





ESP-001-2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION TECHNICAL SPECIFICATION FOR SINGLE GIRDER UNDER SLUNG EOT CRANES	Std. / Doc. Number	
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## TECHNICAL SPECIFICATION FOR SINGLE GIRDER UNDER SLUNG EOT CRANES

<b>PROJECT</b>	<b>1X18.5 MW CO-GENERATION POWER PLANT, UNIT-VI</b>
<b>CUSTOMER</b>	<b>M/S NATIONAL ALUMINIUM COMPANY LIMITED (NALCO), DAMANJODI, ODISHA</b>
<b>CONSULTANT</b>	<b>M.N.DASTUR &amp; COMPANY (P) LTD.</b>

<b>Revisions:</b> Refer to record of revisions	<b>Prepared by :</b>  Rajeev Jain	<b>Checked by :</b>  (S.B.N.)	<b>Approved by :</b>  (MSSN)	<b>Date :</b>  30.01.2021
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**Sheet 4 of 21****DOCUMENTS TO BE SUBMITTED WITH THE BID:**

The bidder must submit the following documents along with their bid to enable BHEL to evaluate their offer.

- a) Duly filled in EOT Crane datasheets [Annexure-4-A] for Various Capacity
- b) Tentative GA drawing for BHEL' reference only.
- c) Un-priced copy of attached BHEL price bid formats indicating quoted/ not quoted against each row & column. [Annexure-2]
- d) Checklist [Annexure-3]
- e) Equipment qualification criteria / PTR / Reference Lists [Annexure: 6]
- f) Deviation list [Annexure-9]

**\*\* Bidder shall submit Annexure: 9 indicating as NO DEVIATION along with their offer. Any specific deviations, with respect to specification requirement due to design constraints and OEM limitation, which are impractical to meet, shall be raised in form of pre-bid queries as per Annexure: 10 before submission of Techno Commercial offer.**

**In case the above-mentioned documents are not submitted with the offer, the offer of the bidder may be liable for technical rejection.**



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**Sheet 5 of 21****1. INTENT OF SPECIFICATION:**

This specification specifies the requirement of Design, Engineering, Manufacturing, Assembling, Inspection, Delivery, proper packing and painting of **Single Girder Under Slung Electric Overhead Travelling Cranes [S/G EOT Cranes]**, Erection & Commissioning, testing at site of EOT cranes and final handing over to customer, complete with all accessories as specified in the scope of work and as required for the safe and trouble-free operation of equipment to be installed at site.

**2. SPECIAL NOTES TO BIDDERS**

- 2.1** This specification shall be read in conjunction with its enclosures. In case of any discrepancy arising between this specification & its enclosures, the most stringent of all shall be followed and shall over-ride others. Further, if a requirement in this specification or its enclosures, calls for decision of owner/BHEL, it shall be bidder's sole responsibility to clearly bring out the same distinctively in his technical tender offer, so as to enable owner/BHEL to furnish their decision. If such a requirement is not duly addressed by bidder during tender stage and same comes out during order execution stage, it shall be binding on the bidder to comply with the decision furnished by owner/BHEL then, without any cost, delivery, or any other commercial implications.
- 2.2** Any additional equipment, material, etc., which are not specifically mentioned here, but are required to make the supplied equipment complete in all respect, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be covered under the scope of this specification.
- 2.3** The Bidder shall accept full responsibility for the completeness and for the faultless working of all the equipment's. These shall be executed on the basis of proven design principle and in accordance with the latest state of the art in such a manner that the purpose to be served by the Crane unit is fulfilled in every respect and a maximum of operational dependability and efficiency are assured. Standardization of equipment, materials etc. shall be employed in the design. Care shall be taken to ensure safe operation as well as simplicity of assembling and dismantling of all parts of the plant.
- 2.4** Bidder shall quote strictly as per the scope of supply and requirements of this specification.
- 2.5** Bidder offer shall be strictly as per these specification requirements. Unsolicited or Alternate offers from the bidders will not be entertained.
- 2.6** In case bidder feels that it is necessary to exclude some components of scope of supply or some of the features of specification requirements due to any technical constraints, bidder shall bring the same to the notice of purchaser during pre-bid stage and take their prior approval before submission of their bid.
- 2.7** Incase Bidder is unable to offer due to any specific requirement of specification; Bidder shall bring out the same in their regret letter. Otherwise, it will be considered that non-participation by the bidder is attributable to reasons other than any specification requirements.





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### 3. PROJECT INFORMATION -

Sl. No.	Description	Details
1.	Owner	M/s. National Aluminium Company Limited, Bhubaneswar, Odisha
2.	Project	Installation of Steam And Power Plant For 5th Stream Alumina Refinery Expansion At Damanjodi, Odisha Under Phase-3 Expansion Of M&R Complex
3.	Owner's consultant	Development Consultants Pvt. Ltd., Mumbai
4.	Location	Site is located in Damanjodi village, Semiliguda block, Koraput district in Odisha state
5.	Nearest Airport	Visakhapatnam international airport, Vishakhapatnam, Andhra Pradesh
6.	Nearest Railway Station	Damanjodi
7.	Longitude/latitude	75°51'10'' East/21°02'30'' North
8.	Lowest temperature recorded (deg. C)	3.4
9.	Highest temperature recorded (deg. C)	46.6
10.	Elevation above MSL	910 m
11.	Maximum Ambient temperature for Electrical equipment / system (deg. C)	50
12.	Minimum Ambient temperature for Electrical equipment / system (deg. C)	13

Note: Any data required for designing the equipment, bidder may ask prior to the submission of bid.

### 4. SCOPE OF SUPPLY:

Total 3 Nos. of Single Girder Under Slug EOT Cranes of various capacity as indicated in specification for various application are required for handling equipment during maintenance.  
Location of S/G EOT Crane: Indoor

### 5. TECHNICAL DETAILS/REQUIREMENTS:

#### 5.1 A) Design Parameters of S/G EOT Crane for BFP Area:

Description	EOT Crane for Handling of Boiler Feed Pumps in BC Bay
Type	Single-girder, Under Slung type crane
Quantity (No.)	1
Area Classification	Safe area
Main Hoist Capacity (Ton)	15
Lift (m)	6.0
Span (m)	7.0
Travel (m)	40





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**B) Design Parameters of S/G EOT Crane for Chiller Plant Area:**

Description	EOT Crane for Handling of Various Equipment in Chiller Plant Area
Type	Single-girder, Under Slung type crane
Quantity (No.)	1
Area Classification	Safe area
Main Hoist Capacity (Ton)	5
Lift (m)	6.5
Span (m)	10.0
Travel (m)	20.0

**C) Design Parameters of S/G EOT Crane for Mill Bay Area:**

Description	EOT Crane for Handling of Mills in Mill Bay
Type	Single-girder, Under Slung type crane
Quantity (No.)	1
Area Classification	Safe area
Main Hoist Capacity (Ton)	7.5
Lift (m)	10.5
Span (m)	9.0
Travel (m)	37.5

**5.2 Technical Details of Cranes:**

Sl. No.	Description	Details
1.	Applicable Design Codes & Specifications: [Latest revision of the standards as on the date of enquiry shall be applicable.]	<p>Following Design Standard duly taking care of Customer Specifications (Annexure-4) attached with this specification shall be following while designing EOT Cranes:</p> <ul style="list-style-type: none"> <li>a) IS-3177: Code of practice for Electric Overhead Travelling Cranes and Gantry Cranes other than Steel Work Cranes.</li> <li>b) IS-807: Design, Erection and Testing (Structural Portion) of Cranes and Hoists — Code of practice</li> <li>c) IS- 15560: Point hooks with shank up to 160 Tonne-Specification</li> <li>d) IS-5749: Specification for Forged Ramshorn Hooks</li> <li>e) IS- 3443: Specification for Crane Rail Sections</li> <li>f) IS-2266: Steel Wire Ropes for General Engineering Purposes-Specification</li> </ul>
2.	Crane Duty Class	M5,Indoor as per IS 3177,IS 807 & IS 800
3.	Method of Crane control	<ul style="list-style-type: none"> <li>a) Radio Remote Control (1 No.).</li> </ul> <p>Two sets of long life Nickel Cadmium batteries for the transmitter along with a battery charger shall be provided</p>





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		(i.e. 1 set installed battery + 1 set spare battery + 1 charger) for each radio remote. b) Pendant push button type moving independent of crab along the full length of bridge on a separate track.
4.	Main Hoisting speed	8.0 m/min
5.	Cross travel speed	10 m/min
6.	Long travel	30 m/min
7.	Creep speed for main hoist	10% of Normal Speed. All Hoists shall also have creep controller and VFD with encoders.
8.	Speed control	The controls for Main 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.
9.	Main Hoist Brake	Double Shoe DC Electromagnetic shunt brakes as per requirement, Fail Safe Type & self-aligning type.
10.	Cross Travel Brake	AC Electro hydraulic Thrustor Brakes as per requirement, Fail Safe Type & self-aligning type
11.	Long Travel Brake	AC Electro hydraulic Thrustor Brakes as per requirement, Fail Safe Type & self-aligning type
12.	Gear Box	As per IS 4460 or AGMA
13.	Power Supply at terminal point	BHEL shall provide 1 No 415 V, 3 phases, 50 Hz AC power supply at one point and at one end of the building 1m above ground to triple isolation switch (in IP-54 Enclosure). The triple isolation switch and further power distribution is in the scope of Bidder. Any voltage other than the 415 V to be obtained by the Bidder with suitable transformers.  Glands and lugs for cables at vendor panel end shall be supplied along with the main equipment. Glands shall be Double Compression Stain less steel along with check nut and PVC shroud. Lugs shall be tinned copper heavy duty type. Further glands and lugs for triple isolation switch is in vendor scope only. For this, cable size shall be informed during detailed engineering
14.	Power Supply to Crane	Through Down Shop Lead(DSL) Conductor
15.	DSL repair cage	Repair cages shall be provided below the end carriage for maintenance of DSL (shrouded conductor system) and current collectors. The approach to repair cage will be provided from bridge platform by a ladder.
16.	Motors	Motor Rating shall be computed as per IS – 3177. Motors shall be squirrel cage induction type. Motors shall be Heavy duty reversible crane duty type with 40% CDF, 150 starts/Hr., class H insulation with temperature rise limited to class B. Squirrel cage motors shall have TEFC enclosure, IP-55 degree of ingress protection. The Motor shall be designed for speed control of 10 to 100% with variable speed drive.





