the mechanism is specially designed for trouble-free operation on moving crane. One under-voltage release shall also be incorporated in the breaker. The breaker shall not be used for normal switching off. Suitably rated main contactor shall be used for this duty.

Bidder's Seal and Signed

ii) One double-pole isolating switch with two HRC fuses shall be provided for primary supply to the control transformer.

iii) One (1) 415/110V-control transformer shall be provided with ±5 per cent and ±10% taps on the primary side. The control transformer capacity shall be so selected that voltage drop due to simultaneous closing of the magnetic contactors of multiple drives shall be maintained to the minimum. The anticipated voltage drop on the basis of which the control transformer is selected shall be indicated.

iv) One multiple contact auxiliary contactor shall be provided for feeding control supply to the different motor control panels.

v) Single-pole grip type HRC fuses shall be provided in each control circuit in series with the contact of the auxiliary contactor specified above for control circuit protection to the individual motor panels.

vi) One pilot indicating lamps shall be provided on the panel door to indicate the availability of power to the protective panel. The pilot lamp shall have grip type fuse.

vii) One double-pole 25A switch with fuses shall be provided for control of the crane lighting.

viii) Protection shall be provided against closing of circuit-breaker in case of power contactors getting welded.

5.16.7.4 Individual control panels

The equipment shall be generally as described above and each motor drive shall have VVF drive panels having all necessary devices including the following:

i) Hoist Control

The equipment for the Hoist Control shall be variable speed drive with comprehensive motor protection complete with dynamic braking switch and DB resistor. VVF drive selected shall be suitable for hoisting/lowering application.

One - Triple-pole load-break heavy duty main circuit isolating switch.

Bidder's Seal and Signed

One	-	Double-pole quick break control switch with two adequately rated HRC control fuses
One	-	Circuit contactors
One	-	Triple-pole brake control relay.
Two	-	Triple-pole directional contactors.
One	-	Triple-pole brake control relay.
One	-	Triple-pole magnetic overload relay for each motion with their trip contacts in motor circuit.

ii) Long Travel Control

The equipment for the Long Travel control shall generally be similar to those specified above for the hoist control.

iii) Cross Traverse Control

The equipment for the Cross Traverse control shall generally be similar to those specified above for the hoist control

5.16.8 **Crane Lighting System**

5.16.8.1 The crane lighting system shall consist of the following:

i) One 415/240 V lighting transformer which shall be designed for a minimum continuous rating of 2.5 KVA. The secondary of the lighting transformer shall have centre tap for earthing.

ii) One metal-clad lighting distribution board with one double-pole load break incoming switch-fuse unit and contactor control for controlling four (4) 250 W - LED lamp under slung light fittings.

iii) Four (4) 250 W under slung LED lighting fittings shall be provided complete with reflector, lamps and shock absorbing anti-swing suspension device.

iv) Four (4) red warning lights shall be installed at the four corners of the crane to indicate that the crane is down and undergoing repairs.

Bidder's Seal and Signed

v) Four (4) 24 V and three 240 V two-pole and earth metal-clad plug and sockets shall be provided, for hand lamp and hand tools and the rest distributed on the crane bridge for taking power to portable hand lamps and hand tools respectively.

vi) One (1) No. hand lamp with 10 m long tough rubber sheathed cable.

vii) Four (4) Nos. 70 W LED integral well glass fittings for crane bridge lights.

5.16.9 **Disposition of Electrical Equipment**

5.16.9.1 The electrical panels shall be located as follows:

i) For box girder crane - on the walkway

ii) Where the panels are located, the entire walkway shall have a minimum space of 750 mm when the doors of the panels are open.

The same is applicable from the edge cover of the resistors installed.

5.16.10 **Current Collection**

5.16.10.1 Bridge travel

5.16.10.1.1 The supply and erection of main down shop lead conductors consisting of 3-phase and earth bus for the crane bridge travel shall be within the scope of the crane supplier. The offer shall also include the main current collectors to suit the requirements. Shrouded type DSL system shall be provided.

5.16.10.1.2 The location, size and type of crane power conductors (Down Shop Leads) shall be as indicated for the crane under clause 3.0. Selection of collectors shall suit these requirements.

5.16.10.1.3 The power conductor sizes shall be checked to ensure suitability of the total current requirements of EOT crane keeping the voltage drop along the conductors within 3% of the declared voltage as well as future cranes, if any.

5.16.10.1.4 The crane power conductors (Down Shop Leads) for power collector system for the bridge travel of EOT crane shall be of shrouded / insulated galvanized iron conductors.

5.16.10.1.5 The power conductors for the crane provided in the plant shall generally comprise three (3) insulated conductors for carrying 3-phase power and one (1) insulated conductors of equal

Bidder's Seal and Signed

section mounted directly on bracket to be used as fourth conductor for crane earthing. The top most conductor shall be used for earthing. The crane power conductors shall not be used for feeding other power consumers.

5.16.10.1.6 The maximum continuous length of power conductor section shall not exceed 30 M without an expansion joint.

The power conductor shall be made from standard rolling length. The joints of standard length shall be by 100% butt welding and top surface finished smooth by grinding to provide free movement of the collectors.

5.16.10.1.7 To provide electrical continuity across the expansion joint the power conductors on both sides of the joint shall be connected suitably by flexible copper conductors as per manufacturer's standard.

5.16.10.1.8 The support assembly shall be capable of withstanding high impact and shocks resulting from crane movements. The support assembly shall also have adequate tension and compression strength to withstand the weight of the crane power collector system during the crane movement.

5.16.10.1.9 The crane power conductor supporting brackets shall be of rigid construction and shall be welded with the stiffeners in the gantry girder or welded on inserts provided in the building concrete girders.

The brackets shall generally be fixed at intervals as per manufacturer's standard along the entire length of the crane girder except at the places where expansion joints are provided or where power conductors are sectionalised. At these places special sectionalising assembly shall be used as per manufacturer's recommendations.

5.16.10.1.10For each section of the power conductors the bracket at the middle shall have arrangement to hold the conductor rigidly. The other brackets of that section shall have arrangement to hold the conductor in such a way as to permit free movement of the conductor during expansion or contraction.

5.16.10.1.11 The termination of incoming DSL power supply aluminium cables and aluminium expansion joint jumpers at crane power conductors shall be by means of suitable metallic strap recommended by the DSL supplier. One (1) No. 415V feeder will be made

Bidder's Seal and Signed

available at one point in the shop by the Purchaser. Supply erection and termination of incoming DSL power supply cable along with the load break isolator from the feeder is in the scope of the tenderer.

5.16.10.1.12 Warning light shall be provided for crane power conductor system to indicate presence of power in the section. Warning lights shall be provided at both ends of the conductors.

5.16.10.1.13 The warning light unit shall be of industrial heavy-duty type for indoor locations. The unit shall comprise three lamps for three phases with red glass lens and reflectors. The lamp shall be provided with dropper resistance connected in series with the lamp.

5.16.10.2 Collector Shoes

The main current collector shall be of compatible to the DSL system offered. Double collector shoes with adequate current carrying capacity shall be provided for all the three phases and single shoe for the earthed conductor. The collector shoes shall be suitably designed to avoid jamming at the hinge point due to accumulation of dust or corrosion. The width of the shoe shall be sufficient to cover the permissible lateral movement of the crane.

5.16.10.3 Collector Shunts

Current carrying copper braided shunts on all the collectors shall be so designed that there is no danger of contact with adjacent collectors. The shunts shall be easily replaceable.

5.16.10.4 Mounting

All the collectors shall be mounted on rigid steel brackets and suitably insulated. Collectors shall be designed and mounted so that these are readily accessible for maintenance. Minimum clearance between live parts of adjacent shoes per conductors shall be 100 mm.

5.16.11 **Trolley travel**

For trolley conductors, PCP sheathed butyl rubber insulated copper flexible cables shall be provided. The flexible trailing cable shall be of multi-strand copper conductors with permanent terminations on the bridge and the trolley. The cable shall have ample length and shall be supported by properly designed movable clamps which shall be fitted with rollers mounted on bearings and shall run freely on a guide rail allowing relative movement of bridge and trolley without undue stress or wear on the suspended cables. The cables supported on moving trolleys shall be so mounted on the crane bridge that the trolleys are easily accessible for maintenance and convenient for replacement from the bridge platform / trolley. The cables shall be protected from heat and

Bidder's Seal and Signed

flames. Two (2) spare clamps shall be provided on cable trolley for future requirement. The design of clamp shall be suitable for individual clamping of cables. Drag chain shall be provided in between cable trolleys to avoid stress on the cables while moving from one side to extreme side.

6.0 DESIGN BASIS FOR ELECTRIC HOISTS

6.1 Electric hoists shall be designed, manufactured and tested in accordance with the latest edition of IS: 3938 taking due note of various requirements laid down in this specification. The hoist shall be complete with drive motor, brake, limit switch, rope drum, gearbox, hoisting rope, rope guide, sheaves, hook block etc. The rope drum shall be deep grooved type and shall have adequate provision to prevent the rope coming off the drum. Trolley wheels shall be of forged/rolled/cast steel, single flanged tapered type with minimum hardness of 250 BHN. The trolley shall be provided with built-in type jacking device for jacking up the trolley in case of wheel removal. Opposite wheels of the trolley shall be positively driven. Gearboxes shall be oil lubricated and shall not be vertically split. Hoist block shall be provided with 4/2 rope fall arrangement. Power supply to the hoist block shall be through trailing cable system. Trailing cable system complete with guide beam, brackets, cable trolleys, cable etc.

6.2 The duty class of the electric hoist shall be Class-2 and the hoist shall be designed, manufactured and tested in accordance with the latest edition of IS: 3938. Both hoist and travel motions shall be operated from the operating floor level through push

button station suspended from the hoist block. The geared trolley shall be suitable for moving on a straight or curved travel path of monorail depending upon the handling/operational requirement. The lifting capacity and lifting height shall be adequate for the purpose intended. All bearings shall be of anti-friction ball/roller bearings. No needle bearings and cast iron parts shall be used in the construction of hoists.

6.3 All motors shall be squirrel cage totally enclosed fan cooled, crane duty in IEC frame sizes with IP55 enclosure and shall conform to latest edition of IS: 9628. Motors shall be rated at 40% ED, duty type S4. Minimum pullout torque of the motors shall be 225% of the motor torque based on 40% ED rating. Hoist motor shall be foot mounted type with 6–pole construction and travel motor shall be flange mounted type. Travel motor may be of 4–pole construction.

Bidder's Seal and Signed

6.4 All motions shall be provided with brakes. Hoist brake shall be DCEM shoe type and CT brake shall be DC Disc type. Hoist motion shall be provided with one number rotary and one number gravity operated limit switch. CT and LT motions shall also be provided with two (2) no.s one way lever operated limit switches.

6.5 All control switchgears consisting of contactors, relays, fuses etc shall be enclosed in a dust tight cubicle mounted on the body of the hoist/operating platform. The enclosure shall generally conform to IP54 as per IEC.

6.6 The hoists shall be operated from pendant control units mounted on hoist body. Individual push buttons shall be provided for each direction of all motions and these shall be sufficiently shrouded to avoid inadvertent operation. Push button shall be metal enclosed of dust tight construction with 'START', 'STOP', 'HOIST' and 'LOWER" for hoist motion, with 'FORWARD' and 'REVERSE' for travel motion. Stop push buttons shall be lockable type.

6.7 Electricals

6.7.1 **Motors**

6.7.1.1 The motor shall be of totally enclosed fan cooled (TEFC) type for hoist and traverse and shall be suitable for operating on 415 V, 3-phase, 50 Hz AC power supply and shall conform to latest Indian Standard. All motors shall have anti-friction bearings. The motors shall be suitable for cranes duty, having a duty cycle rating of not less than 40% ED. They shall be class 'F' insulation with temperature rise limited to class 'B' insulation. Minimum pull-out torque of the motor at the rated voltage and frequency shall be at least 225% of the rated torque based on 40% ED rating. The motor shall be designed to withstand a safe running speed of at least 2 times synchronous speed. The hoist motor shall be designed for high starting

torque and frequent reversals. All motors shall have minimum six poles. Electric Hoist shall include 415V LT motors, 1.1kV grade cables, cabling accessories, pending push button station, earthing of all electrical equipment including earthing stations, lighting for all equipment covered under tenderer's scope of supply.

6.7.2 **Brakes**

The hoist shall be equipped with DC electromagnetic brakes both for hoisting and traversing drives. The hoist brake shall be so selected as to arrest and hold any load up to and including the test load (125% of the rated hoisting capacity) at any position of the lift, when the power supply to the motor is cut off or fails.

Bidder's Seal and Signed

Section-V- Cranes & Hoists (cont'd)

6.7.3 **Limit switches**

One shunt limit switch to prevent over-hoisting and over-lowering shall be provided, in addition to one gravity operated limit switch for over-hoisting. The limit switch shall reset automatically by lowering of hoist by push button control.

Trolley shall also be provided with suitable limit switches. Limit switches shall be of heavy duty type.

6.7.4 **Controls**

6.7.4.1 The controls shall consist of moulded case (miniature) circuit breaker, heavy duty contactors, protective relays, fuses etc. in dust tight enclosures mounted on the body of the hoist and shall be easily accessible for repair and maintenance. All cables shall be brought to a terminal box and shall be clearly marked for identification.

6.7.4.2 The motor and controls shall be adequately protected and shall be so rated that the temperature rise above an ambient of 50^0C does not exceed the limits specified in the relevant Indian Standard Specifications.

6.7.4.3 All contactors shall be heavy duty type and shall be adequately rated to carry the rated current of the motors used for each of the drive. Directional contactors shall be interlocked electrically and mechanically. One suitably rated main line contactor with circuit breaker shall be provided for controlling the power supply to the hoist block. Power contactor shall be minimum 16 A (AC-3) rating.

6.7.4.4 Control circuit shall be designed for 110V AC conforming to IS: 3938. Duplicate transformers with manual change-over switch shall be provided. Necessary step-down transformer for reduced control voltage shall be provided.

6.7.4.5 Push-button station, metal enclosed, dust-tight construction and robust design with 'Start', 'Stop', 'Hoist' and 'Lower' buttons for the hoist motion and with 'Forward' and 'Reverse' buttons for the traverse motion shall be supplied. Stop push-button shall be lockable type. An emergency push-button with mush room type head shall also be provided for cutting power supply under emergency condition. An indicating lamp for 'Main Contactor ON' shall be provided. The push-button station shall be at a convenient height for operation from floor level and the multi-core control cables used for the push-button station shall be butyl rubber insulated with sheathing of PCP. The weight of pendant push-button station shall be supported independent of the electric cable by means of a chain or wire rope.

Bidder's Seal and Signed

6.7.5 **Cabling**

6.7.5.1 All the fixed wiring for power, control etc., shall be carried out with 1.1kV grade heavy duty PVC insulated and PVC sheathed armoured copper cables laid on open racks and adequately clamped. If un-armoured cables are used, these shall be laid inside the cable troughs or shall run through conduits. Each motor feeder cable shall be laid in separate conduit.

6.7.5.2 Power supply to the hoist shall be through butyl rubber insulated PCP sheathed extra flexible trailing multi-core copper cable supported on rollers moving on a beam running parallel to the monorail on which the hoist will traverse. The trailing cable system shall be complete with guide beam, cable trolley, cable clamp, link chain, cable etc. A continuous earthing conductor shall be provided for the purpose of earthing. Electrical conductors of section smaller than 2.5 sq.mm copper shall not be used for power supply to the hoist or its motors. For wiring of hoist only copper cable of stranded construction shall be used.

6.7.5.3 Degree of protection of all electrical equipment enclosures shall be IP54.

7.0 DESIGN BASIS - MECHANICAL HOIST

All the mechanical hoists shall be designed, manufactured and tested in accordance with the latest edition of IS:3832 (Hand Operated Chain Pulley Block). The mechanical hoists shall be of a mono block type consisting of chain pulley block permanently suspended from a geared trolley suitable for moving on a straight or curved travel path of monorail depending upon the handling/operational requirement. Both hoist and travel motions shall be affected through pulling of hand chain over hand wheels. The lifting capacity and lifting height shall be adequate for the purpose intended. No cast iron parts shall be used in the construction of mechanical hoists. The cross travel trolley shall be fitted with wheels mounted on life lubricated antifriction bearings.

8.0 CABLING

All wiring for power, control, lighting etc. shall be carried out with 1.1 kV grade XLPE armoured cables except flexible cables where armouring shall not be provided. All power cables 10 sq. mm and above shall be of stranded aluminium conductor and size 6 sq. mm and below shall be of stranded copper conductor. Control cables shall be minimum 2.5 sq. mm copper. Cable cores shall be of stranded construction. All cables shall be laid on suitable size of GI cable trays.

Bidder's Seal and Signed

Cable selection and routing on the crane shall form part of the crane design. Cable trays shall not be routed behind the panels as far as possible. Terminal connectors used shall be approved by the Purchaser. Cable selection shall take into consideration the ambient temperature specified, grouping factor, duty factor of the drive. The voltage drop on the crane shall not exceed 3% with the largest motor starting and the second largest running. Conduits and conduit fittings, if used on crane, shall be of standard design and shall be supplied with all accessories. Each motor shall be wired through separate conduits. Only 50% of the conduit inside space shall be occupied by the cables. All cables remaining live in open position of the isolator shall be shrouded separately. Cables carrying AC and DC power of different voltages shall be laid in different conduits. Power and control cables shall be laid separately and terminated in separate terminal boxes. For all flexible copper cables for cross conductor, double compression cable glands will be used.

9.0 EARTHING

The crane structure, motor frames and metal frames of all electrical equipment including metal conduits, cable trays etc. shall be effectively connected to the earth by independent earthing strips to conform to the requirements of the Central Electricity Authority (CEA) and Indian Electricity Rules. Equipment fed by flexible cables shall be earthed by means of spare core provided within the flexible cable. The earthing of the crane shall be effected through the fourth collector of the down shop leads. 50 X 6 mm GI strip have to be run throughout the walkway, repair cage, and for individual mechanism, motors, panels, resistor boxes, switches, junction boxes and all other electrical equipment have to be earthed with other GI strip/wire of adequate sizes. GI wires used shall be of stranded construction. The sizes of the GI strips selected for local earthing shall be approved by the Purchaser. Associated civil works related to earthing shall be included in Tenderer scope of work.

10.0 DRAWINGS AND DOCUMENTS

10.1 The Tenderer shall include in his offer for supply of all necessary drawings and other documents. The Tenderer shall specifically submit all the GA drawings/design & power calculations etc., for approval/information before taking manufacture of crane. The following drawings shall be submitted after the award of contract:

Bidder's Seal and Signed

1. The detailed general arrangement drawing of EOT cranes (Double Girder & Single Girder), Electric wire rope hoists and Mechanical hoists with trolley containing all basic dimensions and all technical particulars of the equipment.
2. Crab assembly for DG EOT crane.
3. Structural Calculation for DG EOT Crane (Girder, End Carriage, Crab).
4. For EOT crane - Basis of selection of motor kW and brake selection, wire rope selection, sheaves, rope drum [Dia, length & shell], max & min LT wheel loads.
5. For Electric hoists - Sizing calculations includes motor selection, brake selection, wire rope selection.
6. Speed, torque characteristics curves for each drive/motion of crane.
7. Power & control circuit diagram for Crane.
8. Panel layout for Crane.
9. GA of crane DSL.
10. External wiring connection diagram for Crane.

11.0 TOLERANCES

The crane shall be manufactured as per the tolerance specified below.

a)	Span over LT wheels	:	± 6mm upto 40 Metres ± 7.5 mm above 40 Metres
b)	Diagonal on wheels	:	±5 mm
c)	Trolley track gauge	:	±3 mm
d)	Long travel wheel alignment (Horizontal and Vertical)	:	± 0.5 mm
e)	Tilt of wheels or balance axle	:	± 0.25 mm

Bidder's Seal and Signed

f) Difference in height between trolley rails (H) in relation to the trolley track gauge (S) shall have the following tolerances:

S (mm)	H (mm)
Upto 2,500	4
2,500 to 4,500	6
Above 4,500	8

g) Speeds at full notch with rated load, voltage and frequency:

Hoist	:	± 10%
Lowering	:	+20%, -10%
Traversing	:	± 10%
Travelling	:	± 10%

h) Wheel load : ± 3% of the calculated value

Bidder's Seal and Signed

	DATA SHEET (VENDOR TO SUBMIT FILLED COPY ALONGWITH THEIR OFFER)	
	NALCO FGD PROJECT	
	DETAILS OF UNDER SLUNG EOT CRANES FOR OXIDATION BLOWER AND RECIRCULATION PUMP HANDLING	
	PROJECT NAME: NALCO PROJECT	
1.0	**Capacity: UNDER SLUNG ELECTRIC CRANES**	As per Enquiry
2.0	**Quantity**	As per Enquiry
3.0	Main Hoist (minimum)	As per Enquiry
4.0	**SPAN (Wheel Centre to Wheel Centre Dimension):**	
4.1	Long Travel Span for Recirculation Pump Area	Please Refer the Attached ANNEXURE IV
4.2	CT Span	Vendor to submit
5.0	**Height of Lift:**	
5.1	Hoist height for Oxidation blower & Recirculation Pump Area	Please Refer the Attached ANNEXURE IV
6.0	**Bay Length:**	
6.1	Oxidation blower & Recirculation Pump Area	Please Refer the Attached ANNEXURE IV
7.0	**DUTY CYCLE:** (Related to Drive Motor & Mechanisms)	
7.1	Hoists	40 % CDF
7.2	Long Travel	40 % CDF
7.3	Cross Travel	40 % CDF
8.0	**SPEED:** (Operating)	
8.1	Main Hoist	**As per attached Customer Specification**
8.2	Cross Travel (CT)	**As per attached Customer Specification**
8.3	Long Travel (LT)	**As per attached Customer Specification**
9.0	**MOTOR DETAILS:** Vendor to provide details like capacity of motor, Frame size, make, type and No. of poles etc.	Vendor to confirm & submit details
9.1	Main Hoist	Vendor to submit
9.2	Cross Travel (CT)	Vendor to submit
9.3	Long Travel (LT)	Vendor to submit
10.0	**GEAR BOX SIZES:**	
10.1	Main Hoist	Vendor to specify
10.2	Cross Travel (CT)	Vendor to specify
10.3	Long Travel (LT)	Vendor to specify
11.0	**Acceleration:**	
11.1	Cross Travel (CT)	Vendor to specify
11.2	Long Travel (LT)	Vendor to specify
12.0	**Hoist Rope Details: (Size & Number of Falls)**	
12.1	Main Hoist rope Size	Vendor to specify
12.2	Falls	Vendor to specify
13.0	**CONTROL (Remote control)**	
13.1	Through pendent type control	Vendor to confirm
13.2	**Control Voltage:** Shall be 110V AC	Vendor to note
13.3	**Input Power Supply:** Shall be 415 ± 10% Volts , 50 ± 3% Hz, 3 Phase- AC.	Vendor to note
13.4	**Duty Class:**	Vendor to confirm
13.5	**Mechanism Group Classification:**	**As per attached Customer Specification**
13.5	**Design Standard:** The crane design standard as per IS – 807 & 3177 / 1999.	Vendor to confirm
13.6	**WIRE ROPE HOIST:** The electric hoist shall be designed and constructed in accordance with the latest revision of IS:3938 and shall be suitable for duty class 2.	Vendor to confirm
14.0	**Wheel Sizes:**	
14.1	Cross Travel (CT)	Vendor to specify
14.2	Long Travel (LT) -	Vendor to specify
15.0	**Brake Drum Sizes:**	
15.1	Main Hoist	Vendor to specify
15.2	Cross Travel (CT)	Vendor to specify
15.3	Long Travel (LT)	Vendor to specify

(VENDOR TO SUBMIT FILLED COPY OF ABOVE DATA SHEET ALONGWITH THEIR OFFER)

ANNEXURE – 2-A

LIST OF PREFERRED VENDORS FOR BOILER AND TG PACKAGE

Sl. No.	Item		List of Vendors
I)	**MECHANICAL**		
1.	Fans And Accessories	:	ANDREW YULE/FLAKTWOODS/ ALSTOM/ BHEL
2.	Boiler Feed Water Pumps	:	KSB/ SULZER/BHEL
3.	Electrostatic precipitator	:	BHEL/THERMAX/ETS
4.	Pulveriser	:	BHEL
5.	Fuel feeder	:	SCHENCK/TRANSWEIGH/THERM-RAMSAY/KISTLER-MORSE
6.	Refractory	:	ACC (CALDERYS INDIA REFRACTORIES LTD)/ TATA REFRACTORIES/SAIL REFRACTORY
7.	Sample Coolers	:	BHEL/THERMAX /FORBESMARSHALL
8.	Bellows	:	ANUP ENGG./LONESTAR/FLEXICAN BELLOWS & HOSES PVT LTD.
9.	Air And Flue Gas Dampers	:	BACHMANN INDIA/FOURESS ENGINEERING INDIA LTD/KELD/BHEL
10.	Gear Box	:	ELECON/GREEVES/PREMIUM TRANSMISSION/ SHANTHI GEARS/TRIVENI/BHEL
11.	Geared Motors	:	PBL/REMI/SHANTHI GEARS/INTERNATIONAL COMBUSTION (I) LTD
12.	Couplings	:	EUROFLEX/FENNER/WELL MAN/RATHI/LOVE JOY/ROTEX/FLENDER
13.	Variable Speed Coupling	:	VOITH TURBO

Annexure-2A (cont'd)

Sl. No.	Item		List of Vendors
14.	Bearings	:	FAG/NTN/SKF
15.	Chemical Dosing System / Pumps	:	ENPRO/MILTON ROY/ASIA LMI/ SWELLORE/XL PUMPS AND SYSTEMS
16.	Chemical Dosing Equipment (Agitator, Flocculator, Flash Mixer)	:	REMI/DELKOR/FIBER & FIBER/CEECONS INDIA
17.	Deaerator	:	ALLIED ENGINEERING/TEMA INDIA/ GE GODAVARI/BHEL
18.	CBD / IBD TANK	:	SV ENGINEERING/ALLIED ENGINEERING
19.	Desuperheater	:	SAMASON/MAZDA/IMI-CCI/KOSO/SPX-FLOW
20.	Condenser	:	GEGODAVARI/L&T/MAZDA/TEMA/ BHEL
21.	Condensate Extraction Pumps	:	KSB/SULZER/KIRLOSKAR EBARA
22.	Gland Steam Condenser	:	MAZDA/L&T/BHEL/ESKAY
23.	Ejector	:	MAZDA/L&T/WIEGAND/ CHEMPROCESS
24.	Feed Water Heaters	:	TEMA INDIA / GE GODAVARI/ ALLIED ENGG/ /MAZDA
25.	Lube Oil System	:	SOUTHERN LUBRICATION/ENPRO INDUSTRIES/ PSI /LINCON HELIOS/TA HYDRAULICS / LEONARDO/BHEL
26.	Oil Purification System	:	ALFA LAVAL
27.	QCNRV	:	SEELAND ENGG/BHEL/WEIR/ ARMATURY
28.	Mechanical Seal	:	SEALOL/FLOWSERVE/BURGMANN
29.	Plate Heat Exchangers	:	ALFA LAVAL/KELVION INDIA/SWEP/IDMC

Bidder's Seal and Signed

Annexure-2A (cont'd)

Sl. No.	Item	List of Vendors
30.	Lining	: AKZO NOBEL / KIRLOSKAR CORROCOAT / REMA TIP TOP
31.	Slurry Pumps	: WEIR / KSB / GRUNDFOS
32.	Wet Ball mills	: THYSSENKRUPP / FL SMIDTH / METSO MINERALS
33.	Horizontal centrifugal pumps	: KSB / KIRLOSKAR / SULZER / FLOW MORE
34.	Vertical sump pumps	: KIRLOSKAR / FLOW MORE
35.	Belt Vulcanizers	: NILOS / SHAW ALMEX / SYNERGY
36.	Belting	: DUNLOP / PHOENIX YULE / MRF / NORTH LAND / ORIENTAL / HINDUSTAN / YOKOHAMA
37.	Brake – Thruster operated	: ELECTROMAG / SIBRE / BUBENZER / ELDRO / JOHNSON BRAKE / STROMAG
38.	Brake – DC Electromagnetic	: ELECTROMAG / BCH / ELECTRONIC POWER CONTROL / STROMKRAFT
39.	Crusher	: L&T / TRF / ELECON / EASTMAN CRUSHER / MCNALLY SAYAJI /ECOMAN
40.	Idlers	: ELECON / TRF / L&T / KALI
41.	Pulleys	: ELECON / TRF / L&T / KALI
42.	Vibrating feeder	: ELECTROMAG / MCNALLY SAYAJI / IC / TRF / BHP / L&T
43.	Vibrating screen	: ELECON / MCNALLY SAYAJI / IC / TRF / BHP / L&T
44.	Chain pulley blocks	: INDEF / ANUPAM INDUSTRIES / BRADY & MORRIS / TRACTEL TRIFOR / ELECTROMECH / WMI / FAFECO / ARIMSEL MHE PVT LTD

Bidder's Seal and Signed

ANNEXURE – 2-B

LIST OF PREFERRED VENDORS FOR UTILITIES

Sl. No.	Item		List of Vendors
1.	Pipes	:	TATA/BST/JINDAL/ /MAHARASHTRA SEAMLESS LTD/SAIL
2.	Pipe Fittings	:	N.L. HAZRA / SHYAM ENGG/M.S. FITTINGS / DEE DEVELOPMENT /TRUE FORGE/ TEEKAY TUBE /CHARGESON/VIVIAL FORGE PVT. LTD/ TUBE BEND /PROJECT TOOLING / ENGINEERING SERVICES
3.	Traps & Strainers	:	UNI KLINGER/ESCO/FORBES MARSHAL/ PENNANT
4.	Insulation	:	LLOYDS INSULATION/ROCKWOOL INDIA/ JAYASHREE INSULATORS
5.	Expansion Joints (Metallics & Non-Metallics)	:	METALLIC EXPANSION JOINTS – FLUIDYNE/LONESTAR / METALLIC BELLOWS/B.D ENGINEERS/ C.L ENGINEERS. NON-METALLIC EXPANSION JOINTS – KELD/ FLEXCON / CORI ENGINEERS PVT. LTD.
6.	Gaskets	:	CHAMPION/IGP/REINZ/TALBROS/ /UNIKLLNGER
7.	Hoses Including Rubber Steel Cladding	:	HYDROCRIMP/SENIOR INDIA/BENGAL INDUSTRIES/ PAREKH BROTHERS
8.	Gate, Globe & Check Valves		
i.	Valve Rating #800 And Above	:	BHEL/AUDCO/FISHER XOMOX SANMAR

Bidder's Seal and Signed

Annexure-2-B (cont'd)

Sl. No.	Item		List of Vendors
ii.	Valve Rating Below #800	:	BHEL/AUDCO/KSB/FOURESS/ /FISHER XOMOX
9.	**Ball Valves**		
i.	Cast Iron	:	AUDCO/FOURESS/REYNOLDS/ VALTECH INDUSTRIES
ii.	Cast Carbon Steel	:	AUDCO/BDK/FOURESS/VIRGO/ FISHER-XOMOX SANMAR/ /REYNOLDS
iii.	Forged Steel	:	AUDCO/FOURESS/VIRGO/ REYNOLDS
10.	**Butterfly Valves**		
i.	Cast Iron	:	AUDCO/FOURESS/INTER VALVE (INDIA)/KSB
ii.	Cast Carbon Steel	:	AUDCO/FOURESS/INTERVALVE/ HI-TECH BUTTERFLY VALVES/ FLUID CONTROL EQUIPMENT
iii.	Forged Steel	:	AUDCO/BDK/FOURESS/ INTERVALVE/HI-TECH BUTTERFLY VALVES
11.	Plug Valves		
i.	Cast Iron	:	AUDCO/FISHER-XOMOX SANMAR/BHEL/KSB
ii.	Cast Carbon Steel	;	AUDCO/FISHER-XOMOX SANMAR/BHEL/KSB
iii.	Forged Steel	:	AUDCO/FISHER-XOMOX SANMAR/BHEL/KSB
12.	Other		
i.	Safety Valve/Pressure Relief Valve	:	TYCOSANMAR/AUDCO/ FAINGERLESER/ BHEL/ MAZDA
ii.	Pressure Reducing Valves	:	JNM/FISCHER XOMOX/ILP/MIL

Bidder's Seal and Signed

Annexure-2-B (cont'd)

Sl. No.	Item		List of Vendors
iii.	Control Valves	:	JNM/FISCHERXOMOX/FISHER ROSEMOUNT/METSO/ R.K.CONTROL/TOSHNIWAL/ILP/ MIL
iv.	Pressure Release Valves	:	FISCHER XOMOX/AUDCO CROSBY
v.	Needle Valves	:	FISCHER XOMOX/TUFLIN/AUDCO
vi.	Float Valves	:	LEVCON/IVI/IVC/G.M.DALUI
vii.	Spring Supports	:	PIPE SUPPORTS / SUPPORTS SYSTEM /TECHNO INDUSTRIES
viii.	Valve Actuators	:	AUMA/LIMITORQUE/ROTORK CONTROLS
ix	Knife Edge Gate Valve / Double Eccentric Butterfly Valve	:	VAAS/FOURESS/KEY STONE/ JASH/VAG
x	Goggle Valve	:	FOURESS/JOSHI JAMPALA
xi	Positive Displacement Pump (For Fuel Oil)	:	UT / ROTO / TUSHACO / DELPD
xii	Strainer	:	HAWA / FLUID TECH / XICON /PRECEDENCY/ GROTTO
xiii	Oil Water Separator	:	K PACK SYSTEMS PVT. LTD, BANGALORE/ GRAND PRIX FAB PVT LTD HARYANA/ FIL SEP EQUIPMENTS PVT LTD GUJARAT

Bidder's Seal and Signed

ANNEXURE – 2-C

LIST OF PREFERRED VENDORS FOR ELECTRICAL

Sl. No.	Item		List of Vendors
A.	**HIGH TENSION (HT) EQUIPMENT (INDOOR)**		
1	11 / 6.6 kV Vacuum Circuit Breakers (Indoor)	:	BHEL/SIEMENS/SCHNEIDER/ABB/ CGL/L&T
2	11/6.6 Kv PTs (Panel mounted type)	:	AEP/PRAGATI/SCHNEIDER/ PRAYOG ELECTRICALS/KAPPA /SILKANS/ABB/BHEL
3	11/6.6 Kv CTs (Panel mounted type)	:	AEP / PRAGATI / SCHNEIDER / PRAYOG ELECTRICALS/KAPPA/ SILKANS/ABB/BHEL
4	CT and PT (Outdoor type)	:	AEP/SCHNEIDER/CGL/NTL/ ABB/ GE
5	HT Busduct (Phase–Segregated)	:	C&S / ECC/KGSEL(STAR DRIVE)/ ENPRO/POWER GEAR/GE
6	Generator Transformer	:	ABB/BHEL/CGL/GE T & D INDIA LTD/EMCO/SCHNEIDER/SIEMENS/ TRANSFORMER & RECTIFIERS (INDIA) LTD/TOSHIBA
7	Generator Busduct	:	BHEL/C&S/GE/SCHNEIDER
8	HT Capacitors	:	BHEL/ABB/UNISTAR/MEHER/ EPCOS/PCPL/SAVIN/ GE/SCHNEIDER
9	11/6.6 Kv Vacuum Contactors	:	SCHNEIDER/BHEL/SIEMENS/ABB
10	11/6.6 Kv Lightning Arrestors & ZnO CR type surge suppressors	:	ELPRO / RAYCHEM / SCHNEIDER / SIEMENS AG (Imported)/PCEPPL/ABB
11	HT HRC Fuses	:	SCHNEIDER /PSPL(DP) / S&S / COOPER BUSSMAN/ SIEMENS/ABB /BHEL/JYOTI

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
12	Neutral Grounding Resistor	:	NARKHADE/PEFCO/ RESITECH/ NATIONAL/ LACHHMAN/GE
13	Outdoor HT Isolators	:	ELPRO (SIEMENS)/ALLIANCE / CONSOLIDATED/S&S/ TRANSELECTRICALS
14	Indoor HT Isolators	:	PSPL(DP)/A BOND STRAND / ESWARI/SIEMENS (13.1 KA, 800 A)
15	11 Kv and 6.6 Kv Power Transformers (Oil–filled) & Earthing Transformers	:	BHEL/CGL/SCHNEIDER/AREVA/ VOLTAMP/ KIRLOSKAR (KEC) /ABB/ SIEMENS
16	11Kv & 6.6Kv Cast Resin type power transformers	:	ABB/VOLTAMP/BHEL/KIRLOSKAR (KEC) /INDCOOIL/CGL/SIEMENS
17	11 Kv & 6.6 Kv Dry type power transformers	:	KIRLOSKAR(KEC)/ABB/BHEL/ VOLTAMP/BB/CGL
18	Winding and Oil Temperature Indicator	:	SKII/PRECI MEASURE/PRECISION INSTRUMENT/PERFECT CONTROL/ OSMADIAL
	a) Control and Relay Panel	:	SCHNEIDER/ABB/SIEMENS / GE
	b) Electromagnetic & Numeric Relay	:	SCHNEIDER/ABB/SIEMENS/GE
19	Magnetic Oil Level Indicator	:	SUKRUT/I&C/PRAYOG
20	Buchholz Relay	:	PRAYOG / ATVUS/VIAT/I&C/GE
21	On Load Tap Changer	:	EASUN / BHEL / CGL
22	Battery VRLA	:	CHLORIDE (EXIDE)/AMCO/ STANDARD/HBL–NIFE (SABNIFE)/ AMAR RAJA
23	Battery Charger	:	HBL–NIFE(SABNIFE)/CHHABI ELECTRICALS/CALDYNE/ AMAR RAJA
24	Power Socket outlets	:	BCH/INDO ASIAN/SCHNEIDER