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17.	Motor 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.
18.	Lifting Hooks	Main hoist hook: Standard single Trapezoidal shank hook with self-latching provision
19.	Wire rope	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%. Wire ropes shall be as per IS 2266 with 6X36 or 6X37 construction
20.	Crane Wheels	LT Wheels: Forged steel. CT Wheels: Forged steel.
21.	Limit Switch	Long Travel: 2 Nos. Lever/Roller type Cross Travel: 2 Nos. Lever/Roller type Main Hoist: 1 No. Rotary gear & 1 No. Gravity Type Auxiliary Hoist : 1 No. Rotary gear & 1 No. Gravity Type
22.	LT rails	Rails as per IS: 3443. Flat rails are not acceptable. <b><u>Note: Rails shall be as per IS 3443 Only. Rails as per Manufacturer recommendation/ Standard Practice is strictly NOT acceptable.</u></b>
23.	Hall dimensions	Refer enclosed drawings [Annexure-1]

### Notes:

- Above mentioned details shall be read in conjugation with Customer Specification for Crane & Hoist [Annexure-4, Doc. No. NALCO CGPP-3CA01-PWR-01(R1)].
- All Equipment including electrical shall be designed for ambient temperature of 50 Deg. C.
- Electric gong bell of reputed make, on bridge platform shall be provided.
- Hook approach for Main Hoist is indicated in the attached equipment layout drawing [Annexure-1]. Accordingly, the end carriage to be designed.
- Power supply to trolley shall be through festoon type flexible cable.
- LT Power supply to crane shall be through Shrouded DSL type conductor system.

### **6. SCOPE OF SUPPLY, SCOPE OF SERVICES, EXCLUSIONS AND TERMINAL POINT DETAILS:**

Designs, supply of material to site, fabrication, erection, inspection, testing, commissioning and handing over of EOT Cranes are covered under this specification.

#### **6.1 Scope of Supply:**

The major scope of supply shall include:





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- 6.1.1** 3 Nos. of EOT cranes as per details mentioned in Cl. No. 5 above.
- 6.1.2** All electrical appliances such as Triple isolation switch, Cable & cable tray from triple isolation switch to DSL system, DSL system, Power distribution throughout the crane assembly, and all other cabling including festoon cable is in bidder's scope of supply. Shrouded DSL type conductor system shall be as per IS 3177.
- 6.1.3** LT rails with fixtures such as shims, anchor bolts, washers, inserts, fish plates etc. suitable to mount the steel crane girder.
- 6.1.4** End stoppers made with structural steel 2 Nos. on each side (total 4 Nos.) of each building. The same to be erected by Bidder on the steel crane girder.
- 6.1.5 Commissioning Spares:**

3 Set (1 Set for Each Crane) of commissioning spares shall be quoted as per manufacturer's recommendation. One set stands for requirement for one no. of EOT Crane.

Bidder to furnish the list along with the offer regarding requirement of commissioning spares.

Bidder shall include all the required commissioning spares in their scope of supply and ensure that the erection and commissioning of the plant is not delayed for want of Commissioning spares.

Any leftover (unused) spares after commissioning, out of those included by vendor, shall be handed over to the owner.

Prices for the commissioning spares shall be part of main scope of supply. No separate price shall be offered for the same.

Note: Any commissioning spare consumed over and above the recommended commissioning Spares, during commissioning shall be supplied free of cost by the equipment vendor.

**6.1.6 Mandatory Spares:** Not Applicable

**6.1.7 2 Year Recommended spares (Mandatorily a part of Main Order):**

Bidder to consider and Supply of spares for 2 years normal operation and maintenance of the crane, other than the mandatory spares listed above in clause no 6.1.7. The Price of spares for 2 years' normal operation and maintenance of the crane shall be included as part of Main order only.

**6.1.8 Special tools & tackles:**

The bidder shall furnish 3 set of all special tools, wrenches etc. with necessary tools boxes as required for operation and maintenance [disassemble, assemble, or maintaining the unit] of the EOT Crane packages) supplied, as a part of scope of supply. Bidder shall furnish a list of such tools along with offer for the system. Prices for the special tools and tackles shall be part of main scope of supply. No separate price shall be offered for the same.





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**6.1.9 Any other accessories required for completeness of EOT crane, maintenance, and trouble free working, operating convenience etc. other than specifically mentioned in Specification shall be in bidder's scope of supply.**

## **6.2 SCOPE OF SERVICE:**

The major scope of service shall include the following as a minimum:

- 6.2.1 Design, engineering of EOT Crane, preparation drawings & documents, bill of material, tag and piece numbers, welding procedures, Erection and commissioning procedures, preventive and overhauling recommendations etc. Stiffeners and other structural framing for supporting the EOT Crane shall be designed by the fabricator and properly shown in the fabrication drawings.
- 6.2.2 Fabrication, Erection, inspection and testing, painting [at shop & at site] and commissioning, handing over of crane are in Bidder's scope. Bidder to furnish recommended fabrication, erection & commissioning, testing and inspection procedure along with drawing / documents to facilitate fabrication, Erection & Commissioning, testing and inspection of Crane.
- 6.2.3 Preparation and submission of all drawings as per Cl. No. 14.0 of this specification.
- 6.2.4 Any other service required for making the installation complete in all respect within bidder's scope and for satisfactory erection & commissioning of the system, unless specifically EXCLUDED from scope of services.
- 6.2.5 Surface preparation, painting of cranes as indicated in Cl. No. 9.0 of specification at Site/sub vendor's works.
- 6.2.6 Vendor is requested to visit site and ascertain all site intensive requirements such as Health, Safety and environment requirements, work permits, security and special requirements, availability of electricity & water, arrangement of existing equipment, interfaces required for the Present equipment etc.
- 6.2.7 Vendor shall carry out the load test of the above Crane. However, the required Test loads for Crane shall be arranged by BHEL as required.
- 6.2.8 Arrangement of Inspection agency [statutory / TPI certification as applicable for state laws] shall be by vendor. The complete responsibility of coordinating with any of the statutory authority prior to and during the test load at site shall be in the scope of Bidder.
- 6.2.9 Bidder to note that all consumables, chemicals, lubricants etc. required during E&C arranged by bidder. Further a detailed lubrication schedule having details about requirement of consumables, chemicals, lubricants, frequency of filling etc. to be furnished by bidder post order stage.

## **6.3 EXCLUSIONS:**

- 6.2.1 Steel girder on which LT Rails & DSL system is to be installed
- 6.2.2 Storage, Preservation of Material & Site Transportation from Stores to the Location of Installation.
- 6.2.3 Facilities required (Electricity, Water etc.) during E&C.



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- 6.2.4 Internal movement of material from stores to actual site.
- 6.2.5 Material handling requirement [e.g. Hydra] during E&C of Crane.

**However, the above requirement data as necessary for the offered crane shall be informed to the purchaser well in advance.**

**6.4 TERMINAL POINT DETAILS:**

One No 415 V, 3 phases, 50 Hz AC power supply, at one point i.e. at one end of the building 1m above ground, to triple isolation switch (in IP-54 Enclosure), shall be provided by BHEL. The triple isolation switch and further power distribution is in the scope of the crane Bidder. Any voltage other than the 415 V to be obtained by the crane Bidder with suitable transformers. All cable glands and lugs at isolation switch panel end are in bidder scope.

**NOTE: [CONFLICTS IN SPECIFICATION REQUIREMENTS]**

In case of any conflict between this specification and Annexures, stringent of both the requirements will govern.

**7. EQUIPMENT QUALIFICATION CRITERIA (EOC):**

Bidder to submit the Equipment Qualification Criteria for EOT Cranes as per Annexure-6.

**8. QUALITY PLAN & INSPECTION AGENCY & TESTING:****8.1 Quality Plan:**

Quality plan will be reviewed during detailed Engineering stage with respect to inspection, standard Engineering practices & specification requirements and various tests and stages of inspection and appropriate agencies for Inspection will be Intimated. Bidder to abide by the same.

Pl refer Annexure-5 for ITPs. For details, refer EIL specifications, Annexure-4.

**8.2 Inspection Agency:**

BHEL/Third Party appointed by BHEL/Customer/Consultant.

The various review/witness/observation stages by individual agencies (or) Group of Agencies as above will be in line with approved quality plan. Pl refer Annexure-5. For details, refer enclosed specifications.

**8.3 Inspection and Testing performance requirement:**

All the below mentioned requirements to be read conjugation with enclosed Customer/Consultant specification, IS 3177 & applicable standards.



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Vendor shall perform tests and inspection necessary to ensure that the material and workmanship conform to the requirement of Clause 26 and 27 of IS-3177. Load and over load tests shall also be carried out at site.

Any or all the tests, at purchaser's option, shall be witnessed by purchaser/its authorized inspection agency. However, such inspection shall be regarded as check-up and shall in no way absolve the vendor of his responsibility.

**8.3.2 Performance Testing and Guarantees:**

A field performance test shall be conducted by the vendor to demonstrate the performance of the equipment after commissioning in accordance with test procedure approved by BHEL/Customer/Consultant.

The procedure of performance testing shall be submitted for Purchaser's review and shall be mutually agreed between the purchaser and the vendor.

A field performance test shall be conducted by the vendor to demonstrate the performance of the Crane after commissioning as per clause 28 of IS-3177. Following parameters shall be guaranteed.

- a) SWL of Main and Auxiliary Hoists
- b) LT, CT and Hoisting Speeds.
- c) Deflection of bridge girder

All parts of the crane shall operate satisfactorily with no undue friction, noise or display of any other unfavorable characteristics during the performance test.

All equipment and component parts shall be guaranteed by the vendor against defective material and design for a period as specified in Purchaser's general purchase conditions.

If any defect occurs during the guaranteed period the Vendor shall make all necessary alterations, repairs and replacement at their own cost.

Necessary instruments for the performance testing shall be arranged by the vendor, and shall be tested and calibrated before undertaking the performance test. Only test load shall be provided by purchaser near test site.

**8.4 Guarantees:**

The performance of the cranes in regard to the following items/features shall be guaranteed as specified below:





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Sl. No.	Descriptions	Tolerances
A.	Span over LT wheels	± 6mm upto 40 Meters, ± 7.5 mm above 40 Meters
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
F.	Difference in height between trolley rails (H) in relation to the trolley track gauge (S) shall have mentioned tolerance:	4 mm (H) upto 2500 mm(S), 6 mm (H) from 2500 mm to 4500 mm(S), 8 mm (H) above 4500 mm(S)
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
I.	<b>Hoist Capacity</b>	
i)	Safe Working Load(SWL)	(-) 0.00%
ii)	With 125% of safe working load, the crane shall be able to operate without any permanent deformation, for hoisting and cross travel motions.	(-) 0.00%

### 8.5 Performance Clause

In respect of items guaranteed, the Contractor shall guarantee them with tolerances as indicated in the table above. The Contractor shall make every effort practicable to correct the deficiencies. Should the performance test results deviate from the guaranteed values including the specified tolerance, the Contractor shall correct his equipment without any techno commercial implications to the Purchaser and repeat the performance tests within a reasonable period as agreed to by the Purchaser.

If, however, the Contractor fails to meet the guaranteed values subject to the tolerance mentioned herein, the Purchaser retains the option of rejecting the equipment and in case of such option of rejection being exercised; the Contractor shall replace the equipment with new one, which shall meet the guaranteed values.



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**Sheet 15 of 21****9. PAINTING:**

All the below mentioned requirements to be read conjugation with enclosed Customer/Consultant specification, IS 3177 & applicable standards.

**Painting & surface preparations shall be in line with End Customer Specification attached as Annexure-5.**

**The color of finished coat shall be golden yellow unless otherwise specified.**

The term “painting” referred herein covers rust preventive fungus/insects preventive and decorative coating along with surface protection of the following are but not limited to the areas indicated below:

1. Surface Steel Works
2. Mechanical Equipment
3. Electrical Equipments
4. Instrumentation and control equipments
5. Pipe Works, etc.

Surfaces made of asbestos, aluminum, brass, bronze, galvanized steel, stainless steel, cast iron and other corrosion resistant alloys and rubber /synthetic polymer/fiber reinforcement plastic are not required to be painted unless specified except for aesthetic purposes or for identification band, wherever relevant.

The complete paint system for any item includes the following basic activities:

1. Proper surface Preparation
2. Application of Primer coats
3. Application of intermediate coats

The painting procedure of performance testing shall be submitted for BHEL/Customer review and prior approval to be obtained before proceeding with Painting.

**10. STORAGE, HANDLING, PACKING AND DISPATCH OF EQUIPMENTS / COMPONENTS:**

All the below mentioned requirements to be read conjugation with enclosed specifications [Annexure- 5], IS 3177 & applicable standards.

A) Packing shall be accomplished in accordance with acceptable commercial practices and as per annexure-5.

B) The vendor shall make shipment using the minimum number of shipping containers consistent with the requirements of safe transit, available mode of transportation and the routing of the consignment.

C) It shall be the Bidder's responsibility to determine the packing as done is adequate to assure that all equipments shall arrive at the destination in an undamaged condition, on damage is expected during storing at site & also it shall be ready for intended use.

D) All packaging shall be done in such a manner as to reduce the volume. The equipment shall be dismantled into major components suitable for shipment and shall be properly packed to



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provide adequate protection during shipment. All assemblies shall be properly match marked for site erection.

E) Attachments, spare parts of the equipment and small items shall be packed separately in wooden cases. Each item shall be appropriately tagged with identification of main equipment, item denomination and reference number of the respective assembly drawing.

F) Detailed packing list in water proof envelop shall be inserted in the package together with equipment.

G) Each equipment shall have an identification plate giving salient equipment data, make, year of manufacturer, equipment number, name of manufacturer etc.

H) Packaging shall be unless otherwise stated suitable for prolong storage at site to prevent undue corrosion and damage before erection & commissioning of the crane.

**11. SUB VENDORS:**

Bidder shall follow approved sub vendors list as per Annexure-7.

In case of any specific practical difficulty, bidder is requested to bring out the same with proper reason for not following vendor list [Annexure: 7] and to furnish Proven Track record, credentials for the proposed vendors for BHEL approval.

For other items for which sub vendors are not specified, bidder can follow their standard vendors with due intimation to BHEL during detailed engg stage. Also they have to ensure the Proven Track record of the sub vendors and Bidder to take prior approval of BHEL for the same.

**12. INSTRUCTIONS ON PRICE BID FORMAT**

Bidder to indicate his offer as per Price Bid format enclosed as Annexure: 2.

All the items included in the price bid format shall be quoted as per tender specification and pre-bid clarifications as per Annexure: 10, if any. Responsibility of ensuring correctness & completeness of scope of supply as per specification requirement solely lies with bidder.

The equipment supplied shall be complete in all respects. The bidder shall not be eligible for any extra payment in respect of such mountings, fittings, fixtures and accessories if required for the safe and reliable operation of the equipment. Any additional equipment, material, etc., which are not specifically mentioned here, but are required to make the supplied equipment complete in all respect, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be in bidder scope Only.

Main offer consists of those items which will be part of main order after successful bidder is identified. Optional Items consists of those items which need to be quoted by bidder but may or may not be ordered by BHEL. Bidders are instructed to provide the pricing details listed under Main offer and Optional items as per the prescribed format. Prices quoted by the bidder shall remain firm till the successful handing over of the entire package to end customer. Any request for upward revision of price during any intermediate stage before handing over the plant to end customer will be summarily rejected by BHEL.



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**Sheet 17 of 21****13. PRE-BID CLARIFICATIONS & DEVIATIONS:**

Bidders shall comply with various requirements of this specification. It may please be noted that the requirements specified here in this specification are the standard practices being followed by the bidders. However, same things are presented in a structured form so that it can be ensured that the requirements of ultimate customer are complied with.

Bidders can bring out only those deviations which are impractical to meet, for our review in pre bid clarification only as per Annexure-10.

Bidders may also please note that the data sheets for valves, instruments etc., submitted along with the offer will be considered as indicative only, as the requirements specified in the specification are standard in nature. These will not be reviewed by BHEL before award of contract. Same will be reviewed during order execution stage in line with the requirements of specification and agreed deviations.

All pre-bid clarifications & deviations shall be clear bring as per Annexure: 10 only.

In case bidder doesn't bring any clarification/deviation in prebid stage, the same shall be brought in their offer with following conditions:

- a) Any deviations to Customer specifications, same are acceptable provided these deviations are also regularly accepted by Customer for their direct orders on bidders. In such cases, proof of the same shall be furnished along with the offer.
- b) Bidders may please note that unless the deviations are specifically brought out under deviations clause, it will be considered that no deviations are taken, even if they are mentioned elsewhere directly/indirectly in the offer.
- c) Price implication due to non-acceptance [by BHEL/Customer] of the deviations considered by bidder will not be permitted.
- d) Deviations [if any] shall be clear bring as per Annexure: 9 only.

**14. DOCUMENTATIONS**

Please refer to enclosed Master Documentation List [MDL] for the list of Documents / Drawings to be submitted by the bidder as part of documentation. Bidder shall ensure submission of all documentation as per the MDL, Annexure: 8.

Bidder to note that the dates of submission of all the documents shall be finalized based on PO date. It shall be solely bidder's responsibility to get approval on the entire document from purchaser to meet project schedule.

**DEFINITION OF VENDOR DOCUMENT REVIEW STATUS ASSIGNED BY BHEL**

The guidelines listed below are followed in assigning the document status code to the vendor documents: Final submittal of vendor documents will not be required as long as the document status code is 1 or 4 and the "AS-BUILT" condition of the component agrees with the current document.



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Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the vendor and does not relieve the vendor from full compliance with contractual obligations.

**Code-1: Work may proceed**

The document conforms to procurement document requirements. The document requires no changes or additions. Matters remaining to be resolved do not require document change and will be handled by correspondence. Where it is known that the design information on a vendor document is not complete and re-submittals will be required, e.g., due to "hold" areas, the document is assigned another status code.

**Code-2: Revise and resubmit**

Work may proceed subject to resolution of indicated comments. The document is in basic conformance with procurement document requirements. Minor deviations from procurement document requirements have been noted or other minor technical or physical changes in the equipment are required. The vendor shall resolve comments and resubmit documents prior to shipment of commodity.

**Code-3: Rejected. Revise and resubmit**

The document:

- Does not conform to the procurement requirements,
- Is of a design that is technically unacceptable without significant changes,
- Does not meet project requirements, i.e., orientation of equipment, nozzles, conduit connections, etc.,
- Does not conform to project criteria or with proposal documents or data, or
- Does not meet minimum submittal requirements.

This submittal rejection does not relieve vendor of any schedule commitments.

**Code-4: Review not required**

The document is not subject to BHEL review. Typical uses for this status are in the review of items that are vendor standard products, small internal parts of major equipment, or vendor standardized data.