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
B.	**MEDIUM VOLTAGE SWITCHGEAR AND CONTROL GEAR**		
1	L.T. Air Circuit Breaker Distribution Board, fully drawout, single front (including circuit breaker), for main substation (process)	:	L&T/SIEMENS/ABB/ SCHNEIDER/ GE
2	L.T. Busduct	:	ECC/C&S/BRIGHT ENGINEERS /POWERGEAR APE/GODREJ (SANWITCH TYPE) UNITED ELECTRIC/JACKSON / COSMIC/UNILEC/VENUS TRICOLITE/KGSEL(STARDRIVE)/ SCHNEIDER
3	415 V Air Circuit Breaker	:	SIEMENS/L&T/ABB / SCHNEIDER/GE
4	Moulded Case Circuir Breaker (MCCB)	:	SIEMENS/L&T/ABB / SCHNEIDER/GE
5	LT Switch board (semi drawout) for auxiliaries & Non process units	:	SIEMENS/L&T/SCHNEIDER/ABB/ GE
6	415V Motor Control Centre for process units	:	SIEMENS/L&T/ABB / SCHNEIDER/ GE
7	415V Motor Control Centre for non–process units/ Power Distribution Boards(Single front)/ Outdoor Distribution Boards	:	SIEMENS/L&T /SCHNEIDER/ABB/ GE
8	Power Distribution Boards (single front below 630A), Outdoor distribution boards (below 630A) and Lighting Distribution Boards	:	SIEMENS/L&T /SCHNEIDER/ABB/ GE
9	MPCB	:	SIEMENS/L&T/ABB / SCHNEIDER/ GE
10	Flameproof Switchgear	:	AY/FCG HITECH/ABB/ GE

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
C.	**MOTORS**		
1	HT AC Motor (1000 kW and above)	:	KEC/BHEL/CGL/MARATHON/ABB/ SIEMENS
2	HT AC Motor (200 kW – 1000 kW)	:	SIEMENS/CGL/KEC/BHEL/ MARATHON/ABB
3	Synchronous & Sq. Cage Motors above 3000 kW	:	BHEL/SIEMENS/ABB
4	LT AC Sq–cage induction Motor (General purpose)	:	SIEMENS/CGL/ABB/ MARATHON/ BBL/BHEL/ KIRLOSKAR
5	LT AC Motor (Flame proof)	:	KIRLOKAR (KEC)/CGL/SIEMENS / BBL /MARATHON/ABB
6	L.T. Geared Motor	:	KIRLOSKAR (KEC)/POWER BUILD/ IC/BB/SEW/FIMET/REMI/WEG/ ABB/SIEMENS
7	DC Motors	:	CGL/MARATHON/KIRLOSKAR/ BHEL /ABB/SIEMENS
D.	**DRIVES AND CONTROL EQUIPMENT**		
1	Converter duty cast resin transformer (6.6 kV)	:	BHEL/ABB/KEC/VOLTAMP/RPG RAYCHEM
2	Thyristor Converter Unit	:	BHEL/SIEMENS/ROCKWELL / SCHNEIDER/ABB/SCHNEIDER / NELCO/KEC/L&T/KELTRON
3	VVVF Drive	:	SIEMENS/ABB/ROCKWELL / SCHNEIDER/L&T/BHEL/CGL/GE–POWER
4	VVVF Drive (Flux Vector Control) – 2 level & 3 level Controller	:	ABB/SIEMENS/SCHNEIDER / HITACHI/ROCKWELL
5	Isolator	:	SIEMENS/L&T/SCHNEIDER/ABB
6	HRC Fuses	:	SIEMENS/SCHNEIDER/ABB/L&T/ GE POWER/BUSSMAN

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
7	AC Power Contactor	:	SIEMENS/L&T/BCH /ABB/ SCHNEIDER/GE–POWER
8	DC Power Contactor	:	BCH/BHEL/SIEMENS/ABB/L&T/ SCHNEIDER
9	Bimetallic Relay	:	SIEMENS/L&T/BCH/C&S/ABB/ SCHNEIDER/GE
10	Single Phase Preventer	:	L&T/MINILEC/SIEMENS/C&S/ABB/ SCHNEIDER/GE
11	Resistor	:	SIEMENS/BCH/RSI/PEFCO /ELECTROMAG/RESITECH / NARKHADE/KAKKU/INDUSTRIES SYNDICATE
12	L.T. Capacitor	:	UNISTAR/CGL/SCHNEIDER/SAVIN / KHATAU/MEHER/VPT/HAVELL'S/ PCPL/PE/AS/CEPL/EPCOS/ABB
13	Semiconductor Fuse	:	SCHNEIDER/SIEMENS/COOPER BUSSMAN/ABB
14	Thyristor	:	SIEMENS/BHEL/HIND RECTIFIER/ ABB
15	LT Vacuum Contactor	:	GE/SCHNEIDER/L&T / SIEMENS/ ABB
16	Soft-starter (LT)	:	ABB/ROCKWELL/SIEMENS / SCHNEIDER
17	UPS	:	GUJARAT HI-REL/SIEMENS/ EMERSON/KEC/DB ELECTRONICS/ L&T/IL KOTA/ABB/ APC
E.	**CONTROL DESKS AND CONTROL DEVICES**		
1	Control Desk / Control Panel / Control Station	:	SIEMENS/L&T/BHEL/SCHNEIDER/ GE/ABB
2	Control Switch	:	SIEMENS/KAYCEE/SCHNEIDER / L&T/VAISHNO/C&S/ABB

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
3	Push Button	:	SIEMENS/BCH/L&T/VAISHNO /C&S/SCHNEIDER/TECHNIC/ KAYCEE/ HOTLINE/ESSEN/ABB
4	Limit Switch	:	AG SYSTEMS/JAY BALAJI / TECHNOCRATS/KAKKU/SIEMENS/ BCH (may be considered only for light duty)/SCHNEIDER
5	Change Over Switch/Selector Switch	:	C&S/STANDARD/HHE/KAYCEE / SIEMENS/BCH/L&T / HAVELL'S/ ABB/SCHNEIDER
6	Discrepancy Control Switch	:	ABB/AG SYSTEMS
7	Timer/Time Delay Relay	:	BCH/L&T/SIEMENS/ABB/CGL/ EAPL/AG SYSTEM/GE/SCHNEIDER
8	Emergency Switch/Belt Sway Switch/Pull Cord Switch/ Belt Slip Switch	:	JSI/AG SYSTEMS/PB/JAI BALAJI/ BETA SYSTEMS/ IMSS/UIC/IS/ KAKKU
9	Semaphore Indicator	:	SIEMENS/SCHNEIDER/GE
10	Auxiliary Relay/ Control Contactor	:	SIEMENS/L&T/ABB/GE POWER/ SCHNEIDER/GE
11	Master Controller	:	SIEMENS/STROMKRAFT / ELECTROMAG/AG SYSTEMS/IS / PERFECT ELECTRICS/GE
12	Control Transformer	:	INDCOIL/SIEMENS/AEP/INDUSREE /KAPPA/UIC/BCH/UNIVERSAL MAGNETICS
13	Voltage/Power/Current/Frequency/Energy Transducers	:	ABB/SIEMENS/SCHNEIDER
14	Indicating Lamp (Including Cluster LED type)	:	SIEMENS/VAISHNO/TECHNIK/ BINAY/ESSEN/BCH/SWITCHING CIRCUIT/RISHAB/L&T/ABB/ SCHNEIDER
15	Temperature Scanner	:	APLAB/SYSTECH/MASIBUS/ECIL / ADVANI/ABB

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
16	Photo-cell transducer	:	SYSTECH/TSC/INSTRUMENT ENGG.
17	Hooter/Buzzer/Bell	:	GETCO/KHERAJ/EDISON/KAKKU
18	Solid State Annunciator	:	APLAB/L&T/PROCON/CONTROL AND DYNAMICS/PIRI/SEMUDA / MINILEC/ELECMECH/EAPL / SWITCHING CIRCUIT
19	Proximity Limit Switches (Non-contact type)	:	JSI/AG SYSTEMS/ROCKWELL /TELEMECHANIQUE/ACCENT/ SCHNEIDER/SIEMENS
20	Zero Speed Switches	:	JAYSHREE/TELEMECHANIQUE / AG MECHANICAL/KAKKU/ TECHNOCRATS/SIEMENS
21	Current Transformer	:	AEP/KAPPA/INDCOIL/SIEMENS/GE
22	Voltage Transformer	:	KAPPA / INDCOIL/SIEMENS/GE
23	Tachos/Encoders	:	SCHNEIDER/HUBNER/IFM / VURLEY–TELEDYNE/LEINE & LINDE/GLOBAL TECH
24	Pull chord and belt sway detection system	:	PARAMETERIC/JAYSHREE
F.	**PROTECTION RELAYS**		
1	a) Electronic Motor Protection Relays	:	L&T/SIEMENS/ABB/SCHNEIDER/ GE
	b) Microprocessor based Motor Protection Relays for LT Motors		L&T/SIEMENS/ABB/SCHNEIDER/ /GE
	c) Microprocessor based Protection Relays for HT Motors	:	L&T/ABB/SCHNEIDER/SIEMENS/ GE
2	Auxiliary Relays	:	ABB/L&T/SCHNEIDER/SIEMENS/ GE
3	Numerical Protection Relays (for HT system)	:	ABB/SIEMENS/SCHNEIDER/GE

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
4	Numerical Protection Relays (for LT system)	:	ABB/SIEMENS/SCHNEIDER / GE/SCHNEIDER/L&T
G.	**ELECTRICAL MEASURING AND TESTING EQUIPMENT**		
(i)	**ELECTRICAL MEASURING INSTRUMENTS**		
1	Ammeter/Voltmeter/Wattmeter/Var–meter	:	AEP/IMP/MECO/RISHAB/SIEMENS
2	Watt–hour meter	:	ALSTOM/BHEL/IMP/ RISHAB/ MECO/SIEMENS
3	PF meter	:	AEP/IMP/MECO/KAPPA/ RISHAB
4	Frequency meter	:	AEP/IMP/RISHAB
5	Multimeter	:	MECO/MOTWANE/RUTTONSHAW
6	Low resistance ohm–meter and kelvin double bridge	:	MOTWANE/AGRONIC/TOSHNIWAL
7.	Electronic energy meter	:	SCHNEIDER/SEMS/SATEC/PML/ L&T/SIEMENS
(ii)	**ELECTRICAL TESTING EQUIPMENT**		
1.	Insulation resistance tester	:	SHANTI/MOTWANE/MECO
2.	Earth resistance tester	:	SHANTI/UTMC
3.	Tong tester (AC/DC)	:	MECO
4.	Transformer oil testing set	:	NTPL/UDEY
5.	AC high voltage test set	:	AEP/AGRONIC/NTPL/UDEY
6.	DC hipot test set	:	NTPL
7.	Primary & secondary current injection relay testing set	:	AEP/NTPL/TOSHNIWAL/ALSTOM

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
8.	Cable fault locator & cable burn down instrument (for high resistance cable fault)	:	UTMC/SHANTI/APLAB
9.	Earth leakage current tester	:	NTPL/AEP
10.	Capacitance & tan delta measuring instrument	:	TELTEX AG (L&T)
11.	Phase Sequence indicator	:	AEP/MECO/NIPPEN
12.	Synchroscope	:	AEP
13.	DC Powerpack	:	ACESS ELECTRONICS
14.	Transformer winding Resistance Meter	:	SCOPE T&M PVT LTD
(iii)	**SPECIAL INSTRUMENTS**		
1.	Microprocessor based digital power meter	:	AEP/MECO/ALACRITY/DIGI
2.	Maximum demand meter	:	AEP
3.	True RMS' digital panel ammeter/voltmeter	:	AEP/MECO/ALACRITY
4.	Intelligent P.F. regulator	:	AEP/MECO/ALACRITY
5.	Computer aided cable fault analyser	:	APLAB/UTMC
6.	Transducer operated metering system	:	AEP
7.	Portable energy audit instrument	:	ALACRITY
8.	Energy meter Calibrator (ACCUCHEK)	:	SEMS
H.	**LIGHTING AND POWER WIRING EQUIPMENT AND ACCESSORIES**		
1	LED Lighting Fitting	:	PHILIPS/GE/BAJAJ/CGL/WIPRO/ HAVELLS

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
2	Flameproof LED Lighting Fittings and Accessories	:	BAJAJ/BALIGA/CGL/FLEX PRO/ PHILIPS
3	a) 240 V Switch Socket Outlet (10A & 20A)	:	HENSEL/HAVELL'S/BCH/ABB/ LEGRAND/INDO ASIAN/SCHNEIDER
	b) 415 V Switch Socket Outlet (30A, 63A & 100A)	:	BCH/ABB/HENSEL/LEGRAND/ INDO ASIAN/SCHNEIDER
4	Flame–proof Equipment	:	BALIGA/FLAME PROOF EQPT. MFG. CO./LUZ/CEAG/FCG HITECH /FLEXPRO
5	MCB	:	LEGRAND(MDS)/STANDARD/CGL/ SIEMENS/GE/HAVELL'S/MERLIN GERIN/ABB/INDO ASIAN/ SCHNEIDER
6	ELCB	:	LEGRAND(MDS)/SIEMENS/GE/ MARLINGERIN/HAVELLS/HPL/ HAGER /ABB/SCHNEIDER
7	MCB DB	:	LEGRAND(MDS)/HAVELL'S / MERLIN GERIN/SIEMENS/GE/ HPL/ ABB/INDOASIAN/SCHNEIDER
8	Single–core flexible copper wire	:	RAJNIGANDHA / HAVELL'S / FINOLEX/THERMO PAD/NICCO/ RPG/FINECAB/RADIANT/POLYCAB /LAPP/DELTON/UNIFLEX/KDK/KEI
9	High Mast Towers	:	BAJAJ/PHILIPS/CGL
10	Street Light Poles		
	Octagonal Type	:	BAJAJ/PHILIPS/CGL/BMW/ BP PROJECTS
	Tubular Type	:	ELECTRO STEEL/QUALITY STEEL/ CALCUTTA POLES &TUBES/STEEL POLE CORPORATION/BMW/JINDAL
11	Dry type Lighting Transformers	:	UNIVERSAL MAGNETICS/TRANSO INDIA/INDCOIL/INDUSREE/AE/ DEVIKA

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
12	Thermoplastic Junction Boxes	:	HENSEL/SYNTEX/RITTAL/ DEVI POLYMERS/ SHRENIK/ SPELSBERG/PUSTRON
13	Aviation Obstruction Light	:	BENOY/BALIGA/MICROTECH/ SPECTRUM
I.	**CABLES AND CABLING ACCESSORIES**		
1	33kV/ 11kV/ 6.6 kV XLPE Cable (Only Dry cured)	:	KECIL(RPG)/UNIVERSAL/CCI/ NICCO/TORRENT CABLES/ INDUSTRIAL/KEI/POLYCAB/RAVIN (PRIME CAB)
2	a) 1.1 kV PVC/XLPE/ HRPVC Cable (Power)	:	KECIL(RPG)/UNIVERSAL/CCI/ NICCO /TORRENT/INDUSTRIAL/ POLYCAB/FINECAB / RADIANT / CRYSTAL/KEI/SPECIAL/ PARAMOUNT/ RAVIN(PRIME CAB)/ RRK/GPIL/AVOCAB/SHYAM CABLES/LAPP
	b) 1.1 kV PVC/XLPE/ HRPVC Cables (Control)	:	KECIL(RPG)/UNIVERSAL/ NICCO/TORRENT/INDUSTRIAL /POLYCAB / DELTON /CCI / CORDS/SPECIAL/ CAPCAB/ FINECAB/RADIANT/CRYSTAL/LAPP /THERMOPADS/KEI/BELDEN/ DELTON/PARAMOUNT/RAVIN (PRIME CAB)/RRK/GPIL/ AVOCAB/ SHYAM CABLES/LAPP
3	Silicon Rubber insulated copper Cable	:	KECIL(RPG)/UNIFLEX/UNIVERSAL/ NICCO/INCAB/INDUSTRIAL/ POLYCAB/LAPP/TORRENT/ UNIFLEX/GOVIND/KEI/ SHYAM CABLES/LAPP
4	Flexible trailing copper cable	:	KECIL(RPG)/ UNIVERSAL/NICCO/ INCAB/CCI/LAPP/THERMOPADS/ INDUSTRIAL/POLYCAB/TORRENT / GOVIND/KEI/RRK/ SHYAM CABLES/LAPP
5	HT Cable Termination Kit/straight through jointing kits	:	TYCO(RAYCHEM) /3MECI(MSEAL-MECP)

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
6	LT Cable Termination Kit/straight through jointing kits	:	TYCO(RAYCHEM)/3MECI (MSEAL-MECP)/DENSION/CCI
7	Cable Reeling Drum (Stacker Reclaimer)	:	ELECTRO ZAVOD/ELECTROMAG/ TECHNOCRATS
8	Cable Reeling Drum (Cranes, Hoists, Transfer Trolleys)	:	ELECTRO ZAVOD/ELECTROMAG/ IS/TECHNOCRATS
9	Cable Lugs	:	DOWELLS/FORWARD/COMMET/3D /RATAN ENGG/ABB.
10	Cable Gland	:	ELECTROMAG/CC I/COMMET / PHOENIX/DOWELLS /RATAN ENGG.
11	Terminal Block	:	ELMEX/ESSEN/CONNECTWELL/ C&S/WAGO/PHOINEX/ABB.
12	Cable Coupler	:	A. BOND STRAND/ABB.
13	Weather proof outdoor Junction Box	:	ELECMECH/TECHNOCOM/ABB
14	Passive Fire Protection System	:	LLOYD/PROMAT/3-M/KBS/ SIGNUM/ HILTI
15	Cable Tray / Rack	:	RATAN ENGG./INDIANA/IDS COMPOSITES/INDIA ELECTRICALS SYNDICATE /PREMIER/ TECHNO
J.	**MISCELLANEOUS**		
1	Diode	:	HIND/USHA RECTIFIER/BHEL/ RUTTON SHAW/APEPL
2	Battery	:	EXIDE/HBL-NIFE/AMAR RAJA /AMCO
3	Braking Resistance Panel	:	RESISTEC / BCH
4	DC EM Brake	:	BCH/STROM KRAFT/ELECTROMAG/ ELECTROMECH CORPN./EPC/IS
5	Thrustor brake	:	IS/STROMKRAFT /ELECTROMAG /ELECTROMECH/EPCC

Bidder's Seal and Signed

Annexure-2-C (cont'd)

Sl. No.	Item		List of Vendors
6	Lifting Magnet	:	ELECTROMAG/SUPERLIFT/EPCC / ELECTRO ZAVOD
7	Power Pack for Magnet	:	ELECTROMAG/SUPERLIFT
8	Earthing Resistor	:	BHEL/BCH/IS/EEF/RESITECH / NARKHADE
9	MG Welding Set	:	KEC/ADVANI/PHILIPS
10	Portable Welding Transformer	:	ADVANI/IOL/KEC
11	Harmonic Filter	:	AMTECH/ABB
12	FRP/SMC, S/O outlet & PB STN	:	RITTAL/HENSEL/DEVI POLYMERS/ SHRENIK/SYNTEX/SPELSBERG/ PUSTRON
13	Autoglo safety posters/ photo Luminiscent signages	:	PROLITE