**DRAWINGS REVIEW & APPROVALS:**

Each drawing submitted by the bidder shall be with a title block furnished by BHEL during detailed engg stage.

All drawings / documents shall be thoroughly checked, duly signed, and stamped by the vendor including drawing /documents of sub-vendor, before submission to BHEL. Documents, which are unchecked, unsigned, and without revisions marked clearly, shall be returned without review. Any delay on account of this shall be to the vendor's account. After first review of documents, vendor to submit all the further revisions of documents along with comment resolution sheet. Successive documents submitted without comment resolution sheet shall be returned without review.

The approval and /or review by BHEL /End customer shall not be construed by the bidder as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.





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Documents once reviewed in Code-1 shall not be submitted (incorporating some changes) again for review, however if some change is really necessary, the same shall be brought to the notice of BHEL separately through design change note for review / information. Finally, As – built drawings, duly updated, shall be submitted.

During detailed engg stage, BHEL shall furnish check list reg minimum contents in GA drawing. Bidder to submit GAD [duly incorporating all requirements as per the check list] along with signed checklist. GAD shall not be reviewed without duly filled in checklist signed by the bidder.

#### NO. OF COPIES OF EACH DOCUMENT TO BE FURNISHED:

All the documents shall be submitted as given below:

SL NO.	DESCRIPTION	NO. OF COPIES / PIECES TO BE SUBMITTED	WHEN TO SUBMIT
1)	Initial drawings/documents under approval and information category.	Soft copy only	Within 2 weeks of placement of order
2)	BHEL shall furnish their observation on submitted documents	Soft copy only	Within 2 weeks of document submission
3)	*Revised drawings/documents along with compliance sheet incorporating all BHEL comments.  <i>*Vendor to incorporate all BHEL comments so that further revisions can be minimized.</i>	Soft copy only	Within 1 weeks of receipt of commented Drawings from BHEL
4)	BHEL shall furnish their observation on submitted documents	Soft copy only	Within 2 weeks of document submission
5)	Final Drawings/documents	12	Within 2 months of placement of order.
6)	Erection Documentation	5	1 month before dispatch of equipment. The list of documents identified under master document list for erection to be furnished in 5 no's of folders
7)	Draft O & M Manuals for BHEL review.  <i>Note: Bidder to furnish final hard copy of O&amp;M only after getting concurrence on soft copy.</i>	Soft copy	At least 2 months before the delivery date of equipment





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8)	Revised O & M Manuals with Test Certificates to be submitted to BHEL (Hyderabad)	12	Within one month before the delivery date of equipment
9)	Final O&M manuals in a CD	4	Within one month after dispatch of equipment after BHEL concurrence on soft copy.

**Notes:**

The O&M manuals shall contain the following as minimum:

- a) The identification details of the equipment like BHEL P.O. No., Vendor's Job Identification No., full contact address with telephone, fax, & e-mail details.
- b) Brief description of the system.
- c) All approved documents [ Drawings, documents & test procedures as per MDL]
- d) Bill of material, BBU, LO schedule, sub vendor list, Mandatory & commissioning spares list etc.
- e) Operation, Instruction & maintenance manuals of all equipment / items for the complete package
- f) System unloading, storage erection, start up, commissioning, shut down requirements.
- g) Operational & environmental safety instructions.
- h) Test reports and certificates.
- i) Catalogues of the equipment & instrumentation.

**15. VARIANT TABLE:**

Variant	Item	Material Code
01	15T EOT crane for Maintenance of boiler feed pump in BC bay-Main Supply	PY9751709016
02	15T EOT crane for Maintenance of boiler feed pump in BC bay-E&C	PY9851709026
03	5T EOT crane for Maintenance of chiller equipment in Chilled water plant-Main Supply	PY9751709032
04	5T EOT crane for Maintenance of chiller equipment in Chilled water plant-E&C	PY9851709042
05	7.5T EOT crane for Maintenance of mills in Mill bay-Main Supply	PY9751709059
06	7.5T EOT crane for Maintenance of mills in Mill bay-E&C	PY9851709069



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[illegible]