Bidder's Seal and Signed

ANNEXURE – 2-D

LIST OF PREFERRED VENDORS FOR INSTRUMENTATION AND CONTROL SYSTEM

Sl. No.	Item		List of Vendors
A	**CONTROL ROOM EQUIPMENT**		
1.	Distributed Control System (DCS)	:	BHEL/YOKOGAWA/HONEYWELL/EMERSON/ABB/SIEMENS/SCHINDER
2.	Programmable Logic Controller (PLC)	:	ROCKWELL AUTOMATION- ALLEN BRADLEY/ SIEMENS/ABB/ SCHNEIDER
3.	Programmable Logic Controller Components/Remote IO (RIO)	:	ROCKWELL AUTOMATION- ALLEN BRADLEY/SIEMENS/ABB/ SCHNEIDER
4.	HMI PC/ Server/ Data storage system	:	IBM/HP/DELL/SIEMENS
5.	HMI Software (3rd Party)	:	WONDERWARE(INTOUCH)/INTELLUTION (FIX)/US DATA (FACTORY LINK)/ ABB/GE/SCHINDER
6.	TFT MONITOR	:	DELL/SAMSUNG/IBM-LENOVO/ NEC/HP
7.	LARGE SCREEN DISPLAY MONITOR	:	BARCO/DELTA/PLANER/ PYROTECH
8.	COMPUTER FURNITURE	:	ADARSH CONTROLS/COSMOS MEDIA/ FEATHER LITE/ GODREJ/ OTS/ PYROTECH/ RITTAL
9.	Printer	:	
	1. DOT Matrix Printer		TVS/WIPRO/HP/EPSON
	2. LASER Printer		CANON/HP/IBM/XEROX
	3. INKJET Printer		CANON/HP/IBM/XEROX/EPSON
10.	Controller	:	YOKAGAWA/HONEYWELL/ SIEMENS/ ABB/TOSHIBA/ INVENSYS (FOXBORO) / MASIBUS/MOORE/ FUJI/BHEL
11.	Bargraph & Digital Indicator (EDLI) /Panel Digital Indicators/Hydrastep	:	MASIBUS/EUROTHERM/YOKOGAWA/HONEYWELL/TELETHERM/ HI-TECH SYSTEM/ABB/LEVEL STATE/ YARWAY

Bidder's Seal and Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
12.	Totalisers	:	YOKOGAWA/ABB/MASIBUS/ HONEWELL
13.	Scanner	:	MASIBUS/APLAB/ECIL/M.B. CONTROLS/ EUROTHERM/ ACCSYS/ABB
14.	Recorder	:	YOKOGAWA/ABB/HONEYWELL/MOORE/ DIGITAL/EUROTHERM/MOORE
15.	Alarm Annuniciator	:	IIC/MINILEC/PROCON/ACC SYS/AP LAB/ DIGICONT
16.	Signal Isolator/Multiplier	:	MTL/YOKOGAWA/MASIBUS/ PEPPERL & FOCHS/ PYROELECTRIC/ABB/GE
17.	Instrument Panel/Cabinet /Desk	:	RITTAL/RKC/SIMCON/ PYROTECH/ INDUSTRIAL CONTROLS/ SYSPRO
18.	Pneumatic actuators (cylinder or rotary)	:	ELOMATIC/KROMBACH/ MECCAIR/ NUCON /PRIMA
19.	Power Supply Unit	:	SIEMENS/PHONEX/MTL/ APLAB/ ELNOVA/MCTH/ CYBERNICS/ COSEL/ ABB
20.	Intrinsic Safety Barrier /Surge protection device	:	MTL/P&F/ABB/ENDRESS-HAUSER/ PHOENIX/SIEMENS
21.	Terminal Blocks (Power and Control)	:	PHOENIX/WAGO/ELMEX/ WEIDMULLER/CONNECTWELL/ SCHNEIDER-TELEMECANIQUE/ BECKHOFF/ELMEX/ BECKHOSS/ ABB/GE
22.	Plugs and Sockets	:	ANCHOR/CRABTREE/ABB/ SCHINDER
23.	Interposing Relays	:	OEN/JVOTI/PARAMOUNT/ ABB/GE/ SIEMENS
24.	Digital Indicators	:	ABB/FOXBORO/MASIBUS/ PTROTECH /GANZ/GOSSEN/WEIGEL/ RISHAB/AE
25.	Cables-Fibre Optic/ Co-axial/UTP	:	MOLEX/RPG/AT&T/LUCENT
26.	SCADA System	:	REPUTED AS PER OEM STANDARD

Bidder's Seal and Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
27.	Operating System	:	REPUTED AS PER OEM STANDARD
28.	Data Base	:	REPUTED AS PER OEM STANDARD
29.	Control Desk (Instrument Panel/Cabinet /Desk)	:	ICA/PYROTECH/RADHA KRISHNAN CONTROLS/ RITTAL/INDUSTRIAL CONTROLS/SYSPRO/ABB/ SIEMENS/ ALSTOM/POWER & PROTECTION/ SCHINDER
30.	Power distribution system/ Marshalling/ Control Panels	:	RITTAL/SIEMENS/GE/ SCHINDER
31.	Push Buttons	:	BCH/L&T/SIEMENS/ SCHNEIDER-TELEMECANIQUE/ABB
32.	LED Lamp	:	GE/BCH/SCHNEIDER-TELEMECANIQUE/BINARY/ ABB/ SIEMENS
33.	Manageable Switches	:	REPUTED AS PER OEM STANDARD
34.	LIU Units	:	REPUTED AS PER OEM STANDARD
35.	Ni-Cd Batteries	:	REPUTED AS PER OEM STANDARD
B	**Network Components**		
1.	Switches/Routers	:	CISCO/3-COM/NORTEL/DLINK/GE/ SIEMENS
2.	Converts/Repeaters/Modems /Radio Modems	:	LOTUS/DLINK/US ROBOTICS/ NORTEL/MULTI TECH/ PRUDENT/ SIEMENS
C	**FIELD INSTRUMENTS**		
1.	Pressure Gauge	:	GIC/H.GURU/WAREE/INDUSTRIAL INSTRUMENTATION / WIKA/GENERAL INSTRUMENTS/GOA INSTRUMENTS/AN INSTRUMENTS
2.	Draught gauge & DP gauge	:	SWITZER /GIC/H.GURU/ WAREE/ WIKA

Bidder's Seal and Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
3.	SMART Transmitters	:	YOKOGAWA/HONEYWELL/ ABB/ SIEMENS/ EMERSON/E&H/FUJI
4.	Pressure/DP/temperature & Flow Switches		SWITZER / H. GURU INDUSTRIES/ DANFOSS/ VARMA-TRAFAG/GENERAL INSTRUMENT/GEORGIN
5.	Temperature Gauge	:	WIKA/GIC/H.GURU/WAARE/ INDUSTRIAL INSTRUMENTATION/ GENERAL INSTRUMENTS/GOA INSTRUMENTS/AN INSTRUMENTS
6.	Temperature Elements (RTD & T/C)	:	NAGMAN/TEMPSENS/ TOSHNIWAL INDUSTRIES/PYROELECTRIC/ GIC/ GOA INSTRUMENTS/ALTOP/FUJI
7.	Temperature transmitters	:	HONEYWELL/EMERSON/ YOKOGAWA /E&H/ABB/FUJI
8.	Temperature Switch	:	SWITZER / INDFOS/ HONEYWELL/ VERMA TRAFAG /P& F / H. GURU INDUSTRIES/GEORGIN
9.	Level gauges and float type level switches	:	GIC//LEVCON/V. AUTOMAT/PLACKA/ TECKTROL/KHRONE/CHEMTROL (VEGA)/SWITZER/S.B. ELECTROMECHANICAL/ V.AUTOMAT/EIP/NIVELCO/EUREKA /V. AUTOMAT/Hi-TECH
10.	Level Switches (Conductivity/capacitance/Resonance)	:	LEVCON/ENDRESS-HAUSER/ EIP/S.B. ELECTROMECHANICAL / SAPCON/ NIVO/ABB
11.	Nucleonic Level Gauge	:	CONCORD (BERTHHOLD) / EMERSON (K.RAY)/ECIL/ CHEMTROL (VEGA) /ENDRESS HAUSER
12.	Ultrasonic/Rader type Level (Guided wave RADAR (SILO) etc) transmitter	:	TOSHBRO (MILTRONICS)/ ENDRESS-HAUSER/SIEMENS/ VEGA /EMERSON (SAAB)/SBEM/ABB
13.	Rotameter	:	IEPL/EMERSON(BROOKS) / EUREKA/ AL FLOW/KROHNE MARSHALL/PLACKA /ROTA/ABB

Bidder's Seal and Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
14.	Vortex Flow Meter	:	ENDRESS HAUSER/ YOKOGAWA / KHRONE/EMERSON/ABB/ ROSEMOUNT/SIEMENS
15.	Mass Flow Meter	:	EMERSON/ ABB/ ENDRESS HAUSER/ YOGOKAWA/ KHRONE/SIEMENS
16.	Pollution Control & Stack Monitoring System	:	HONEYWELL/EMERSON/FORBE MARSHALL/ABB/CHEMTROL /AMETEK/SICK & LAND
17.	SWAS & other water analysers/meters	:	FORBES MARSHALL /ABB ANALYTICAL /YOGOKAWA / EMERSON/ STEAM EQUIPMENTS/HACH
18.	RF Capacitance (Hopper)	:	EIP / EIP ENVIRO/ABB/MAGNETROL
19.	Flow Elements (Orifice Plate, Flow Nozzle, Venturi Tube etc)	:	ENGG. SPL/MICRO PRECISION/IL/ BALIGA/GI/ STAR MECH/MECHANICAL ENGINEERS/GENERAL INSTRUMENT / STARMECH/EMERSON
20.	Control Valves /On-Off Valves	:	IL/ FISHER-XOMOX/ FORBES MARSHALL/MIL/ABB/KOSO/ EMERSON PROCESS MANAGEMENT/ SEVERN GLOCON INDIA PVT LTD/SPX-FLOW/FLOW SERVE/ IMI-CCI
21.	Motorised/Electric Actuators	:	AUMA/ IL / LIMITORQUE/ ROTORK/ DANFOSS
22.	Pneumatic Actuators (Cylinder or Rotary/Rack and Pinoin Type etc)	:	ELOMATIC/KROMBACK/MECCAIR/ NUCON/PRIMA/AUDCO/FISHER/ VIGRO/NORGREN/ASCO NUMATIC/ JANATICS/SMC/ROTEX/ SCHRADDER
23.	Air filter Regulator	:	PLACA/SHAVO NORGREN/ ABB/ CONTROL AIR/BELLS CONTROLS/ FAIR CHILD
24.	I/P Convertor	:	HONEYWELL/EMERSON/FORBE MARSHALL/ABB/CHEMTROL /AMETEK/FAIR CHILD/WATSON-SMITH

Bidder's Seal and Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
25.	Terminal Block	:	CONNECTWELL/ELMEX/WAGO/ PHOENIX/WEIDMULLER/BECKHOFF/ ABB
26.	Solenoid Valves	:	ROTEX/ASCO/VICKERS/SMC/ NORGREN/SCHRADER BELLOW
27.	Magnetic Flow meter/Ultrasonic Flow meter	:	ENCDRESS-HAUSER/KHRONE/ABB/ INVENSYS (FOXBORO)/EMERSON/ YOKOGAWA/SIEMENS
28.	Positive Displacement Flow meter	:	TOSH. HYD(BOPP & FEUTHER) /ROCKWIN/ABB/SWITZER/ KRAL
29.	Encoder	:	P & F / ROCKWELL / HUBNER/MTL/ PHOENIX/SIEMENS
30.	Vibration Monitoring Systems	:	BENTLEY-NEVADA/FROBESMARSHALL (SHINKAWA)/ROCKWELL AUTOMATION /ABB
31.	UPS	:	EMERSON/HI-REL/APC/NUMERIC/ ABB
32.	Limit switches	:	ABB/JAY BALAJI/ ELECTROMAG/ KAKKU/ SIEMENS/HONEYWELL/ TELE-MECHANIQUE/ ALLEN-BRADLLEY/GO-SWITCH (EMERSON)/ SCHINDER
33.	Ultrasonic Level Switch (Measurement- Liquid/Solid)	:	ENDRESS-HAUSER/KHRONE/ EMERSON/SIEMENS/VEGA/ ABB
34.	Microwave Solid/Liquid Level Measurement	:	ENDRESS-HAUSER/KHRONE/ EMERSON/MILLITRONICS/VEGA/ SIEMENS/ABB
35.	Control Valve with Diaphragm Actuator (Critical Application)	:	MIL/KOSO/FISHER/DRESSER/IMI-CCI /EMERSON PROCESS MANAGEMENT/ SPX-FLOW/ SEVERN GLOCON INDIA PVT LTD/ IL
36.	Pull Chord/Belt sway/Zero Speed & Proximity Switches	:	JAYSHREE/JAI BALAJI/AG SYSTEM/ ROCKWELL/SCHNEIDER-TELEMECANIQUE/ SIEMENS

Bidder's Seal and Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
37.	Voltage/Power/Frequency/Current/Energy Transducers	:	ABB/SIEMENS/ALSTOM/SCHINDER
38.	Humidity Sensor	:	SIEMENS/HONEYWELL/ FOXBORO
39.	HART CONFIGURATOR (UNIVERSAL)	:	ROSEMOUNT/ABB/YOKOGAWA
40.	PVC coated copper Tubes/Copper Tubes	:	REPUTED AS PER OEM STANDARD
41.	Tank Level Indicator	:	NIVO/LEVCON/SWITZER/MEGNETROL
42.	Annubar	:	SWITZER/EMERSON/ ENGG.SPL
43.	Water Meter	:	KAYCEE/RAJKAMAL/CAPSTAN
44.	Flow meters	:	E & H / KHRONE / ROSEMOUNT / YOKOGAWA/ABB
D	**SPECIAL INSTRUMENTS**		
1.	Electronic Weighing System	:	ABB/SCHENCK/SARTORIOUS MECHATRONICS/TRANSWEIGH/METTLER-TOLEDO/NOVA WEIGH /IPA /KLISTER –MORSE/STOCK REDLER/ MERRIC INDUSTRIES/SIEMENS
2.	Gas Analysers/Meters (CO,Co2,O2 etc,.)	:	EMERSON /ABB ANALYTICAL /SIEMENS/YOKOGAWA/ FORBE MARSHALL/ HONEYWELL (TELEDYNE) /CHEMTROL/POTENCE/SICK/FUJI & LAND/METTLER TOLEDO
3.	Water Analysers/Meters (SWAS etc,.)	:	FORBES MARSHALL /ABB ANALYTICAL /YOGOKAWA /HACH/ION EXCHANGE / CHEMTROL/POTENCE/EMERSON
4.	Ph,DO and Conductivity Meter	:	EMERSON / YOKOAGAWA/ FORBESMARSHALL / INVENSYS (FOXBORO/ TOSHBRO CONTROLS\ION EXCHANGE/ POLYMETRON /HONEYWELL/ HACH/ABB

Bidder's Seal and Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
5.	Infrared Pyrometer	:	MAGMAN (IRCON) / EUROTHERM (LAND) LAXSON (CHINO) / FLUKE / TEMPSENS/ABB
6.	Moisture Analyser	:	CONCORD (BERTHHOLD) /EMERSON K-RAY) ECIL/SHAW/ENDRESS HAUSER/ YOKOGWAWA/ CHINO-INSTRUMENTS
7.	Vibration Sensor & Monitor	:	BENTLEY-NEVADA/FROBESMARSHALL (SHINKAWA)/SHERMAN (SKF) / ROCKWELL AUTOMATION/SIEMENS
8.	Governor System	:	WOODWARD/TRISEN/BHEL
9.	Flame detector/Scanner	:	HONEYWELL/FIRE-EYE/DURG/ABB/ DURAG/ BHEL
10.	Gas Leak Detector	:	MSA / HONEYWELL
E	**INSTRUMENT CABLES/CABLE TRAYS (PERFORATED) AND ACCESSORIES**		
1.	Instrumentation Cables (Screened Cables, Control cables & Compensating Cables) Non Mineral Insulated /Insulated and Armoured/Unarmoured etc.	:	DELTON/FINOLEX/SPECIAL CABLES /CORDS / GOYOLENE/THERMOPADS /UNIVERSAL / LAPP / BROOKS CABLES/PYROCABLES/UDAY/HEAVEL STHERMO CABLES/KEI
2.	FIBER OPTIC CABLES/Co-axial/UTP	:	RPG/ FINOLEX/ MOLEX/ LUCENT
3.	Instrument (Isolation/root) Valves (BALL/GLOBE/GATE/ NIDDLE)	:	AUDCO/ KSB/ VIRGO / BDK/FLUID CONTROLS/XOMOX
4.	Instrument Fittings/Air Line Fittings	:	SWAGALOK/ PARKER /FLOW TECH/EXCEL-HYDRO/ASTEC/HP/ MET-LOCK

Bidder's Seal and Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
5.	Junction Boxes	:	BALIGA/PYROTECH/HENSEL/EXPROTECTA/FLEXPRO/FLAMEPACK/SUDHIR SWITCHGEAR/ RITTAL/ABB
6.	Cable Gland	:	BALIGA/DOWELLS/CCI/ELECTROMAG/HUMMEL
7.	Cable Termination Kit	:	RAYCHEM/M-SEAL
8.	Testing and Calibration Instruments	:	NAGMAN/FLUKE
9.	Cable Lugs	:	CONNECTWELL/DOWELLS/ PHONEIX
10.	Cable Trays (Perforated Type) -GI Material & FRP	:	INDIANA/PROFAB/SADHANA/ ERCON/ SYNTEX
11.	Manifolds/Condensate Pots	:	REPUTED AS PER OEM STANDARD
F	**FIRE DETECTION AND ALARM SYSTEM**		
1.	Pressure Gauge	:	GIC/H.GURU/WAREE/GE GAUGES PVT LTD/INDUSTRIAL INSTRUMENTATION /MANOMETER/WIKA /FORBES MARSHALL/ PRECISION INDUSTRIES /GENERAL INSTRUMENTS/GOA INSTRUMENTS/AN INSTRUMENTS
2.	Temperature Gauge	:	WIKA/GIC/H.GURU/ WAARE/FORBES MARSHALPRECISION INDUSTRIES/ INDUSTRIAL INSTRUMENTATION/ GENERAL INSTRUMENTS/GOA INSTRUMENTS
3.	Temperature Elements (RTD & T/C)	:	NAGMAN/TEMPSENS/TOSHNIWAL INDUSTRIES/ PYROELECTRIC/ GIC/GOA INSTRUMENTS/ALTOP
4.	Detector (Intelligent & Addressable)	:	NOTIFIER/EDWARD/TYCO/ CERBERUS/HONEYWELL AND UL/FM/ LPC/ APPROVED
5.	All modules (Intelligent & Addressable)	:	NOTIFIER/EDWARD/TYCO/ CERBERUS/HONEYWELL AND UL/FM/LPC/ APPROVED

Bidder's Seal and Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
6.	Fire Alarm Panel (Intelligent & Addressable)	:	NOTIFIER/EDWARD/TYCO /CERBERUS/HONEYWELL AND UL/ FM/LPC/ APPROVED
7.	Repeater Panels (Intelligent & Addressable)	:	NOTIFIER/EDWARD/TYCO/ /CERBERUS/HONEY WELL AND UL/ FM/LPC/ APPROVED
8.	Cables	:	DELTON/FINOLEX/SPECIAL CABLES /CORDS/GOYOLENE/THERMOPADS /UNIVERSAL/LAPP/BROOKS CABLES /PYROCABLES/UDAY/THERMO CABLES
9.	Battery	:	AMCO/STANDARD/EXIDE
10.	Manual Call Points	:	UL/FM/LPC AND TAC APPROVED
11.	Electronic Hooters (Addressable)	:	UL/FM/LPC AND TAC APPROVED
12.	HMI PC/ Server/ Data storage system	:	IBM/HP/DELL/SIEMENS
13.	Printer	:	
	1. DOT Matrix Printer		TVS/WIPRO/HP/EPSON
	2. LASER Printer		CANON/HP/IBM/XEROX
	3. INKJET Printer		CANON/HP/IBM/XEROX/EPSON
14.	Cables - Fibre Optic/Co-axial/UTP	:	RPG/ FINOLEX/ MOLEX/ LUCENT
15.	Networking Cables	:	DELTON/FINOLEX/CMI/RPG/ HCL/ RELIANCE/SIEMENS
16.	Manageable Switches	:	REPUTED AS PER OEM STANDARD
17.	Ni-Cd Batteries	:	REPUTED AS PER OEM STANDARD
18.	LIU Units	:	REPUTED AS PER OEM STANDARD

Bidder's Seal and Signed

Annexure-2-D (cont'd)

Sl. No.	Item		List of Vendors
G	**PLANT COMMUNICATION SYSTEMS**		
1.	Telecom Cables (PVC Armoured/Unarmoured and Jelly Filled etc)	:	DELTON/FINOLEX/CMI/RPG/ HCL/ RELIANCE
2.	Plant Telephone Systems	:	
	i) EPABAX System		GTL/SIEMENS/TADIRAN/AVAYA
	ii) Telephone handset		BEETEL/AVAYA/SONY/BPL/ SIEMENS/ITI
	iii) Power Supply Unit		AMARA RAJA/PULSE POWER/ SIGNOTRON
3.	Loud Speaker (PA) System	:	
	i) Selective calling system		INDUSTROINCS/NEUMANN/ FEDERAL/BOSCH/ PHILIPS
	ii) Page Party Type		MICO BOSCH(PHILIPS)/ INDUSTROINCS/NEUMANN
4.	Radio Communication System	:	MOTOROLA/KENWOOD/ SIMOCO
5.	Hooter/Buzzer/Bell	:	ALAN/PROCON/MASSIBUS/ PROCON

Bidder's Seal and Signed

ANNEXURE – 2-E

LIST OF PREFERRED VENDORS FOR CRANES & HOISTS

Sl. No.	Item		List of Vendors
1.	Double Girder EOT Cranes	:	MUKAND/KONE/FAFECO/ DEMAG
2.	Single Girder EOT Cranes	:	KONE/FAFECO/MM ENGINEERS/GRIP ENGINEERS
3.	Electrical Hoist	:	BRADY & MORRIS/ MM ENGINEERS/ GRIP ENGINEERS/
4.	Mechanical Hoist	:	INDEF/TRACTOR TIRFOR/ BRADY
5.	Geared coupling	:	HICLIFF/FENNER/ELECON/ UNIVERSAL/FMG/NAW
6.	Wire rope	:	USHA MARTIN/BOMBAY WIRE ROPE/ FORT WILLIAMS/ UNITED WIRE ROPE
7.	Hook	:	MOZUMDAR & MOSUMDAR /HERMAN & MOHATTA/ EE KARACHIWALA/STEEL FORGINGS/FORGING ENTERPRISE
8.	Gear Box	:	NAW/ELECON/SHANTHI

Bidder seal & Signed

ANNEXURE - 2-F

LIST OF SUB-VENDORS FOR BOILER & TG ELEVATORS

Sl. No.	Item	List of vendors
1.	Gear box	ELECON/GREAVES/NAW/FMG DAVID BROWN/ABB
2.	Gear Coupling	NAW/HI-CLIFF/ELECON/ BIBBY/ WELLMAN/GBM/LOVEJOY/CONCORD/ ABB
3.	Wire Rope	USA MARTIN BLOCK/FORT WILLIAM/ CASAR/BOMBAY WIRE ROPE
4.	Bearing	SKF/FAG/NTN/NBC/ASEAN BEARINGS /ABB
5.	AC Motor	SIEMENS/CGL/KEC/MARATHON (AREVA/ ALSTOM) /ABB
6.	DC brake with Rectifier Panels	BCH/ELECTROMAG METHODS
7.	MCCB	L&T/DTH/SIEMENS/SCHNEIDER/CGL/ GE
8.	Contactors	SIEMENS/L&T/EE/BCH
9.	Limit switch	UNION ENGG/MECH ENTERPRISES/ INDUSTRIES SYNDICATE/ AG MECHANICAL/JAI BALAJI
10.	Cables	ICC/UNIVERSAL/FORTGLOSTER/CCI/ NICCO/FINOLEX
11.	Variable Speed Drive(VFD)	ABB/SIEMENS/ALLEN BRADLEY/L&T - YASKAWA/AB CONTROLS/SCHNEIDER.
12.	Passenger & passenger cum goods elevator	KONE/OTIS/THYSSENKRUPP/ JOHNSON

Bidder's Seal and Signed

ANNEXURE - 2-G

LIST OF PREFERRED VENDORS FOR COMPRESSED AIR SYSTEM

Sl. No.	Item		List of Vendors
1.	Compressor	:	ATLAS COPCO/ INGERSOLL RAND / KAESER/ ELGI
2.	Air Dryer	:	KAESER/ATLAS COPCO /TRIDENT /DELAIR
3.	Filters	:	DYNA/IMPEC/PUROFIL/ SPECTRUM /CHEMFARM
4.	Pipe	:	TATA TUBE /JINDAL/BST/ MAHARASHTRA SEAMLESS LTD
5.	Valves	:	AUDCO /BDK /KSB MCNEILL / LEADER/FOURESS/J.N. MARSHALL/ XOMOX
6.	Fittings	:	FLASH FORGE/SIVANANDA PIPE FITTING/TRUE FORGE/FITTING MFG. CO.

Bidder's Seal and Signed

ANNEXURE - 2-H

LIST OF PREFERRED VENDORS FOR AIR CONDITIONING, AIR COOLING AND VENTILATION SYSTEM

Sl No.	Package		Supplier
1.	VAM Chillers	:	VOLTAS/CARRIER/ TRANE/ KIRLOSKAR/HITACHI/THERMAX
2.	Air Handling Unit	:	BLUE STAR/VOLTAS/EMERSON/ CARRIER/HITACHI/TRANE
3.	Split Air Conditioners	:	BLUE STAR/VOLTAS/ CARRIER/HITACHI
4.	Package type FRP cooling Tower	:	PAHARPUR/ HAMON SHRIRAM/ THERMOPAK/GEM/MIHIR/
5.	Pump	:	MATHER & PLATT / KIRLOSKAR / KSB / AKAY
6.	Insulation	:	BEARDSHELL/FGP/LLOYD/ ROCKWOOL/ TWIGA
7.	Centrifugal Fan/Axial flow Fan	:	C.DOCTOR/BATLIBOI/DUSTVEN/KLEENAIR/NADI/FLAKT/SK SYSTEM
8.	Roof extractors	:	C. DOCTOR / DUSTVEN / S.K. SYSTEMS / KHAITAN
9.	Filters	:	DYNA/IMPEC/PUROFIL/ SPECTRUM /CHEMFARM
10.	GI Sheet	:	TATA/JINDAL/SAIL/ISPAT
11.	Pipe	:	TATA TUBE/JINDAL/RSP/SAIL/ AJANTHA TUBES
12.	Valves	:	L&T /BDK/DEWRANCE/KSB MCNEILL/LEADER/FOURESS/J.N. MARSHALL/SAUNDERS
13.	Traps & Strainer	:	UNI KLINGER/ESCO/ FORBES MARSHAL
14.	Fittings	:	FLASH FORGE/SIVANANDA PIPE FITTING/TRUE FORGE/FITTING MFG. CO.

Bidder's Seal and Signed

ANNEXURE - II

Details of Under slung Electric Crane for RC pumps and Blower Handling | **PROJECT : NALCO FGD**

SL NO	AREA	TYPE OF CRANE	CAPACITY OF CRANE	LONG TRAVEL RUNWAY TRACK OR BEAM FLANGE BOTTOM ELEVATION (LT RUNWAY TRACK OR BEAM in BHEL SCOPE)	FLOOR LEVEL	TRAVEL LENGTH (METER)	LONG TRAVEL SPAN	DISTANCE BETWEEN RUNWAY TRACK OR BEAM FLANGE CENTER TO SHED COLUMN CENTRE ON BOTH SIDE	LONG TRAVEL RUNWAY TRACK OR BEAM (IN BHEL Scope)	MAXIMUM HEIGHT OF BOTTOM OF RUNWAY TRACK OR BEAM FLANGE LOWER TO HOIST HOOK	ACTUAL HEIGHT OF BOTTOM OF RUNWAY TRACK OR BEAM FLANGE LOWER TO CRANE HOOK - VENDOR TO SPECIFY IN THEIR OFFER	TOTAL QNTY
			TON	(EL (+) METER)	EL (+) METER	(METER)	(METER)	(MM)	(NPB /ISMC)	(MM)	(MM) VENDOR TO SPECIFY	(SET)
1	RC pumps & Oxidation Blower Shed	UNDER SLUNG ELECTRIC CRANE	5	EL (+) 11.1	EL (+) 0.00	12.5	16	1000	NPB 600X220X122.4 + CAPPING ISMC400	3000	_____ MM	As per Enquiry

A Single or Double travelling Bridge / Grider (As per vendor design) Underslung Electric Crane shall be running on the lower flange of two runway Track or Beam for Long Travel.
Please refer above tabulation for Long travel Runway Track detail.

NOTE : 1) Depending upon actual crane head room , the actual height of list for Crane shall be arrived.
Special Note: The respective Speed of Hoist /LT /CT for above 5T Crane shall be as specified in ANNEXURE -I - CUSTOMER TECHNICAL SCECIFICATION & DATA SHEET OF CRANE.

Bidder Signed with seal

Ranipet	Painting schedule for APH, ESP, FAN, FGD and Gates & Damper for NALCO DAMANJODI, 1X18.5 MW Project (BHEL WO NO: R181 & R182)	Doc No: PS:NALC:R181 Rev 01 Date: 08/04/2021 Page 7 of 11

Sl No	Description	Surface preparation	Primer/ DFT in µm	Intermediate DFT	Finish DFT	Total DFT
	ABSORBER MISCELLANEOUS;FW322 ABSORBER SYSTEM-CASING INTERM; FW328 W/D INTERFACE (CARBON STEEL); FW380ELEVAIOR,COLURNN';FW381ELEVATOR BEAM AND BRACING; FW385 ELEVATOR M/C ROOM & GUIDE ; FW386 INTER-CONNECTING PLTF TO ABS; FW612 GALLARIES AND RAILINGS FOR DAM;FW613 GALLARIES AND RAILINGS FOR DUC;FW701 SLURRY PUMPS & ACCESSORIES;FW702 WATER PUMPS & ACCESSORIES;FW709 TRENCH COVER PLATE;FW710 MONORAIL FOR HOIST & CRANES;FW711 SHIM PLATE FOR PIPE RACK;FW713 CHAIN PULLEYS;FW714 HOISTS;FW717 MAN HOLE DOOR;FW761 STRUCTURE FOR PIPERACKS;FW765 STR FOR SUB PIPE RACK;FW766 PLATFORM FOR PIPE RACK;FW767 PLATFORM SUB PIPE RACK;FW768 TRESTLE FOR MAIN PIPE RACK;FW769 TRESTLE-SUB PIPE RACK; FW789 TEMPLATE-MISC;FW798 AIR RECEIVERS;FW815 RC PUMP INLT & OUTLT VALVE;FW816 MANL BTRFLY VALV-UTLTY;FW817 MOTOR BTRFL VALV-UTLTY;FW818 PNEM BTRFLY VALV-UTLTY; FW819 MAN BTRFLY VALV-LS SLRY; FW820 MOTOR BTRFLY VALV-LS SLRY; FW821 PNEUM BTRFLY VALV-LS SLRY; FW822 MAN BTRFLY VALV-GYP SLRY; FW823 MOTOR BTRFLY VALV -GYP SLRY;	Power tool cleaning	Two coats of Red oxide Zinc phosphate primer as per IS 12744 DFT 2x30 =60 µm	NIL	Two coats synthetic enamel as per IS 2932 smoke grey shade 692 of IS 5. DFT 2x30=60µm	120 µm (min)

Ranipet	Painting schedule for APH, ESP, FAN, FGD and Gates & Damper for NALCO DAMANJODI, 1X18.5 MW Project (BHEL WO NO: R181 & R182)	Doc No: PS:NALC:R181 Rev 01 Date: 08/04/2021 Page 11 of 11

Sl No	Description	Surface preparation	Primer/ DFT in µm	Intermediate DFT	Finish DFT	Total DFT

Revision No	Date	Record of Revision
00	21/12/2020	Original Issue
01	08/04/2021	Revised Issue to include new PGMA released by BHEL Ranipet Engineering.

Notes

1. Painting of commissioning spares and Mandatory spares shall be as per respective items as above.
2. No painting for SS, Aluminium, non ferrous, stainless steel and Galvanized items.
3. In sub-assy, wherever the plates / sheets of thickness less than or equal to 5mm and rods are used, Power tool cleaning or Hand tool cleaning to SSPC- SP3/ SP2 shall be followed. Painting scheme for Sl no 2 of APH can be used in that case.
4. All components covered under different SL no. are to be painted. Incase any component is left out, the same shall be deemed to be included under the relevant section.
5. Painting of damaged surfaces will be same as the painting scheme in this specification with power tool cleaning.

Bidder's Seal and Signed

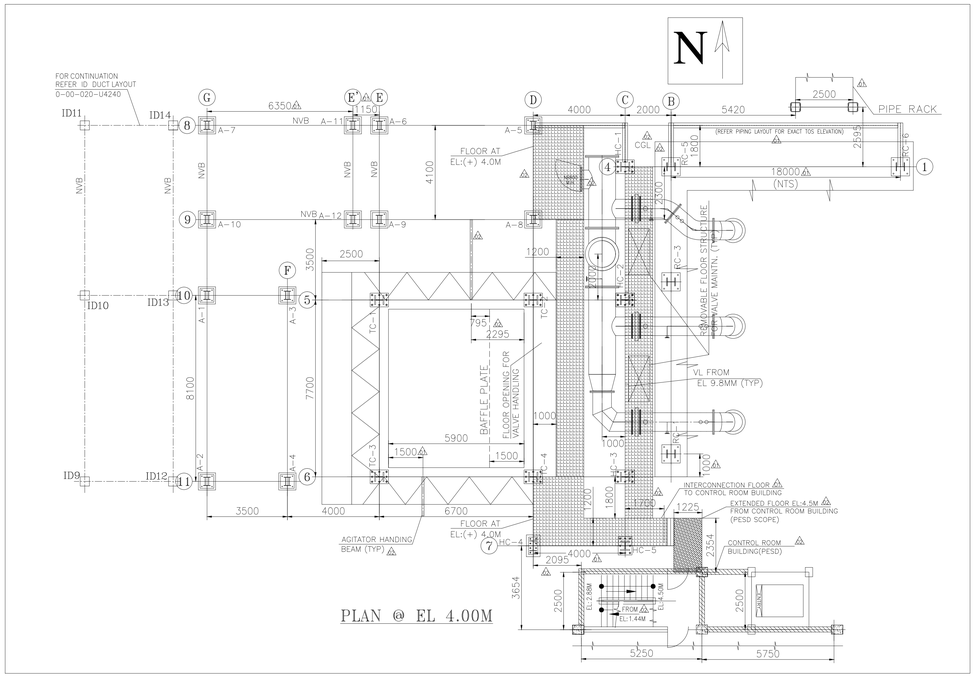
Prepared by	Reviewed by	Approved by
8/4/2021	08/04/2021	8/4/2021
Abdul Ghani Senior Engineer/QA	K Renjith Manager/QA	R.Arunachalam DGM/QA(Mech)

REVIEWED FOR REFERENCE
SIGNATURE:
LETTER REF.: 28812-MD-PWR03-0077A
DATE: 15.04.2021
M. N. DASTUR & COMPANY (P) LTD
KOLKATA

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

SH. 01 OF 04 DRG. NO. 0-FW-000-03574



NOTES:

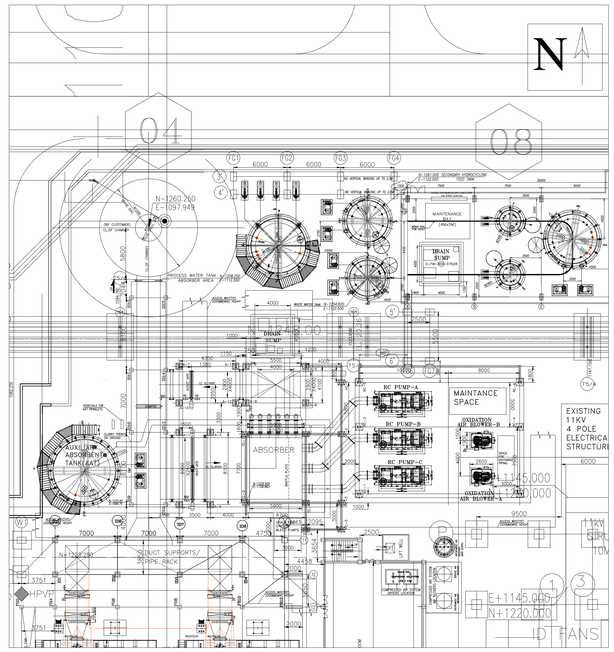
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. EL(+)0.0M WHICH IS FINISHED FLOOR(FFL) OF STG BUILDING, CORRESPONDS TO RL (+)900.3M.
3. FINISHED GROUND/GRADE LEVEL NEAR ABSORBER AREA SHALL BE RL(+)899.80M i.e. EL(-)0.50M.
4. PIPING INDICATED FOR REFERENCE ONLY,PIPING LAYOUT TO BE REFEREED FOR EXACT DETAILS OF PIPING.
5. INDICATED ORIENTATION OF COLUMNS,COLUMN,BEAM SIZES ARE SUGGESTIVE ONY,FOR EXACT ORIENTATION REFER STRUCTURAL DRAWINGS.
6. REFER STANDARD DRAWINGS NO:EGF-Q052-433 & EGF-Q052-434 FOR DETAIL DIMENSIONS OF JAS NOZZLES.
7. 150MM LOCAL DEPRESSION OF SIZE 800MM X 600MM AS SHOWN IN "PLAN @ GRADE LEVEL" TO BE PROVIDED ON ABSORBER BASE.
8. REFER STANDARD DRAWING NO EGF-Q052-411 FOR DETAILS OF EMERGENCY QUENCHING SPRAY PIPE DETAILS.
9. REFER STANDARD DRAWING NO EGF-Q052-413 FOR DETAILS OF W/D INTERFACE WASHING PIPE DETAILS.
10. REFER STANDARD DRAWING NO:EGF-Q052-421 & EGF-Q052-422 FOR DETAILS OF DCFS SPRAY PIPES.
11. ABSORBER DIMENSIONS INDICATED IN "PLAN @ GRADE/FLOOR LEVEL" VIEW ARE ABSORBER CASING OUTSIDE DIMENSIONS.
12. PIPES CUM CABLE ROUTING SHOWN IS INDICATIVE,CORRESPONDING PIPING/CABLE TRAY ROUTING LAYOUT TO BE REFERRED FOR EXACT DETAILS.
13. MARKED DUCT PORTION TO BE ERECTED AFTER INSERTION OF SPRAY PIPES INTO THE ABSORBER CASING. NO VERTICAL BRACINGS(IN THE MARKED AREA) ALONG EAST-WEST DIRECTION SHALL BE PLANNED BETWEEN THE DUCT SUPPORT COLUMNS TO FACILITATE INSERTION OF SPRAY PIPES IN TO THE ABSORBER CASING.
14. COLUMN HC-3 ALONE IS RAISED TO EL:+27.09M FOR INTERCONNECTION PLATFORM PURPOSE,WHERE AS COLUMNS HC-1& HC-2 ARE RAISED UP TO EL:+9.8M ONLY.
15. ELEVATIONS MARKED FOR VARIOUS NOZZLES(IN SHEET-04) ARE NOZZLE CENTER ELEVATIONS.
16. REFER APPROVED DRAWING NO4-FW-000-01205 "SELECTION OF MATERIAL FOR FGD SYSTEM" FOR MATERIAL DETAILS.
17. PLATFORM STRUCTURE IF FOULING WITH NEARBY ID DUCT SUPPORT STRUCTURE,TO BE MODIFIED TO SUIT AT SITE.