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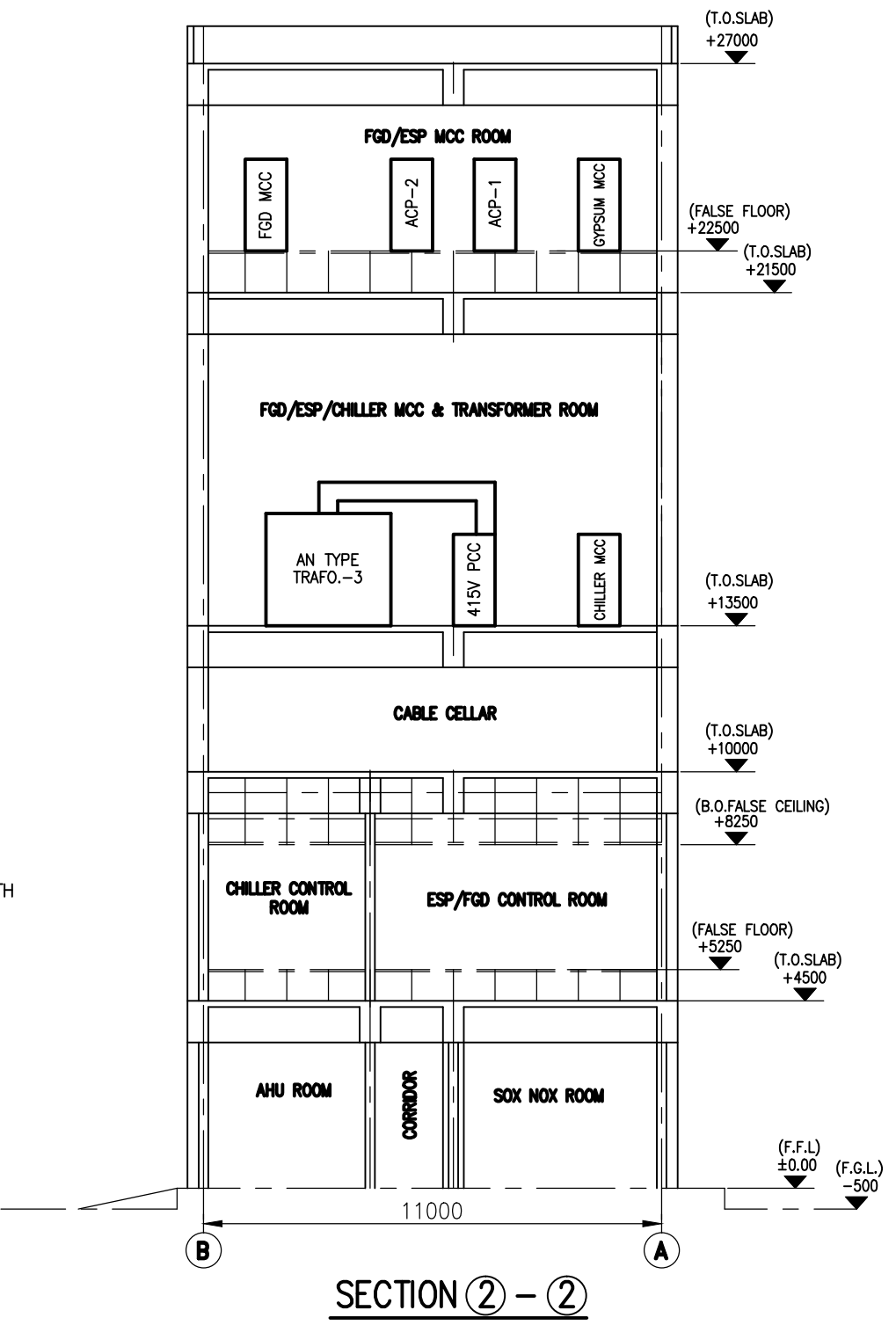
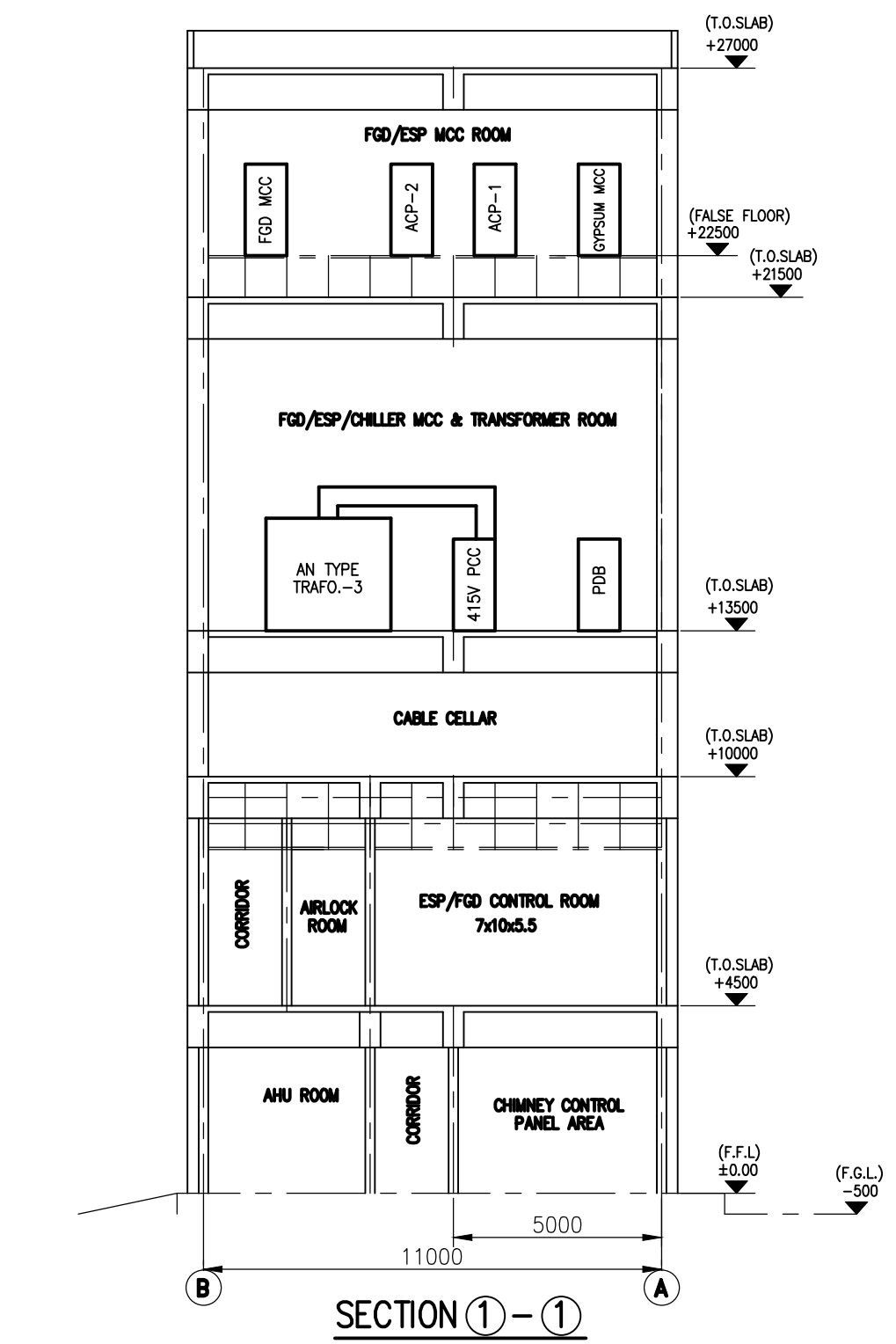
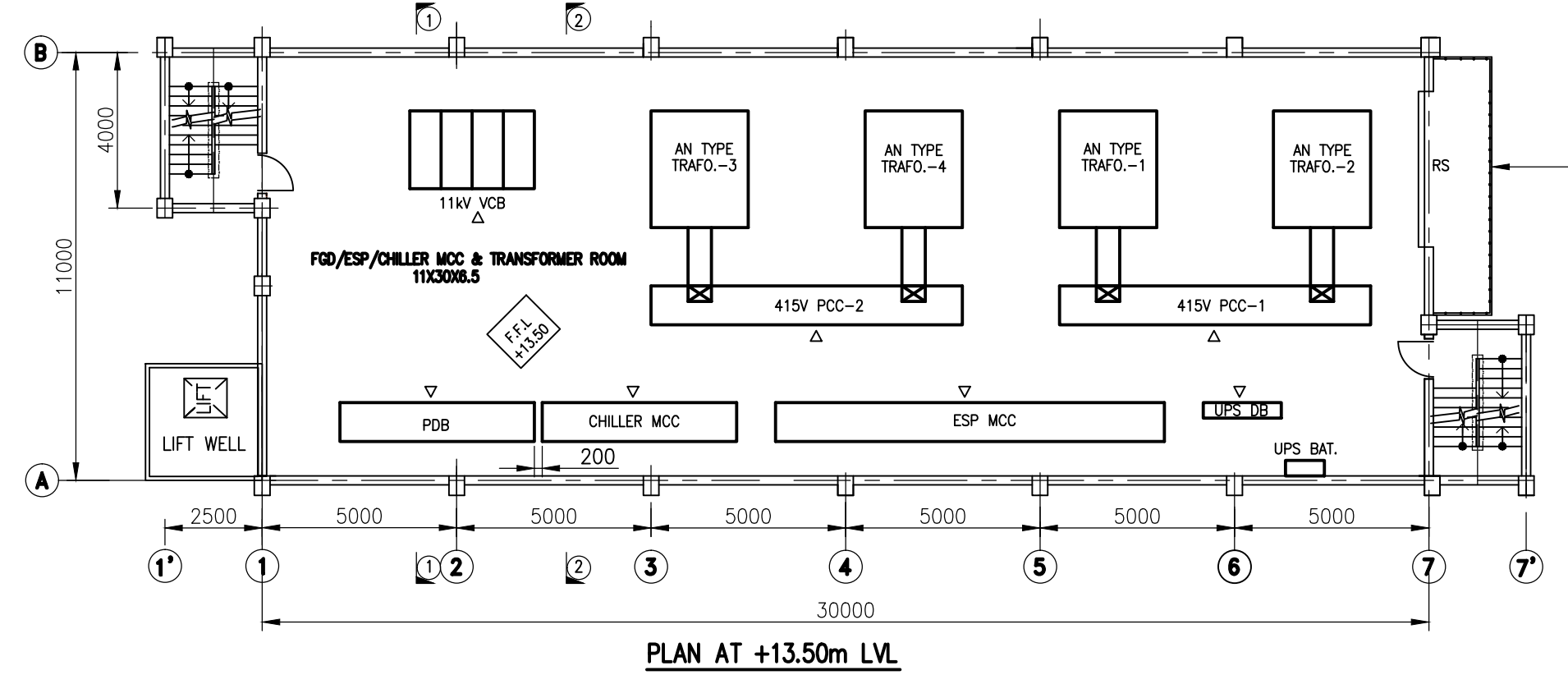
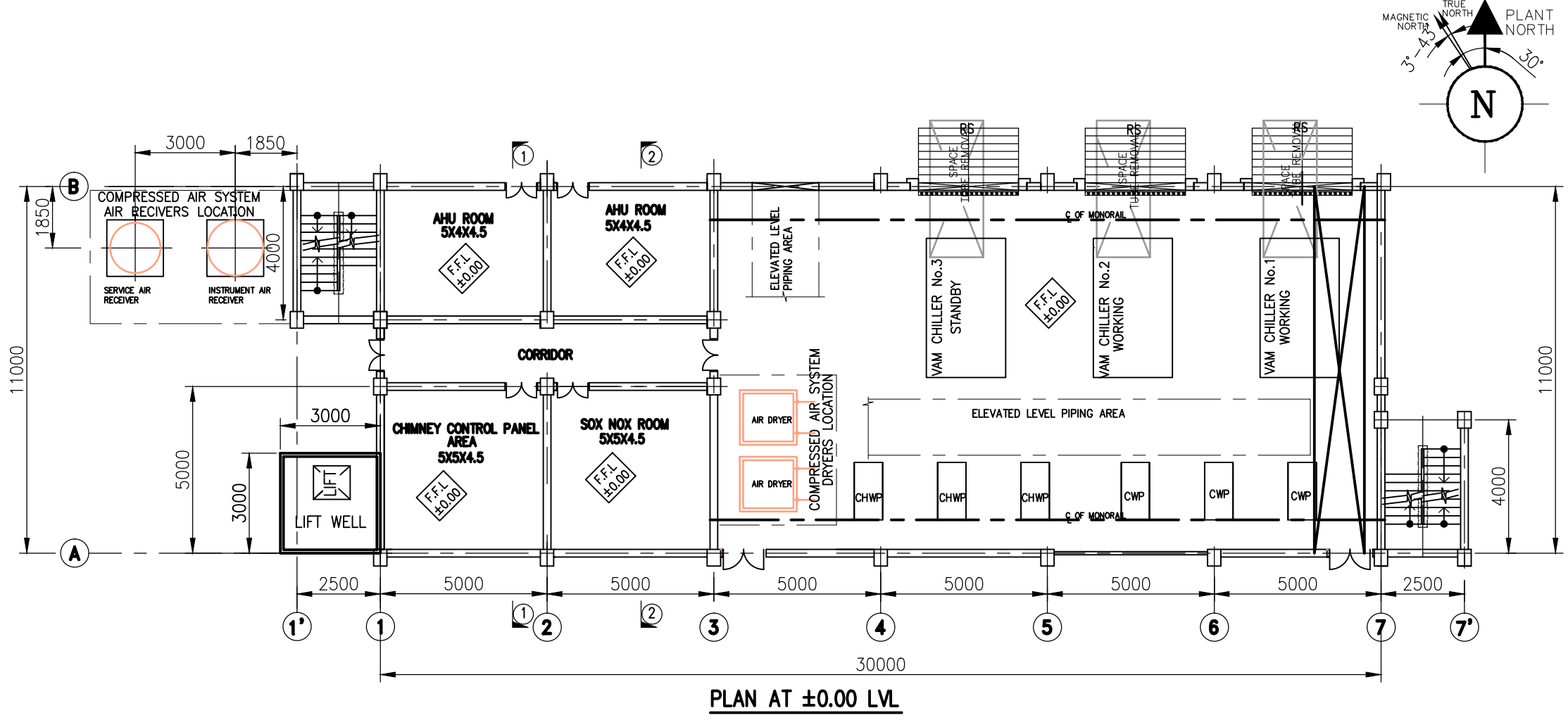
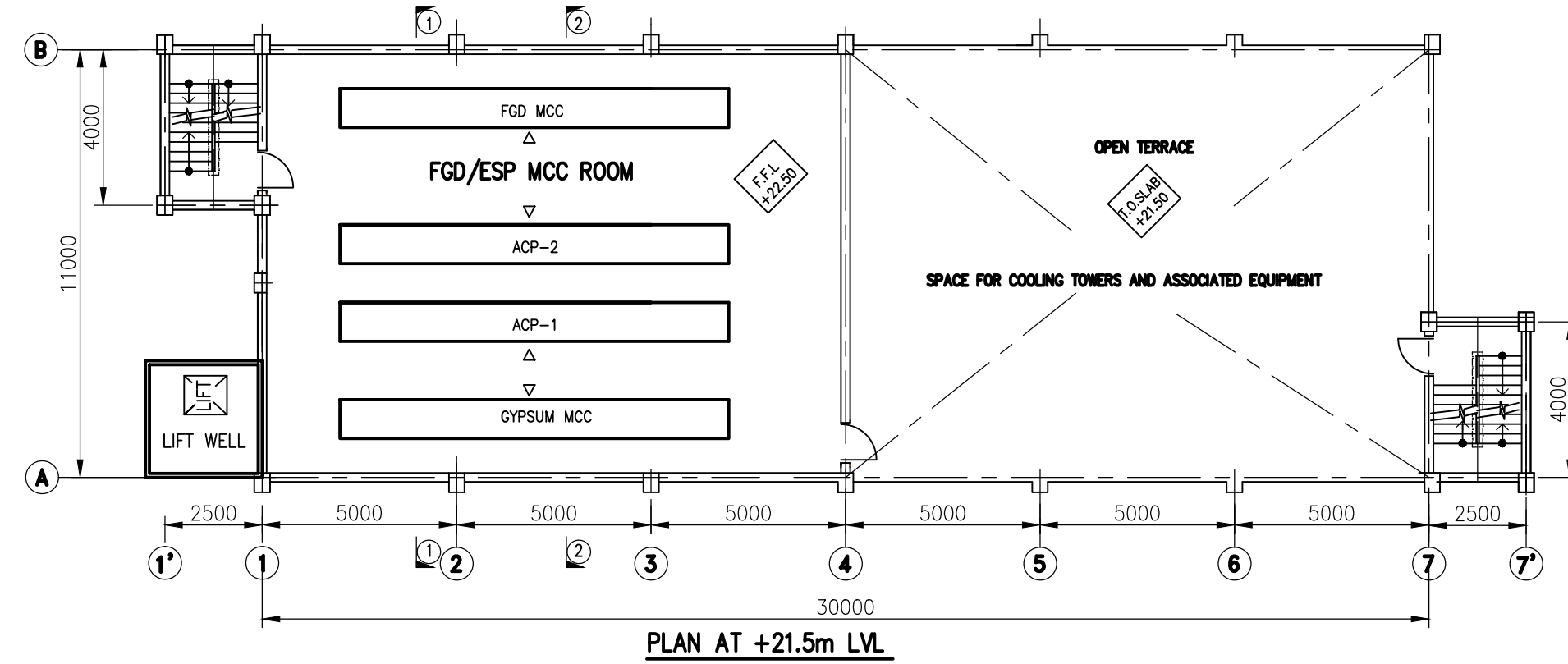