LEGEND:-

FFL	:	FINISHED FLOOR LEVEL
FGL	:	FINISHED GROUND LEVEL
BOB	:	BOTTOM OF BASE PLATE LEVEL
D	:	DOOR 1.2M WIDE
RS	:	ROLLING SHUTTER 4M X4M
TOPF	:	TOP OF PLATFORM
PL	:	PAVED LEVEL
TOG	:	TOP OF GRATING
TOC	:	TOP OF CONCRETE
VL	:	VERTICAL LADDER
CGL	:	CAGE LADDER
NVB	:	NO VERTICAL BRACING ALLOWED
AD	:	ACCESS DOOR
MH	:	MAN HOLE

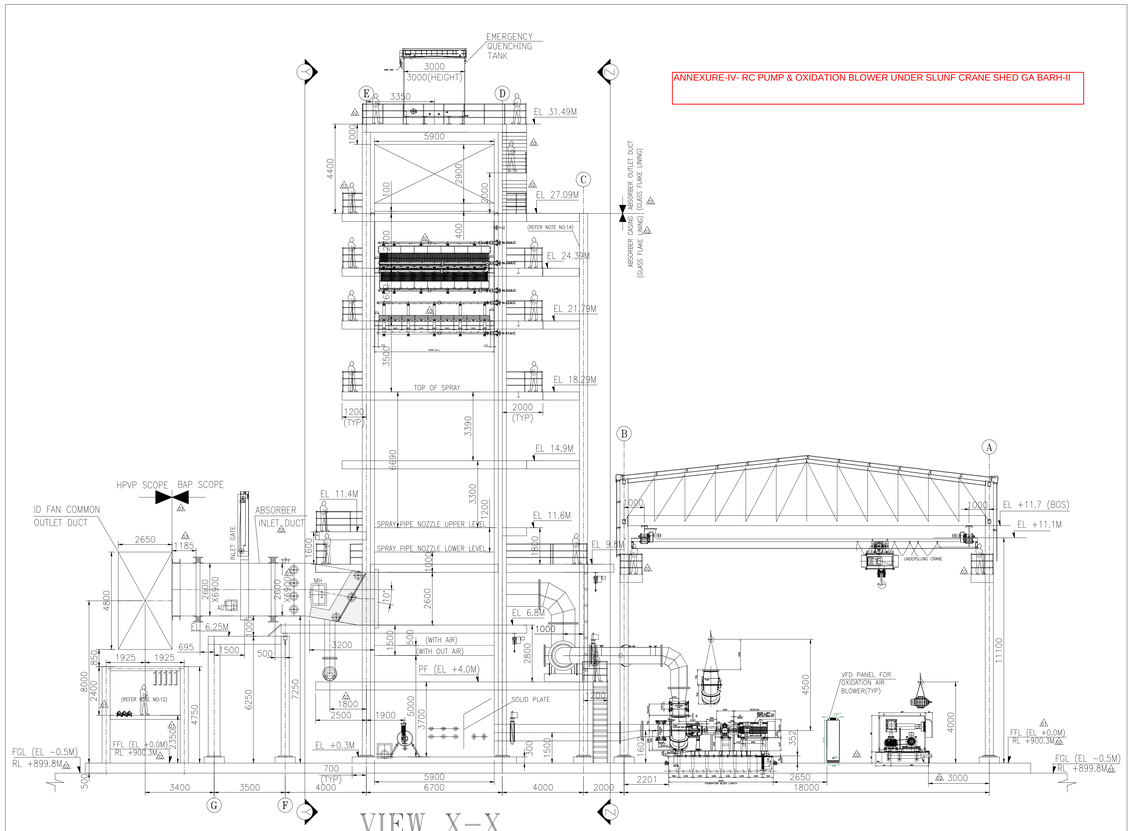
REF. DWGS

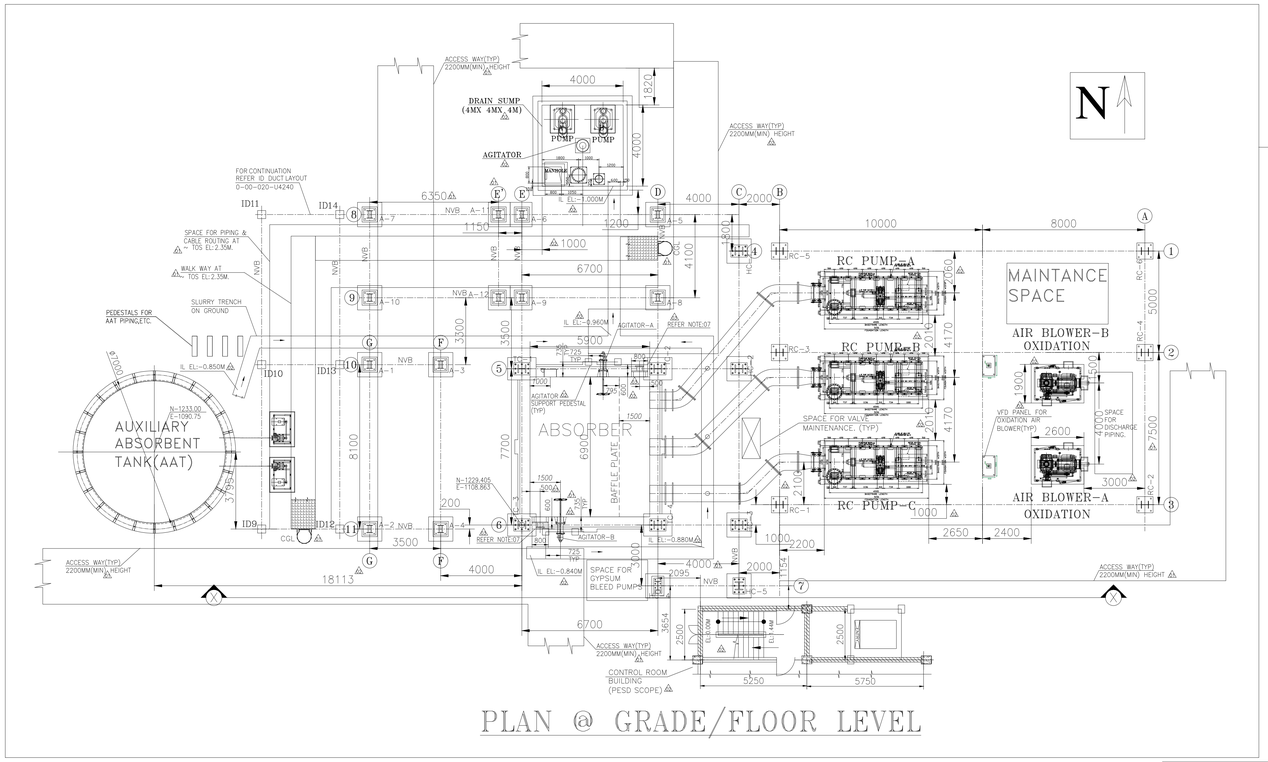
1. PY-LQ-0-M166-2001-01 : PLOT PLAN
2. 0-FW-000-03573 : GENERAL LAYOUT OF FGD DUCTING.
3. 3-FW-000-04141 : P&ID - Absorber ,Oxidation Blower, Gypsum Bleed Pump & Mist Eliminator.



KEY-PLAN

ANNEXURE-IV- RC PUMP & OXIDATION BLOWER UNDER SLUNF CRANE SHED GA BARH-II





PLAN @ GRADE/FLOOR LEVEL

BAP CUSTOMER NO: R182.

CLIENT	NALCO	NATIONAL ALUMINIUM COMPANY LIMITED BHUBANESWAR, ODISHA
CONSULTANT	DASTUR	M. N. DASTUR & COMPANY (P) LTD CONSULTING ENGINEERS, KOLKATA
PROJECT		INSTALLATION OF STEAM AND POWER PLANT FOR 5th STREAM ALUMINA REFINERY EXPANSION AT DAMANJODI, ODISHA UNDER PHASE-3 EXPANSION OF M&R COMPLEX
BHEL	UNIT: BOILER AUXILIARIES PLANT, RANIPET-632 406.	BHARAT HEAVY ELECTRICALS LTD.

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	ILAN/SUKUMAR	-ref-	06-03-2023	
CHD.	K.KUMAR	-ref-	06-03-2023	
APPD.	V.V.SUNDAR	-ref-	06-03-2023	

DEPT.	UNTOL. DIMS. OR C/M/F	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE.		N.T.S	-N.A.-	-N.A.-	-N.A.-	-N.A.-

TITLE: GA DRAWING OF ABSORBER (PLAN & ELEVATIONS)

BHEL DRG NO.: 0-FW-000-03574 REV. 03

CARD CODE: N.A.

SHT. No 01 NO. OF SHT. 04

REV.	DATE	ALTERED	CHD/APPD
03	20.07.22	BAP/HPVP TERMINAL POINT UPDATED AS PER REVISED INPUT FROM HPVP EMAIL DTD:05.03.22. ABSORBER OUTLET DUCT DIMENSION UPDATED IN VIEW-Y&Z AS PER PLAN VIEWS.NOTCH ON ABSORBER BASE FOR BOTTOM DRAIN NOZZLES UPDATED.NOTE:07 UPDATED. LATEST RC PUMP DETAILS UPDATED.	CHD/APPD. KUMAR/SUNDAR
02	17.02.22	AAT LOCATION DETAILS UPDATED AS PER PLOT PLAN. OUTLET GATE LOCATION,MEJ UPDATED.NOZZLE LOCATIONS UPDATED AS PER LATEST P&ID. GYPSUM BLEED PUMP SUMP POSITION,PLATFORM AT EL:4.0M,EL:9.8M,EL:27.09M & EL:31.49M UPDATED.SUGGESTIVE STAIR CASE DETAILS UPDATED.NOZZLE LOCATIONS UPDATED PER PIPING. ABSORBER CASING/OUTLET DUCT & BAFFLE UPDATED. WELDBOMER/PUMP,AGITATOR DATA & RC PIPING UPDATED.	CHD/APPD. KUMAR/SUNDAR
01	19.05.21	INTERCONNECTION PLATFORM WITH CONTROL ROOM BUILDING INDICATED. NOZZLE LOCATIONS UPDATED IN SHEET-04. ALL REVISIONS ARE INDICATED AS△	CHD/APPD. KUMAR/SUNDAR

REV.	DATE	ALTERED	CHD/APPD
			CHD/APPD

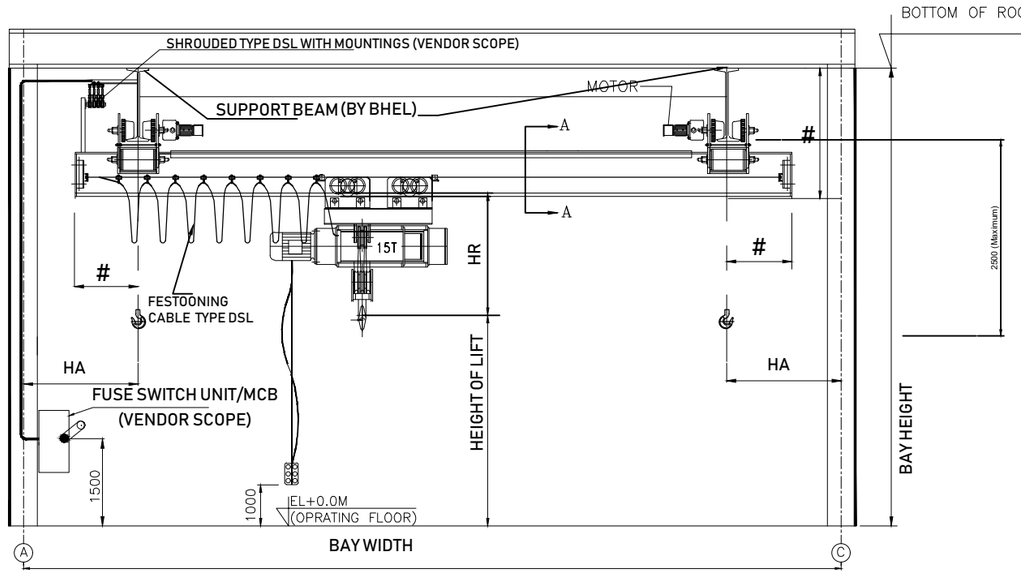
THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

SIGN. AND DATE | REF. DRG. NO. | COMPUTER FILE NAME | INVENTORY NO

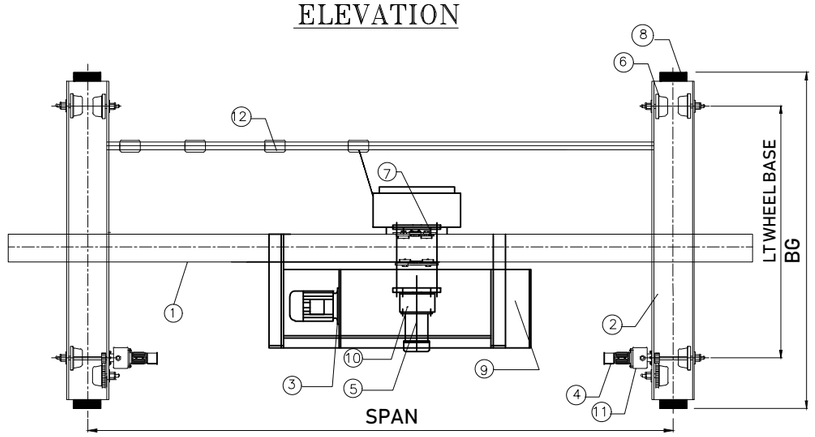
SIZE A0

1410450/2023/BAP-9762_FGD

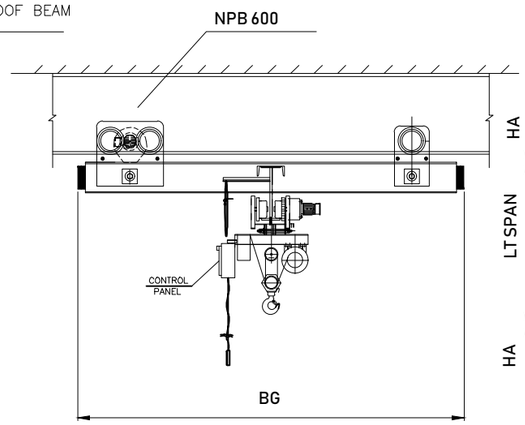
ANNEXURE-V- TYPICAL GA OF UNDER SLUNG ELECTRIC CRANES



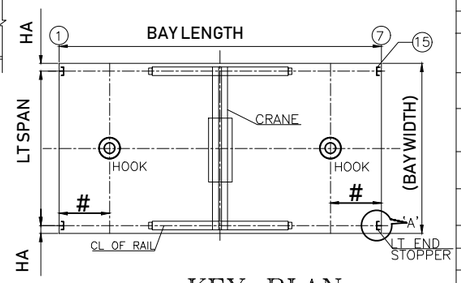
ELEVATION



PLAN



SIDE VIEW

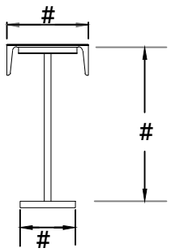


KEY PLAN

CRANE GIRDER

DETAIL AT SECTION AA

(GIRDER SIZE + CAPPING SIZE : AS PER VENDOR DESIGN)



19	CT/LT GEAR BOX HOUSING	VENDOR TO SPECIFY
18	HOIST GEAR BOX. HOUSING	VENDOR TO SPECIFY
17	PULLEY	VENDOR TO SPECIFY
16	ROPE DRUM	VENDOR TO SPECIFY
15	LT END STOPER	VENDOR TO SPECIFY
14	CT END STOPER	VENDOR TO SPECIFY
13	HOOK	VENDOR TO SPECIFY
12	CT DSL	VENDOR TO SPECIFY
11	LT GEAR	VENDOR TO SPECIFY
10	CTGEAR	VENDOR TO SPECIFY
9	MH GEAR	VENDOR TO SPECIFY
8	BUFFER	VENDOR TO SPECIFY
7	CT WHEEL	VENDOR TO SPECIFY
6	LT WHEEL	VENDOR TO SPECIFY
5	CT MOTOR	VENDOR TO SPECIFY
4	LT MOTOR	VENDOR TO SPECIFY
3	MH MOTOR	VENDOR TO SPECIFY
2	LT END CARRAIGE/BEAM	VENDOR TO SPECIFY
1	GIRDER/TROLLEY PLATE	VENDOR TO SPECIFY
DENOT.	ITEMS DISCRIPTION.	VENDOR TO SPECIFY
BOM		

CRANE CAPACITY/LIFT	CRANE CAPACITY/LIFT : AS PER SPEC.						
LOCATION	OXIDATION BLOWER AND RC PUMP						
WEIGHT OF CRANE	VENDOR TO SPECIFY						
MAX. LT WHEEL LOAD	VENDOR TO SPECIFY						
CONTROL SUPPLY	110 V						
POWER SUPPLY	415 V±10%, 3 PH., 50HZ.						
BEARING	VENDOR TO SPECIFY						
CONTROL	PENDANT PUSH BUTTON FROM FLOOR LEVEL.						
GEAR BOX	MOTION	REDUCTION	MATL. OF GEAR & PINION	HARDNESS	LUBRICATION		
	HOIST	VENDOR TO SPECIFY	VENDOR TO SPECIFY	VENDOR TO SPECIFY	VENDOR TO SPECIFY		
	CT	VENDOR TO SPECIFY	VENDOR TO SPECIFY	VENDOR TO SPECIFY			
	LT	VENDOR TO SPECIFY	VENDOR TO SPECIFY	VENDOR TO SPECIFY			
SPEED	HOIST	AS PER SPEC.					
	CT	AS PER SPEC.					
	LT	AS PER SPEC.					
MOTORS	HOIST	VENDOR TO SPECIFY					
	CT	VENDOR TO SPECIFY					
	LT	VENDOR TO SPECIFY					
BRAKE	MOTION	SIZE	RATING	TYPE	LIMIT SWITCH	TYPE	QTY.
	HOIST	#	VENDOR TO SPECIFY		HOIST	VENDOR TO SPECIFY	#
	CT	#	VENDOR TO SPECIFY	VENDOR TO SPECIFY	TROLLEY	VENDOR TO SPECIFY	#
	LT	#	VENDOR TO SPECIFY		CRANE	VENDOR TO SPECIFY	#
WIRE ROPE/FALLS/SPEC.	VENDOR TO SPECIFY						
CLASS OF DUTY	VENDOR TO SPECIFY						
BAY LENGHTH	AS PER SPEC.			LT WH. DIA./QTY.	VENDOR TO SPECIFY		
HEIGHT OF LIFT	AS PER SPEC.			CT WH. DIA./QTY.	VENDOR TO SPECIFY		
SPAN	AS PER SPEC.			SHEAVE DIA	VENDOR TO SPECIFY		
CAPACITY	AS PER SPEC.			DRUM DIA/LENGHT	VENDOR TO SPECIFY		
TECHNICAL SPECIFICATION							

		VENDORS TO INFORM
HR	HEAD ROOM	
HA	HOOK APPROACH	
BG	BOGIE LENGTH	
HL	HEIGHT OF LIFT	
WB	LT WHEEL BASE	

NOTES:–

1. ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE SPECIFIED.
2. # - VENDOR TO SPECIFY
3. **A Single or Double travelling Bridge / Grider (As per vendor design , To Suit) Underslung Electric Crane shall be running on the lower flange of two runway Track or Beam for Long Travel.**

PAINTING OF CONTROL PANELS:

(A) SURFACE TREATMENT WITH MINIMUM SEVEN TANK PROCESS.
(B) PANEL 2 COATS OF SYNTHETIC ENAMEL PAINT.
(C) SHADE–SIEMENS GREY
(D) THE MINIMUM COATING THICKNESS OF POWDER COATED SURFACES SHALL BE MIN OF 80 MICRONS.

Painting:

Primers:
Red Oxide Zinc Phosphate Primer to IS: 12744 (Two coats) of Min DFT 70 microns.

Final:
Synthetic Enamel to IS 2932 Shade: Grey white RAL 9002 (Two coats) of Min. DFT 60 microns.

Total DFT: 130 microns.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT	NTPC PROJECT					
BHARAT HEAVY ELECTRICALS LTD. UNIT: BOILER AUXILIARIES PLANT. RANIPET-632 406	DRN	NAME	SIGN	DATE	NO.OF VAR.	
	CHD					
	APPD					
DEPT AQCS	GRADE OF UNTOL.DIM		SCALE N.T.S	WEIGHT (KG)	REF. TO ASSY/OLD DRG.	ITEM NO. / NO.OF ITEMS
CODE 862						
TITTLE: TYPICAL GA OF UNDER SLUNG CRANE	CODE	CARD U 01	DRAWING NO. 3-FW-0-00001	REV 00		

ANNEXURE - II

Details of Under slung Electric Crane for RC pumps and Blower Handling — PROJECT : NALCO FGD

SL NO	AREA	TYPE OF CRANE	CAPACITY OF CRANE	LONG TRAVEL RUNWAY TRACK OR BEAM FLANGE BOTTOM ELEVATION (LT RUNWAY TRACK OR BEAM in BHEL SCOPE)	FLOOR LEVEL	TRAVEL LENGTH (METER)	LONG TRAVEL SPAN	DISTANCE BETWEEN RUNWAY TRACK OR BEAM FLANGE CENTER TO SHED COLUMN CENTRE ON BOTH SIDE	LONG TRAVEL RUNWAY TRACK OR BEAM (IN BHEL Scope)	MAXIMUM HEIGHT OF BOTTOM OF RUNWAY TRACK OR BEAM FLANGE LOWER TO HOIST HOOK	ACTUAL HEIGHT OF BOTTOM OF RUNWAY TRACK OR BEAM FLANGE LOWER TO CRANE HOOK - VENDOR TO SPECIFY IN THEIR OFFER	TOTAL QNTY
			TON	(EL (+) METER)	EL (+) METER	(METER)	(METER)	(MM)	(NPB /ISMC)	(MM)	(MM) VENDOR TO SPECIFY	(SET)
1	RC pumps & Oxidation Blower Shed	UNDER SLUNG ELECTRIC CRANE	5	EL (+) 11.1	EL (+) 0.00	12.5	16	1000	NPB 600X220X122.4 + CAPPING ISMC400	3000	_____ MM	As per Enquiry

A Single or Double travelling Bridge / Grider (As per vendor design) Underslung Electric Crane shall be running on the lower flange of two runway Track or Beam for Long Travel.
Please refer above tabulation for Long travel Runway Track detail.

NOTE : 1) Depending upon actual crane head room , the actual height of list for Crane shall be arrived.
Special Note: The respective Speed of Hoist /LT /CT for above 5T Crane shall be as specified in ANNEXURE -I - CUSTOMER TECHNICAL SCECIFICATION & DATA SHEET OF CRANE.

Bidder Signed with seal

CONTRACT QUALITY REQUIREMENTS (CQR) for UNDERSLUNG CRANES

1411196/2023/BAP-QA_MECH

PROJECT: **NALCO Damanjodi 1 x 18.5 MW** **(BHEL W.O no: R182)** **PACKAGE: FGD PACKAGE** **MAIN CONTRACTOR:** **BHEL - RANIPET** **SUB CONTRACTOR (OEM) & ADDRESS:** **(To be filled by OEM VENDOR)**	**CONTRACT QUALITY REQUIREMENTS (CQR) for UNDERSLUNG CRANES** **NALCO Damanjodi 1 x 18.5 MW** **(BHEL W.O no:R182)**	**DOC.NO:** **BAP/QR/R182/NALCO Damanjodi/Cranes: 001** **Rev NO.: 00** **PAGE : Page 1 of 2** **DATE: 20.08.2022**	**##Enquiry No:** **## OEM Supplier Name & Address:** **##Offer reference:** **##Date:** **Contact Official Name:** **Mobile no:** **Email id:**

Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NALCO Quality Requirements	##Specific confirmations by the vendor
		ITEM: Underslung Cranes	
01	**Quality Plan Requirement**	**1.** MQP is applicable for these and accordingly Actual Underslung Crane Manufacturer and OEM shall submit the MQP for BHEL and ultimate customer NALCO and its consultant M.N Dastur approval. **2.** If any of Underslung Crane manufacturer is having, ultimate customer NALCO and its consultant M.N Dastur approved MQP (Manufacturing Quality Plan) / NTPC approved RQP (Reference Quality Plan) and having validity, the same is applicable for these Underslung Crane for inspection subject to obtaining ultimate customer NALCO and its consultant M.N Dastur formal approval in the event of an order. **3.** If Underslung Crane Manufacture / OEM vendor does not have MQP/RQP, they should submit a fresh MQP to BHEL/NALCO (in BHEL format) for review & approval in line with the NALCO/M.N Dastur requirements and indicative MQP(copy attached).	
02	**BHEL / Ultimate Customer – NALCO approved vendors**	BOIs including LT Motors are to be procured only from Ultimate Customer - NALCO approved vendors and no deviation on this specific customer requirement is acceptable.	
03	**Inspection Methodology to be adopted at Actual Underslung Crane Manufacture works by OEM vendor**	BHEL/ BHEL AIA (BHEL authorized inspection Agency) to witness / perform inspection Supplier works and submit all the inspection documents test reports as per approved MQP & approved data sheet / drg / spec / as per relevant BIS (Bureau of Indian Standard).	
		No material shall be dispatched without BHEL / BHEL AIA and Ultimate Customer – NALCO Inspection and dispatch clearance.	
04	**Painting Requirements**	Painting requirement like paint shade and painting thickness including no of coats if any are to be ensured by the OEM vendor as per BHEL/ Ultimate Customer - NALCO and its consultant M N Dastur approved data sheet/drg/spec (As applicable).	
05	**Packing**	Packing shall be as per Specification / Drg. / Data sheet to avoid any transit & handling damages.	
06	**For Inspection call**	Inspection call by Vendor for inspection at Manufacture works to be raised for BHEL/BHEL AIA inspection / Ultimate Customer – NALCO including for type test witnessing to be ensured / addressed to Mr MS Aditya Chakravarthy.,Manager (QC-Proc)., Mobile no: +91 9443006303., Email id: msachakravarthy@bhel.in and Mr Zeeshan Ali., Sr.Engineer (QC-Proc)., Mobile no: +91 9443149691., Email id: zeeshan@bhel.in including for inspection related activities for immediate response / resolution.	

CONTRACT QUALITY REQUIREMENTS (CQR) for UNDERSLUNG CRANES

1411196/2023/BAP-QA_MECH

PROJECT: **NALCO Damanjodi 1 x 18.5 MW** **(BHEL W.O no: R182)** **PACKAGE: FGD PACKAGE** **MAIN CONTRACTOR:** **BHEL - RANIPET** **SUB CONTRACTOR (OEM) & ADDRESS:** **(To be filled by OEM VENDOR)**	**CONTRACT QUALITY REQUIREMENTS (CQR) for UNDERSLUNG CRANES** **NALCO Damanjodi 1 x 18.5 MW** **(BHEL W.O no:R182)**	**DOC.NO:** **BAP/QR/R182/NALCO Damanjodi/Cranes: 001** **Rev NO.: 00** **PAGE : Page 2 of 2** **DATE: 20.08.2022**	**##Enquiry No:** **## OEM Supplier Name & Address:** **##Offer reference:** **##Date:** **Contact Official Name:** **Mobile no:** **Email id:**

Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NALCO Quality Requirements	##Specific confirmations by the vendor
		ITEM: Underslung Cranes	
07	**Document Package / Dossier**	Specific confirmation for Document Package in the event of an order (3 hard copies + soft copies in PDF file) is to be given containing the following with proper linkages (.) (i) Index Sheet (ii) MQP/RQP (iii) TCs identified by BHEL/NALCO for record for "CHP" (Customer Hold Point) Verification & Witness "W" portion as given in MQP / RQP / MQP (as applicable). (iv) Final Inspection Report + TC (v) BHEL AIA (BHEL Appointed Inspection Agency) / BHEL report + TC (vi) Ultimate customer NALCO CHP (Customer Hold Point) / MDCC (Material Dispatch Clearance Certificate)	

OEM Supplier signature with seal

 # Necessarily to be filled up & submitted by the OEM vendor at the time of offer itself otherwise the offer may not be considered w.r.t Quality Requirements against Underslung Cranes being BHEL/ ultimate customer – NALCO specific requirements.

Ultimate Customer NALCO/Consultant MN Dastur
Inspection requirements for Cranes, Hoists

INSPECTION PROCEDURE (IP) FOR MECHANICAL EQUIPMENT & STRUCTURES AT MANUFACTURERS' WORKS

Project : 18.5 MW Co-Generation Power Plant, NALCO Damanjodi
Contractor's Name : BHEL, Ranipet
Package Description : BTG Package for steam and Power Plant for 5th stream Alumina Refinery expansion Project of M & R Complex at NALCO Damanjodi

Contract/P.O. No. / L.O.A. No. : NBC/MMXP/SPP/STRM5/BTG/09 DT. 19.11.2020
Contract Specification Reference : NALCO CGPP-3CA01-PWR-01
IP No. & Rev. : IP-28812-M-06 (CHN) Rev.2 **Date** 03.06.2021

Status : Approved

List-A - Test & Test Certificate Codes (Add additional Codes , if required)

Code	Tests & Test Certificates	Code	Tests & Test Certificates	Code	Tests & Test Certificates
1	Visual Inspection	15	Spark test for Rubber Lining	27	Manufacturer's Test Certificates for Bought Out Items
2	Dimensional Checks	16	Adhesion Test	28	Painting/Galvanization Test/ Rust Preventive oil coating approved
3	Fitment & Alignment	17	Performance Test (with Characteristic Curve)	29	Strip test
4	Control Assembly Check	18	Mechanical Run Test (MRT)/No Load/Free Run Test	30	Shaft runout test
5	Raw material -Physical test.	19	Measurement of speed	31	Routine Test
6	Raw material-Chemical test.	20	Vibration,Noise & Temperature	32	Tensile, Elongation & Full thickness breaking
7	Ultrasonic test		Rise Measurement	33	Fire, Electrical resistance, Drum friction test
8	Magnetic Particle Test	21	Pressure Test	34	Abrasion loss & Troughability
9	Radiography Test	22	Leakage Test	35	Free Air Delivery
10	Dye Penetration Test	23	Load/Overload Test	36	Natural Frequency Test
11	Hardness Test	24	Static Balancing Test	37	Spectroscopic Test
12	Water & Dust Ingress Test	25	Dynamic Balancing Test	38	Run out Test
13	Friction factor test	26	Operational & Functional Test	39	Centrifuging (Overspeed Test)
14	Heat treatment/Stress Releiving			40	Clearance Check & Assembly Inspection
				41	Tube Expansion Check

List-B-Documents (Add additional Codes, if required)

Code	Documents	Code	Documents
B1	Approved GA drawing	B10	Painting Certificate
B2	Information and other Reference drawings duly approved	B11	Conformity certificate
B3	Fabrication drawings duly approved	B12	Match marking of site joints
B4	Data Sheet	B13	IBR/Other Statutory Agency Certificate
B5	Bill of Materials	B15	Unpriced P.O. Copy
B6	Manufacturer's Catalogue	B16	List of Valve
B7	Approved Billing Schedule	B 17	BHEL Drawing
B8	Welding Procedure Specification (WPS), Procedure Qualification Record (PQR). Welding Operator Performance Qualification (WPQ)	B 18	BHEL Standard Procedure
B9	Calibration Certificate of all measuring Instruments and Gauges from NABL Lab or Traceable to National / International Standards.		

General Note :-

1) Three sets of test certificates (2 sets hard & 1 set soft) duly verified and signed by the main Contractor shall be furnished.
2) IP number and revision status to be indicated by M.N.Dastur & Co. (P) Ltd.
3) Drawing approval authority shall be as per contract.
4) If quantity is in lot, substantial quantity shall be offered for economy of inspection.
5) For Structural items average quantity shall be offered in 100 MT lot.
6) Attempt shall be exercised to furnishIP for all the items if the package in single lot.
7) Painting to be done after inspection as per approved Painting Specification. Shop Painting Certificate as per format FM VIA shall be submitted; Unless otherwise specified, Painting Shall be as per Manufacturer Standard.
8) Vendor approved detail drawing shall be made available during inspection as required corelated with Dasturco approved GA drawing
9) All measuring instruments used for our inspection and testing shall have valid calibration certificate from NABL laboratory or traceable to national/international standards.
10) Pumps, Fans, Blowers and Compressors Performance test shall be conducted for one per type/model/capacity and remaining quantities shall be Mechanical Run Tested.
11) All manual, pneumatic, electrical operated valves upto and 100 NB size shall be cleared based on review of documents and valve size 150 NB and above shall be witnessed.
12) For Pumps, Blowers & Agitators which are offered with their own electrics (Motor & Controls) same will be interpreted / tested along with pumps and relevant tests certificates will be reviewed.
13)Raw material TC verification for plates of thickness above 40mm only. Certificate of compliance will be submitted for balance raw materials.

41	FW815	RC Pump Inlet & Outlet Valve		1, 2, 5, 6, 7 - P	---	---	1, 2 & 21 - P	1, 2 & 21 - W	1, 2 - W	B1/ B4/ B5/B17/B18	1, 2, 5, 6, 7, 10, 21, 27 & B10	Witness inspection by customer for 1no for functional testing(if it is applicable as per Note-11).
42	78473	Electrically operated Hoist & Accessories		1, 2, 10, 11, 18, 19, - P	---	---	1, 2, 19, 23 - P	1, 2, 19, 23 - W	---	B1/ B2/ B4/ B5/B17/B18	1, 2, 10, 11, 18, 19, 23, 27, 31, B10 & B11	10-Dye Penetrating test (As Applicable) 11-Hardness Test(As Applicable) 18-MRT/NO Load/Free run test(As App.) 31 - Electric Motor Routine TC Review 19 - Test for Hoist up, Down, CT & LT movement(As Applicable) 26-Operational & Functional Test (AS App.) B11-BHEL's Certificate of Conformity (COC)
43	FW293	Elevator and Accessories		1, 2 - P	---	---	1, 2, 19, 26, 31 - P	1, 2, 18, 19, 26, 31 - W	---	B1/ B2/ B4/ B5/B17/B18	1, 2, 18, 19, 26, 27, 31 & B11	18 - No Load Free ru test & brake function test for machinery unit (As App.) 26 - Tripping of over speed governor , controller operations, safety interlock, Push Buttons for Car Call, Landing Call(As App.) 31 - Electric Motor Routine TC Review B11-BHEL's Certificate of Conformity (COC)
44	FW714	Hoists		1, 2, 10, 11, 18, 19, - P	---	---	1, 2, 19, 23 - P	1, 2, 19, 23 - W	---	B1/ B2/ B4/ B5/B17/B18	1, 2, 10, 11, 18, 19, 23, 27, 31, B10 & B11	10-Dye Penetrating test (As Applicable) , 11-Hardness Test(As Applicable); 18-MRT/NO Load/Free run test(As App.);31 - Electric Motor Routine TC Review,19 - Test for Hoist up, Down, CT & LT movement(As Applicable) ,26-Operational & Functional Test (AS App.) B11-BHEL's Certificate of Conformity (COC)
45	Ref. Annexure-A	Non critical items as listed in Annexure-A		---	---	---	1, 2 - P	1, 2 - W	---	B1/ B4/ B5/ B6/ B7/B17/B18 (as applicable)	B11	Non critical items as listed in Annexure-A shall be cleared based om BHEL's Certificate of Conformity (COC)

Abbreviation:-

M : Manufacturer C : Contractor D : M.N.Dastur & Company (P) Ltd. P : Perform W : Witness R : Document Review

Prepared by Abdul Ghani
Reviewed by Renjith K
Approved by Arunachalam R

04/06/2021

Signature of Contractor & Seal
Name: BHEL BAP, Ranipet

RENJITH
Manager/Quality Assurance
BHEL/BAP/RANIPET-632 406.

Signature of Client & Seal
Name:

M.N. DASTUR & CO. (P) LTD. INSPECTION DIVISION

07.06.2021

Signature of Inspection Agency & Seal
Name: M.N. Dastur & Company (P) Ltd.

1411196/2023/BAP-QA_MECH

Suppliers shall submit their MQP in line with attached NALCO/MN Dastur requirements and this Indicative MQP for BHEL and NALCO/Consultant MN Dastur review and approval along with List of Make for Bought Out Items.