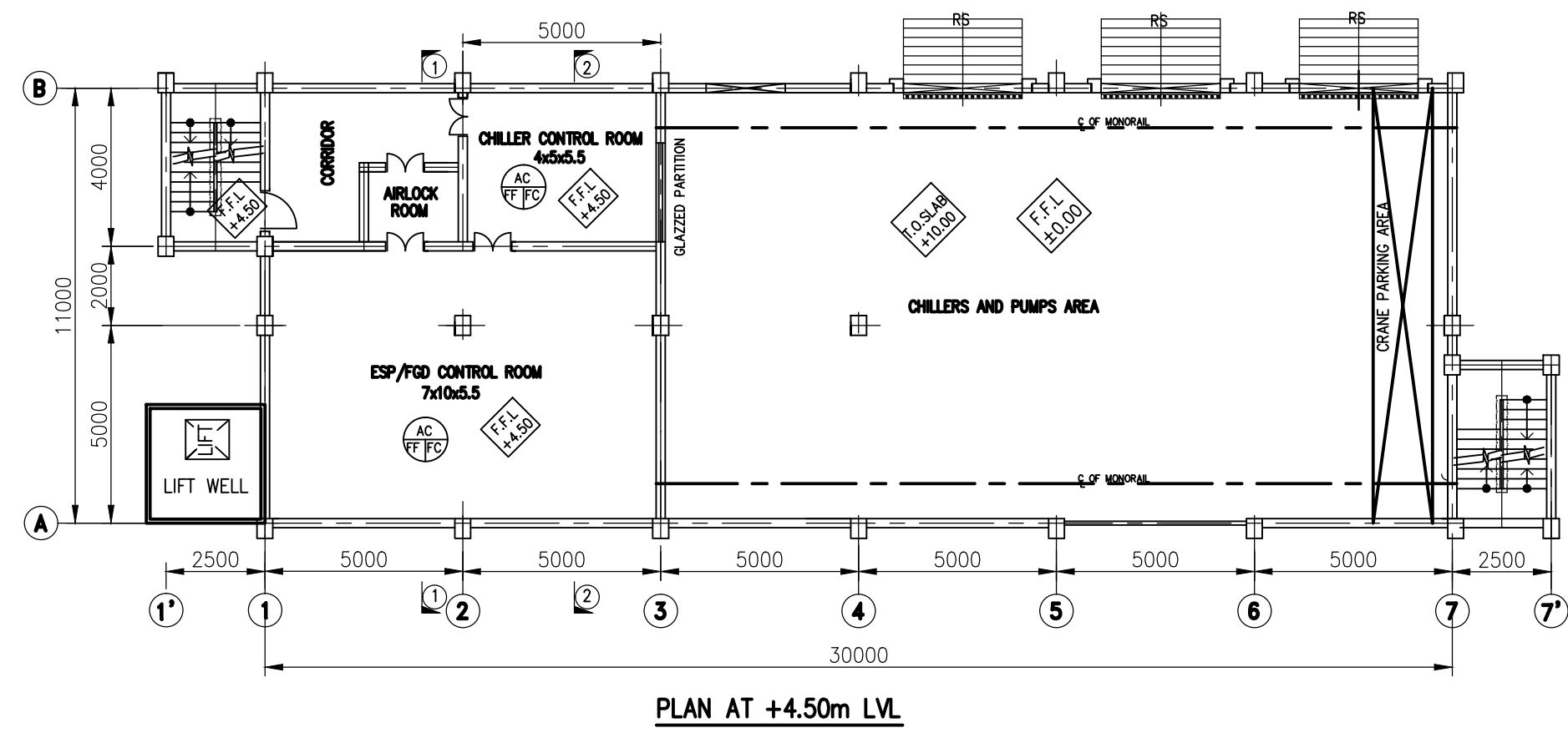
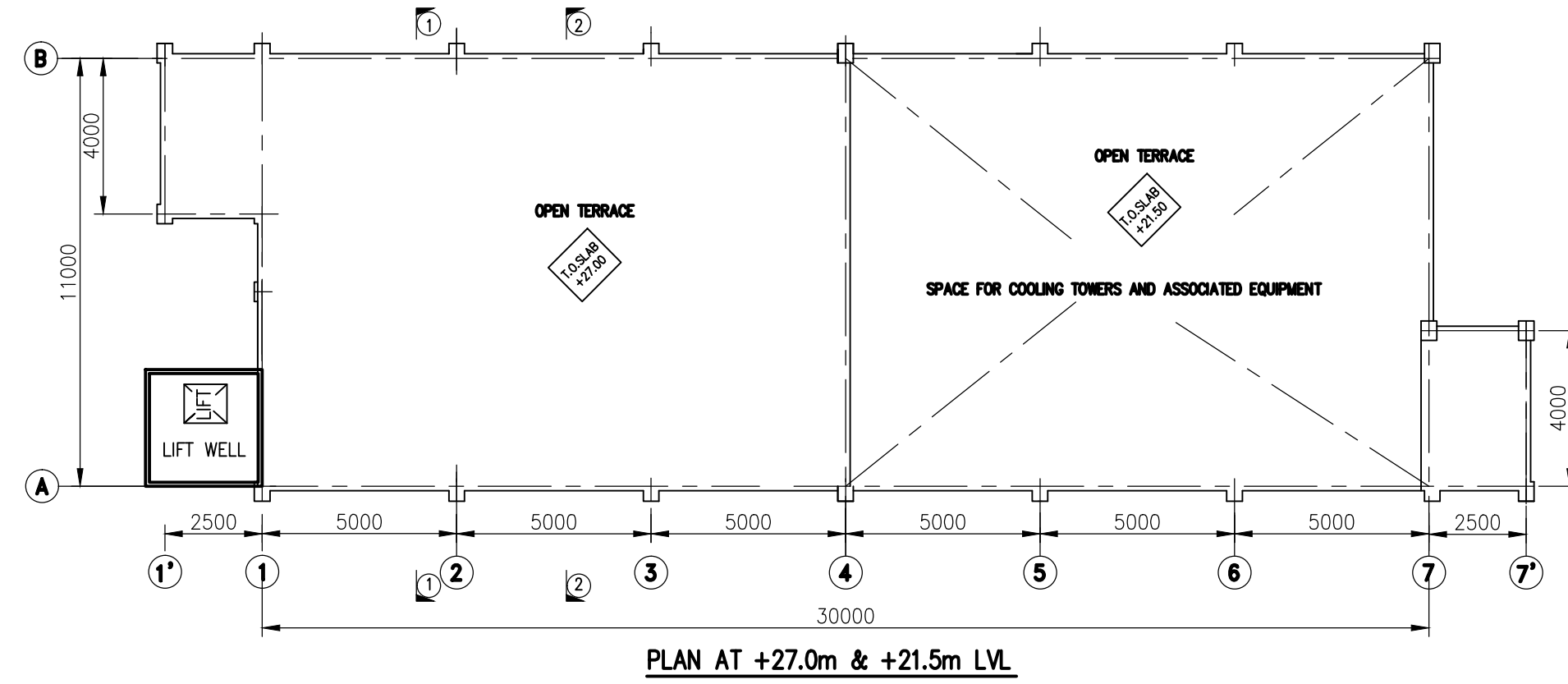
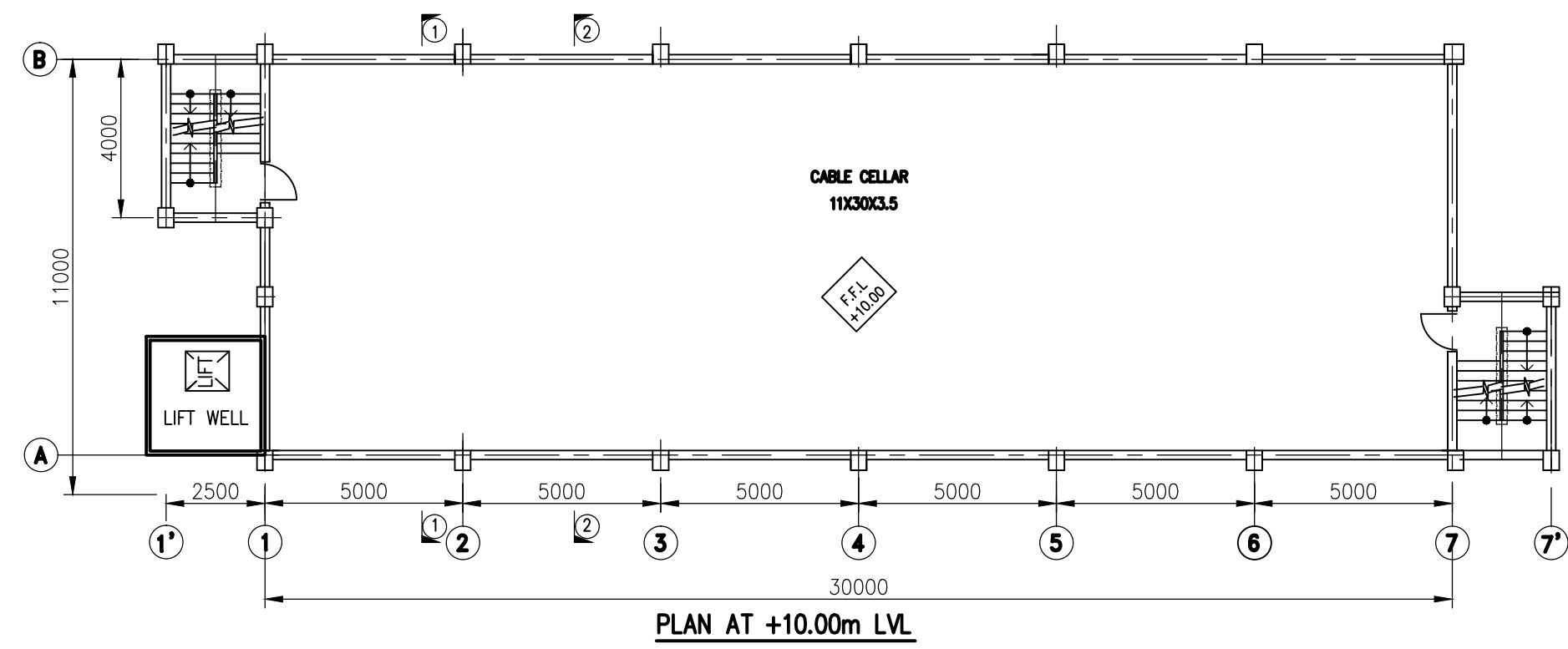
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It must not be used directly or indirectly in any way detrimental to the interest of the company.