MANUFACTURER'S NAME & ADDRESS:

MANUFACTURING QUALITY PLAN (for indicative purpose only)

ITEM :

SUB-SYSTEM :

MQP NO.:

DATE :

PAGE No.

PROJECT :
PACKAGE :
CONTRACT NO. :
MAIN SUPPLIER : BHEL

SL. NO.	COMPONENT / OPERATIONS	CHARACTERSTICS	CL	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	D*	AGENCY M	AGENCY C	AGENCY N	REMARKS
1	2	3	4	5	6		7	8	9		10			11
1	RAW MATERIAL:													
1.1	MS Plates for Trolley Plates , pulleys & Rope drum (or seamless Pipe) MS beams & Channels	Chemical & Mechanical Properties	B	Lab Analysis	Sample	Sample	IS: 2062 Gr A or B	IS: 2062 Gr A or B	MTC / ALC	√	P	V	–	The plates of thickness 25mm and above shall be ultrasonically tested.
1.2	Castings for Bearing Plates, Rope Guide, Pulleys etc	Chemical & Mechanical Properties.	B	Lab Analysis	Sample	Sample	As per DPSI approved drgs	As per approved drgs	MTC / ALC	–	P	V	–	
1.3	Forgings for Shafts,wheels,Hook, Axles & Gears / Pinion	Chemical,Mechanical & Properties.	B	Document review	100%	100%	As per DPSI approved drgs	As per approved drgs	MTC / ALC	–	P	V	–	
	Wheels Hardness.	Hardness	B	Document review	100%	100%	As per DPSI approved drgs	As per approved drgs	MTC / ALC	–	P	–	–	
		Soundness	B	UT / MPI Test Report	100%	100%	A388/ASME Sec VIII Div2	A388/ASME Sec VIII Div2	IR	–	P	V	V	*UT required for dia / thick-ness above 40mm. *MPI and LPI apply after Machining process for Hooks Only.
	BOUGHTOUT ITEMS													
1.4	Trailing cables (Power & control)	Routine Test,Make,Type & Rating	B	~~Document~~ review	100%	100%	NTPC Approved TDS	Approved TDS/ ~~IS:694-1990~~	MTC	√	V	V	V	
1.5	Wire Rope	Breaking load, Dimensional,Make,Type & Rating	B	~~Document~~ review	As per IS	As per IS	IS:2266/2365 Appd Drg	IS:2266/2365 Appd Drg	MTC	√	V	V	–	
1.6	Motor	Routine Test,Make,Type & Rating	A	Review	100%	10%	IS: 325 / Appvd drg	IS: 325 / Appvd drg	MTC and COC	√	V	V	V	*For Motors acceptance reffers Note No.-3.
1.7	Brake	Routine Test,Make,Type & Rating	B	~~Document~~ review	100%	10%	Mfg Std	Mfg Std	MTC	√	P	V	V	
~~1.8~~	~~O/I Relay~~	Routine Test for VFD & Control Transformer	B	~~Document~~ review	100%	100%	IS: 12021 / Mfr Std	Mfr TC	Mfr TC	√	V	V	V	
1.9	Control Transformer,MCB,Fuse, Lamp,Selector Switch,Contractor,VFD, o/l relay	Make,Type & Rating	B	~~Document~~ review	100%	100%	As per approved drgs/Spec	Appvd drg	IR	√	P	V	V	

2 → 1

LEGEND: Cl : Class (A : Critical,B : Major, C : Minor).
** M : Manufacturer/Sub-contractor,
C : BHEL
N : CLIENT
"P": PERFORM; "W": WITNESS; "V" : VERIFICATION.
MTC : Manufacturer's Test Certificate.
ALC : Approved Lab Certificate.
IR : Inspection Report.
*Records,Identified with Tick(√) shall be essentially included in QA documentation.

MANUFACTURER/SUBCONTRACTOR	MAIN SUPPLIER	REVIEWED BY	APPROVED BY	APPROVAL SEAL
SIGNATURE		NAME & SIGN. OF APPROVING AUTHORITY & SEAL		

1411196/2023/BAP-QA_MECH

MANUFACTURER'S NAME & ADDRESS:	MANUFACTURING QUALITY PLAN ITEM : BOILER LIFTING DEVICE-CRANES & HOISTS. SUB-SYSTEM :	MQP NO.: DATE : PAGE No. 2 of 3	PROJECT : PACKAGE : CONTRACT NO. : MAIN SUPPLIER :

SL. NO.	COMPONENT / OPERATIONS	CHARACTERSTICS	CL	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N					M	C	N	
1	2	3	4	5	6		7	8	9	D*	10			11
2.1	Welding Soundness.	Butt Joints under tension & compression and T-Joints (if any for Girder,Rope Drum and End carriage). (100%RT& DPT)	B	RT	100%	100%	ASME Sec VIII Div1, UE51/UW52	ASME Sec VIII Div1, UE51/UW52	IR	–	P	V	V	RT Films Review.
		Other Butt Joints 100% MPI & DPT.	B	MPI/LPI	100%	100%	ASME Sec VIII Div1, Appex.-8	ASME Sec VIII Div1, Appex.-8	IR	√	P	V	–	
		Fillet weld	B	LPI	100%	100%	ASME Sec VIII Div1, Appex.-8	ASME Sec VIII Div1, Appex.-8	IR	√	P	V	–	
2.2	Gear Box	(Major Load Parts) Ideal Run Test	B	Temp.Rise, Vibration,Noise Level, Reduction Ratio,Oil Leakage test	100%	10%	Approved Data sheet/Tech. Specification	As per Manufacturer standard.	IR	√	P	W	V	Sampling Test per Type/Capacity.
2.3	Wheels/shafts/axle/gear & pinion	Strength	B	MPI / LPI	100%	100%	ASME Sec VIII Div2	ASME Sec VIII Div2	IR	–	P	V	–	NDT shall be done after hardfacing & Machining .
2.4	Hook	Strength	B	Proof Load Test	100%	10%	IS: 15560/IS: 3815	As per approved drgs & TDS	IR	√	P	W	V	
		Soundness (After load test)	B	MPI/LPI	100%	10%	ASME Sec VIII Div1, Appex.-8	ASME Sec VIII Div1, Appex.-8	IR	√	P	W	V	NDT(MPI/LPI) shall be done after Proof load test of Hook .
2.5	Control Panel	HV,IR	A	Electrical Test	100%	100%	IS: 13947 Part I- 1993	As per approved drgs & TDS	IR	√	P	W	W	Paint adhesion no peel off,thickness min 50 microns(Powder coated).
		Functional / Interlock test	A	Electrical Test	100%	100%	As per DPSI approved drgs	As per approved drgs	IR	√	P	W	W	
		Paint Shade & Thickness,Adhesion	A	Visual/Measurement	100%	100%	As per DPSI approved drgs	As per approved drgs	IR	√	P	W	W	
		DOP by paper insertion	A	Visual	100%	100%	Not able to insert when door is closed.	As per approved drgs	IR	√	P	W	W	
		Dimension	A	Visual/Measurement	100%	100%	As per DPSI approved drgs	As per approved drgs	IR	–	P	W	W	

LEGEND: Cl : Class (A : Critical,B : Major, C : Minor
** M : Manufacturer/Sub-contractor,
C : **BHEL**
N : CLIENT
*P": PERFORM; "W": WITNESS; "V" : VERIFICATION.
MTC : Manufacturer's Test Certificate.
ALC : Approved Lab Certificate.
IR : Inspection Report.
*Records,Identified with Tick(√) shall be essentially included in QA documentation.

MANUFACTURER/SUBCONTRACTOR	MAIN SUPPLIER	REVIEWED BY	APPROVED BY	APPROVAL SEAL
SIGNATURE			NAME & SIGN. OF APPROVING AUTHORITY & SEAL	

1411196/2023/BAP-QA_MECH

MANUFACTURER'S NAME & ADDRESS:

MANUFACTURING QUALITY PLAN

ITEM :
SUB-SYSTEM :
MQP NO.:
DATE :
PAGE No. 3 of 3

PROJECT :
PACKAGE :
CONTRACT NO. :
MAIN SUPPLIER : I

SL. NO.	COMPONENT / OPERATIONS	CHARACTERSTICS	CL	TYPE OF CHECK	QUANTUM OF CHECK M	QUANTUM OF CHECK C/N	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD 9	FORMAT OF RECORD D*	AGENCY M 10	AGENCY C	AGENCY N	REMARKS 11
1	2	3	4	5	6		7	8						
3.1	Assembled Crane & Hoist	Overall Dimensional and Functional test.	B	Visual Measurement	100%	10%	As per approved drgs	As per DPSI approved drgs	IR	√	P	W	W	Sampling Test per Type/Capacity.
3.2	Performance	Load Test / Overload Test	B	Speeds, Diflection of Girder	100%	10%	IS:3177, IS:807 & IS:3938 & Approed G A Drawing Should not exceed span/900	IS:3177, IS:807 & Approed G A Drawing Should not exceed span/900	IR	√	P	W	W	Sampling Test per Type/Capacity. @: 100% witness for Cranes. 100% witness for Hoists of 10T and above. 10% witness for Hoists of 6T-10T Capacity.
3.3	Painting and Packing	Appearance	B	Visual	100%	L	As peapprvdProcedure, Drg, Tech specification.	As peapprvdProcedure, Drg Tech Specification		–	P	V	–	

LEGEND: Cl : Class (A : Critical,B : Major, C : Minor
** M : Manufacturer/Sub-contractor,
C : Doosan power Systems India Pvt. Ltd.
N : **BHEL**
"P": PERFORM; "W": WITNESS; "V" : VERIFICATION.
MTC : Manufacturer's Test Certificate.
ALC : Approved Lab Certificate.
IR : Inspection Report.
*Records,Identified with Tick(√) shall be essentially included in QA documentation.

REVIEWED BY | APPROVED BY | APPROVAL SEAL

MANUFACTURER/SUBCONTRACTOR | MAIN SUPPLIER

SIGNATURE

NAME & SIGN. OF APPROVING AUTHORITY & SEAL

NOTES:
1) ALL MATERIAL OF CONSTRUCTION AND MAKES SHALL BE AS PER APPROVED DRAWINGS
2) MAKE OF MOTORS & BRAKES SHALL BE AS PER ~~APPROVED DRAWINGS AND~~ BOI LIST.
3) Acceptance of motor less than 30KW based on Manufacturer COC. And Above than 30KW acceptance based on I inspction Witnessed report and manufacturer COC.

& upto 50 KW

A). **Less than 30 KW-**Acceptance of motor less than 30 KW is based on COC of the manufacturer & the contractor confirming as follows. It is hereby confirmed that the above mentioned motor/motor was /were manufacured taking care of NTPC specific requirment regarding amb. temp,voltage & freuency Variation,hot start,pull out torque,starting KVA/KW,temp.rise,distance between centre of stud & gland plate and tested in accordance with approved drawings/data sheet.

B). **30 KW and above:-** Acceptance of motor rating between 30 KW & 50 Kw is based on NTPCreview of Routine test inspection as per IS 325 witnessed by main contractor along with COC of the manufacturer & the contractor confirming as follows. It is hereby confirmed that the above mentioned motor/motor was /were manufacured taking care of NTPC specific requirment regarding amb. temp,voltage & freuency Variation,hot start,pull out torque,starting KVA/KW,temp,rise,distance between centre of stud & gland plate and tested in accordance with approved drawings/data sheet.

OEM SUPPLIER WITH OEM MFGR.'s LOGO (TO BE FILLED BY OEM SUPPLIER)	UNDERSLUNG CRANE MANUFACTURER'S NAME AND ADDRESS (TO BE FILLED BY OEM / UNDERSLUNG CRANE MANUFACTURER)	**MANUFACTURING QUALITY PLAN** ITEM: UNDERSLUNG CRANE FOR FGD APPLICATION SUB-SYSTEM: FGD	QP NO.:UNDERSLUNG CRANE:001 REV.NO.: 00 DATE: PAGE: …. OF….	PROJECT NALCO DAMANJODI 1 X 18.5 MW FGD PACKAGE (BHEL W.O no: R182) MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (TO BE FILLED BY OEM SUPPLIER)

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C / N					M	C	N	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	** 10.			11.

		LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** **M:** OEM MANUFACTURER **C:** MAIN SUPPLIER – BHEL/BHEL AIA , **N**: NALCO **P:** PERFORM **W**: WITNESS AND **V:** VERIFICATION. AS APPROPRIATE, **CHP:** SHALL IDENTIFIED IN COLUM "N" AS ' W"		DOC. NO.: REV…… CAT…..	
OEM MANUFACTURER	MAIN (BHEL) SUPPLIER		FOR CUSTOMER USE	REVIEWED BY	APPROVED BY / APPROVAL SEAL
SIGNATURE					

***(To be submitted In the company letter head by supplier)**

Form - 1

Subject: Public Procurement (Preference to Make In india)

References:

1.P-45021/2/2017-B.E-ll dated. 15th June-2017,
2.P-45021/2/2017-PP(BE-II) dated. 28th May-2018 ,
3.P-45021/2/2017-PP(BE-II) dated. 29th May-2019.
4.P-45021/2/2017-PP(BE-II) dated. 4th June-2020

We hereby declare with reference to above subject and references that M/s ----------(Tick whichever is applicable as below)

"Class-I local supplier" meeting the requirement of minimum local content equal to 50%(fifty percent) or more defined in the above government notification for the goods and services
(or)
"Class-II local Supplier" meeting the requirement of local content 20% to less than 50%(fifty percent) defined in the above government notification for the goods and services

Please mention the details against the following:

Enquiry no:---------- dated. ----------

Type of Supplier (Class-I/Class-II) ……

Product:----------

Project:……..

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

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

Authorized Signature M/s _____

(Signature and seal)

Place:……..

Date:……

From.
M/s_____
Address:_____

Note: For offer value INR 10 crores or more, shall be vetted/endorsed by statutory auditor or cost auditor, for the declared local content.

***(To be submitted In the company letter head by supplier)**

Form – 2

I/we are bidder from _____ (Address with country). We do not belong to any of the below category mentioned.

1. Any of entity/office/workshop of your organisation/incorporation, established in a country sharing land border with India, If yes, provide the full address of all such locations.

2. Any of subsidiary of your organisation/incorporation, established in a country sharing land border with India, If yes, provide the full address of all such locations.

3. Any of entity/office/workshop of your organisation/incorporation, controlled in a country sharing land border with India, If yes, provide the full address of all such locations.

4. Any of entity whose beneficial owner is situated in a country sharing land border with India, If yes, provide the full name, address of all such locations.

5. Any Indian Agent available, If so, Provide details of address and contacts.

6. Any employee/directors who is/are citizen of country sharing land border with India, If yes, provide the full name, employee code and address of all such locations.

7. Any of consortium/joint venture of your organisation/incorporation, established in a country sharing land border with India, If yes, provide the full address of all such locations.

Meaning of beneficial owner

1) In case of a company or limited liability partnership, beneficial owner is the natural person, who, whether acting alone or together, or through one or more judicial person, has a controlling ownership interest or who exercises control through other means.

Explanation

a) Controlling ownership interest means ownership of or entitlement to more than twenty-five percent of shares or capital or profits of the company.
b) "control" shall include the right to appoint majority of the directors or to control the management rights or shareholder's agreement or voting agreement.

2) In case or a partnership firm the beneficial owner is the natural person (s) who whether acting alone or together or through one or more judicial person, has ownership of the entitlement to more than fifteen percent of capital or profits of the partnership.

3) In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together or through one or more judicial person, has ownership of the entitlement to more than fifteen percent of the property or capital or [profits of such association or body of individual.

4) Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official.

5) In case of a trust, the identification of beneficial owner (s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust and any other

***(To be submitted In the company letter head by supplier)**

natural person exercising the ultimate effective control over the trust through a chain of control of ownership.

6) An agent is a person employed to do any act for another, or to represent another in dealing with third person.

We have read the clause regarding restriction on procurement from a bidder of a country which shares a land border with India, we hereby declare that we do not belongs to any such country and are eligible to be considered.

In case, any of information is found to be false, even after bid acceptance, immediate termination may happen and action will be taken as per law.

Format is being filled without altering any of the clause mentioned in the given format**

Dated: _____

Authorised Sign and stamp_____

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:
Date:

To
Bharat Heavy Electricals Limited,
Boiler Auxiliaries Plant,
RANIPET -632 406,
Tamil Nadu,
INDIA

Dear Sirs,

In consideration of the **Bharat Heavy Electricals Limited** 1 (hereinafter referred to as the `Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at "**BHEL House", SIRI Fort, New Delhi- 110049** through its Unit at **Boiler Auxiliaries Plant located at Ranipet-632406, Tamil Nadu, INDIA** having awarded to _____ 2 having its registered office at _____ herein after referred to as the `Contractor/Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No. / **PO No** _____ dated _____3. Valued at Rs_____ 4 (Rupees (In words) . _____) for _____5 (hereinafter called the `Contract') and the Contractor having agreed to provide a Contract Performance Guarantee equivalent to 10% (Ten Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract.

We _____ (hereinafter referred to as the Bank), having registered/Head Office at _____ and inter alia a branch at _____ being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount Rs _____ **(Rupees _____)** without any demur, immediately on a demand from the Employer. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding **Rs. _____ (Rupees_____)**.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the contractors/supplier shall have no claim against us for making such payment.

We the _____ bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid andits claims satisfied or discharged.

We _____ BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall remain in force up to _____ 6 with a validity period of ____months & claim period of 3 months and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the _____7 we shall be discharged from all liabilities under this guarantee thereafter.

We _____BANK, lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed Rs _____ (Rupees _____ Only) 8
b) This Guarantee shall be valid up to _____ 9
c) Unless the Bank is served a written claim or demand on or before _____ 10 all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of
(Name of the Bank)

Dtd :
Place of Issue:

1.NAME AND ADDRESS OF EMPLOYER i.e., Bharat Heavy Electricals Limited.
2 NAME AND ADDRESS OF VENDOR/CONTRACTOR/SUPPLIER
3.DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE
4.BG AMOUNT IN FIGURES AND WORDS
5.PROJECT/SUPPLY DETAILS
6.VALIDITY DATE with a validity of 3 months claim period.
7.DATE OF EXPIRY OF CLAIM PERIOD
8.BG AMOUNT IN FIGURES AND WORDS
9.VALIDITY DATE
10. DATE OF EXPIRY OF CLAIM PERIOD

Ple note: The Validity period wrt our conditions applicable for the Supply / Erection & condition.

Bankers, Auditors & Share Transfer Agent

Bankers
Axis Bank
Bank of Baroda
Canara Bank
Central Bank of India
CITI Bank N.A
Deutsche Bank AG
Export-Import Bank of India
HDFC Bank Limited
IDBI Bank
Indian Bank
Indian Overseas Bank
Indusind Bank
Kotak Mahindra Bank
Punjab National Bank
RBL Bank Ltd.
Standard Chartered Bank
State Bank of India
The Federal Bank Limited
Union Bank of India

Registered Office
BHEL House, Siri Fort, New Delhi-110049 (India)
CIN: L74899DL1964GOI004281
Phone: 011-66337000, Fax: 011-66337428
www.bhel.com shareholderquery@bhel.in