# Annexure-1

- A) Layout Drawing for BFP Area**
- B) Layout Drawing for Chiller Plant Area**
- C) Layout Drawing for Mill Bay Area**



Annexure-1B: Layout Drawing for Chiller Plant Area



NOTE:-  
1. WALL SHALL BE CONSTRUCTED AFTER ERECTION OF PANELS.

SL. No.	DESCRIPTION	SCOPE OF WORK
1	11KV PANEL, TRANSFORMER-(1 & 2) BUSDUCT AND 415V PCC-1 FOR ESP/CHILLER	POWER DISTRIBUTION CONTRACTOR
2	11KV PANEL, TRANSFORMER-(3 & 4) BUSDUCT AND 415V PCC-2 FOR FGD FACILITY	BTG CONTRACTOR
3	ALL MCC, PDB, UPS DB, UPS BATTERY AND MISC. BOARDS	BTG CONTRACTOR

No.	DATE	ZONE	REMARKS	BY	APP.	DRG. No./DETAILS
1	26.11.18		INCLUSION OF FGD ELECTRICAL EQUIPMENT	TS	KBVR	
REVISION			REFERENCE DRAWINGS			

NOTES

APPROVAL

FOR TENDER PURPOSE ONLY

REV	DEPT	BY	DATE

SCALE: 1:150

DATE: 26.03.2018

DSGND. BY: KNK

DRAWN BY: TS

CHKD. BY: KNK

APPVD. BY: KBVR

DASTUR

M. N. DASTUR & COMPANY (P) LTD  
CONSULTING ENGINEERS, KOLKATA

FOR  
**NATIONAL ALUMINIUM COMPANY LIMITED**  
BHUBANESWAR, ODISHA

INSTALLATION OF STEAM AND POWER PLANT FOR 5th STREAM ALUMINA REFINERY  
EXPANSION AT DAMANJODI, ODISHA UNDER PHASE-3 EXPANSION OF M&R COMPLEX  
CHILLER BUILDING AND ESP CONTROL ROOM ELECTRICAL  
EQUIPMENT LAYOUT PLAN AND SECTION

JOB No. 28812

DRG. No. 28812-3CA-VBN-ELE-0011

REV. A

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## Annexure-2

- A) Price Bid Format for S/G EOT Crane for BFP Area**
- B) Price Bid Format for S/G EOT Crane for Chiller Plant Area**
- C) Price Bid Format for S/G EOT Crane for Mill Bay Area**



Annexure-2-A							
		<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b> <b>RAMACHANDRAPURAM: HYDERABAD - 502 032</b>					
		<b>PRICE FORMAT (R00) FOR 15T EOT CRANE FOR BFP AREA</b> <b>CUSTOMER: M/S NATIONAL ALUMINIUM COMPANY LIMITED (NALCO), DAMANJODI, ODISHA</b> <b>PROJECT: 1X18.5 MW CO-GENERATION POWER PLANT, UNIT-VI</b> <b>CONSULTANT:M.N.DASTUR &amp; COMPANY (P) LTD.</b>					
SL. NO	ITEM DESCRIPTION	QTY	UNIT	Weightage w.r.t Overall Price (In %)	Bidder confirmation (Quoted/ Not Quoted)	HSN/SAC Code	GST (%)
	Bidder's Name : <Bidder to indicate> Bidder's Offer No. & Dt. : <Bidder to indicate> Bidder's Ref No. & Dt. : <Bidder to indicate> BHEL Enq. No. & date : <Bidder to indicate>						
<b>I</b>	<b>MAIN OFFER</b>						
<b>A</b>	<b>MATERIAL SUPPLY-EOT CRANE(15 T)[Material Code: PY9751709016]</b>						
<b>A.1</b>	<b>EOT Crane-Main Supply</b>						
	Design, manufacture, inspection, supply to site of EOT Crane Assembly along with Commissioning Spares and Tools & tackles etc., testing at site for EOT crane as per specification. [For Detail scope of Supply & Services, Please refer respective Clauses of Technical Specification] Spares required for 2 years' normal operation and maintenance of the crane shall be included as part of Main order only.	1	No.	92			
<b>A.2</b>	<b>MATERIAL SUPPLY-DSL Conductor System</b>						
	DSL conductor system for LT (Refer note-14)	40	mtrs.				
<b>A.3</b>	<b>MATERIAL SUPPLY-LT Rails</b>						
	Crane LT rails (Refer note-14)	40	mtrs.				
<b>B</b>	<b>E&amp;C of EOT CRANE[Material code:PY9851709026]</b>						
	Erection & Commissioning of EOT crane as per specification. [For Detail scope, Please refer respective Clauses of Technical Specification]	1	No.	8			
	<b>Grand total price for sl no A to B (Inclusive of Packing &amp; Forwarding, Freight and Insurance)</b>			100			
<b>Packing &amp; Forwarding, Freight, Insurance and GST :</b>							
<b>(I) For Supply:</b>							
(i) Packing & Forwarding	In bidder scope			Included in basic price			
(ii) Freight:	In bidder scope			Included in basic price			
(iii) Insurance:	In BHEL scope			--			
(iv) GST	Extra at actuals			Extra at actuals			
(v) Any other:	shall be included in basic price			Included in basic price			
<b>(II) For supervision of E&amp;C:</b>							
(i) GST:	Extra at actuals			Extra at actuals			
(ii) Any other:	Included in basic price			Included in basic price			
<b>Notes:</b>							
1) Bidder to quote strictly as per BHEL's NIT requirements.							
2) Bidders should mention the applicable HSN/SAC code along with GST% against respective line items.							
3) Bidders shall NOT fill/edit/modify anything else in the Price Bid Format.							
4) The rates of line items mentioned in the Price Format shall be derived by BHEL by multiplying the Total Bid Value quoted by the Bidder with the Weightage Factor assigned against respective line items. The rate of each item shall be rounded off to the next 1 (one) Indian paise.							
5) The Total Bid Value quoted by the Bidder shall represent the total landed cost for this enquiry and shall include Packing & Forwarding Charges, Freight and all applicable taxes & duties, other than GST. GST shall be paid extra by BHEL at applicable rates.							
6) Evaluation shall be done on the basis of total bid value (Grand Total Price as above) i.e. the total landed cost to BHEL for this enquiry.							
7) The bidders will also provide UN-PRICED PRICE FORMAT strictly in the BHEL price format given above, in the techno commercial part of their offers. BID WILL BE REJECTED IF ANY OTHER PRICE FORMAT IS USED. Both priced and un-priced price formats to be provided by the bidders shall be signed and stamped copies.							
8) Bidder to quote strictly as per BHEL's NIT requirements.							
9) Bidder to note that this is a LUMP SUM Turn-Key Order. However (a) Changes to the tender specification during execution of the project for successful operation of the system need to be carried out by bidder and commercial implications if any will be settled suitably. (b) Unit rates quoted by bidder shall be applicable for any changes in BOQ during detailed engineering stage.							
10) <b>Main offer</b> consists of those items which will be part of main order after successful bidder is identified. <b>Optional Items</b> consists of those items which need to be quoted by bidder but may or may not be ordered by BHEL. Bidders are instructed to provide the pricing details listed under <b>Main offer</b> and <b>Optional items</b> as per the prescribed format. Offer will be evaluated based on total price for Supply and Erection & Commissioning (i.e. Sl. Nos. 1A+1B of price format). Prices of Optional Item shall not be considered for Price bid evaluation. However, BHEL reserves the right (a) To include any of the optional items in scope of supply (as per customer contract requirements) and accordingly consider the same in evaluation. Any such scope increase and change in evaluation will be intimated to vendor during technical evaluation(before price bid opening). (b) To place PO for any of the Optional items with in the contract period. Hence bidders need to mandatorily quote reasonable prices for all optional items considering such requirement and keep the validity of the prices till the end of contract period.							
11) The Price of respective item shall be quoted Mandatorily as per the % of total prices mentioned above for Supply and E&C. Bidders need to Mandatorily quote reasonable prices for all OPTIONAL ITEMS considering such requirement and keep the validity of the prices till the end of contract period.							
12) Separate Purchase Orders will be issued for Supply portion and for Erection & Commissioning works of this project. The Purchase Order for Supply portion will be issued by BHEL-PE&SD whereas the Purchase Order for E&C portion will be issued by BHEL-Power Sector region (BHEL's Construction Management Division)							
13) Bidder to quote the base rates only. All Applicable taxes and duties to be indicated shall be indicated separately for the Supply Portion and Erection & Commissioning Portion							



SL NO	ITEM DESCRIPTION	QTY	UNIT	Weightage w.r.t Overall Price (In %)	Bidder confirmation (Quoted/ Not Quoted)	HSN/SAC Code	GST (%)
	Bidder's Name : <Bidder to indicate> Bidder's Offer No. & Dt. : <Bidder to indicate> Bidder's Ref No. & Dt. : <Bidder to indicate> BHEL Enq. No. & date : <Bidder to indicate>						
	<b>14) For L/T Rail for Long Travel of Crane assembly :</b> Bidder to quote price for per meter length [for both sides] so that the same can be considered incase of any additional requirement. However Lowest Bidder(L1) evaluation shall be done based on present requirement (length of travel =40 m) .The variation in quantity can be from 0 to (+)10%. <b>For DSL required for Power supply to Crane assembly :</b> Bidder to quote price for per meter length so that the same can be considered incase of any additional requirement. However Lowest Bidder(L1) evaluation shall be done based on present requirement (length of travel =40 m) .The variation in quantity can be from 0 to (+)10%.						
	15.a) For all items including Optional items, prices to be furnished in this prescribed price bid format only for each individual item. The price to be quoted against sl no A to B shall be Weightage w.r.t Overall Price as mentioned above. No combined prices, common prices or any other format will be accepted and such bids may be liable for rejection. 15.b) Bidder must NOT change the indicated item description, quantity & units in the price bid format. Bidder should only fill the unit rates & total price. 15.c) Bidder to quote for ALL the items as per price bid format. Incomplete/partial offer may be liable for rejection.						
	16.a.) Commissioning spares are those spares which are required at the time of commissioning and shall be recommended (as per bidder's experience) and quoted by bidder. However commissioning spares indicated in the price bid format shall be quoted as minimum. 16.b) Commissioning spare consumed over and above the recommended commissioning spares, during commissioning shall be supplied free of cost by the equipment vendor.						
	<b>17)With respect to Mandatory Spares;</b> <b>A) If any of above items indicated by the specified name are not applicable, bidder to offer alternative item serving the same function as per equipment's design and indicate below the item being replaced-</b> <b>B) If bidder is not able to meet the above note, then bidder may mention "Not Applicable". However, if found applicable during detailed engg. stage or alternative item as per equipment design can serve the same function, bidder to supply the specified quantity with out any delivery and commercial implications to BHEL.</b>						
	<b>18) Reference document: PY51709, R00 &amp; annexures.</b>						
	19) Unpriced price bid format indicating as "Quoted" against each applicable item shall be submitted duly signed & stamped along with technical offer by bidder as a token of concurrence that prices are submitted in this format only. The offer shall be liable for rejection in case if un-priced price bid format is not submitted or any modification is carried out in price bid format.						
	20) <b>In case the systems are being supplied from outside India</b> , reputed Third Party Inspection has to be considered and the charges should be included in the Main offer. The list of applicable third party shall be furnished during details Engg. For those bidders who are supplying from India, such third party inspection charges need <u>not</u> be considered and same will be arranged by BHEL/BHEL nominated inspection agency.						



## Annexure-2-B



**BHARAT HEAVY ELECTRICALS LIMITED**  
**PROJECT ENGINEERING & SYSTEMS DIVISION**  
**RAMACHANDRAPURAM: HYDERABAD - 502 032**

<b>PRICE FORMAT (R00) FOR 5 T EOT CRANE FOR CHILLER AREA</b> <b>CUSTOMER: M/S NATIONAL ALUMINIUM COMPANY LIMITED (NALCO), DAMANJODI, ODISHA</b> <b>PROJECT: 1X18.5 MW CO-GENERATION POWER PLANT, UNIT-VI</b> <b>CONSULTANT:M.N.DASTUR &amp; COMPANY (P) LTD.</b>							
SL NO	ITEM DESCRIPTION	QTY	UNIT	Weightage w.r.t Overall Price (In %)	Bidder confirmation (Quoted/ Not Quoted)	HSN/SAC Code	GST (%)
	Bidder's Name : <Bidder to indicate> Bidder's Offer No. & Dt. : <Bidder to indicate> Bidder's Ref No. & Dt. : <Bidder to indicate> BHEL Enq. No. & date : <Bidder to indicate>						
<b>I</b>	<b>MAIN OFFER</b>						
<b>A</b>	<b>MATERIAL SUPPLY-EOT CRANE(5 T)[Material Code: PY9751709032]</b>						
<b>A.1</b>	<b>EOT Crane-Main Supply</b>						
	Design, manufacture, inspection, supply to site of EOT Crane Assembly along with Commissioning Spares and Tools & tackles etc., testing at site for EOT crane as per specification. [For Detail scope of Supply & Services, Please refer respective Clauses of Technical Specification] Spares required for 2 years' normal operation and maintenance of the crane shall be included as part of Main order only.	1	No.	88			
<b>A.2</b>	<b>MATERIAL SUPPLY-DSL Conductor System</b>						
	DSL conductor system for LT (Refer note-14)	20	mtrs.				
<b>A.3</b>	<b>MATERIAL SUPPLY-LT Rails</b>						
	Crane LT rails (Refer note-14)	20	mtrs.				
<b>B</b>	<b>E&amp;C of EOT CRANE[Material code:PY9851709042]</b>						
	Erection & Commissioning of EOT crane as per specification. [For Detail scope, Please refer respective Clauses of Technical Specification]	1	No.	12			
	<b>Grand total price for sl no A to B</b> <b>(Inclusive of Packing &amp; Forwarding, Freight and Insurance)</b>			100			
<b>Packing &amp; Forwarding, Freight, Insurance and GST :</b>							
<b>(I) For Supply:</b>							
(i) Packing & Forwarding :	In bidder scope			Included in basic price			
(ii) Freight:	In bidder scope			Included in basic price			
(iii) Insurance:	In BHEL scope			--			
(iv) GST	Extra at actuals			Extra at actuals			
(v) Any other:	shall be included in basic price			Included in basic price			
<b>(II) For supervision of E&amp;C:</b>							
(i) GST:	Extra at actuals			Extra at actuals			
(ii) Any other:	Included in basic price			Included in basic price			
<b>Notes:</b>							
1) Bidder to quote strictly as per BHEL's NIT requirements.							
2) Bidders should mention the applicable HSN/SAC code along with GST% against respective line items.							
3) Bidders shall NOT fill/edit/modify anything else in the Price Bid Format.							
4) The rates of line items mentioned in the Price Format shall be derived by BHEL by multiplying the Total Bid Value quoted by the Bidder with the Weightage Factor assigned against respective line items. The rate of each item shall be rounded off to the next 1 (one) Indian paise.							
5) The Total Bid Value quoted by the Bidder shall represent the total landed cost for this enquiry and shall include Packing & Forwarding Charges, Freight and all applicable taxes & duties, other than GST. GST shall be paid extra by BHEL at applicable rates.							
6) Evaluation shall be done on the basis of total bid value (Grand Total Price as above) i.e. the total landed cost to BHEL for this enquiry.							
7) The bidders will also provide UN-PRICED PRICE FORMAT strictly in the BHEL price format given above, in the techno commercial part of their offers. BID WILL BE REJECTED IF ANY OTHER PRICE FORMAT IS USED. Both priced and un-priced price formats to be provided by the bidders shall be signed and stamped copies.							
8) Bidder to quote strictly as per BHEL's NIT requirements.							
9) Bidder to note that this is a LUMP SUM Turn-Key Order. However (a) Changes to the tender specification during execution of the project for successful operation of the system need to be carried out by bidder and commercial implications if any will be settled suitably. (b) Unit rates quoted by bidder shall be applicable for any changes in BOQ during detailed engineering stage.							
10) <b>Main offer</b> consists of those items which will be part of main order after successful bidder is identified. <b>Optional Items</b> consists of those items which need to be quoted by bidder but may or may not be ordered by BHEL. Bidders are instructed to provide the pricing details listed under <b>Main offer</b> and <b>Optional items</b> as per the prescribed format. Offer will be evaluated based on total price for Supply and Erection & Commissioning (i.e. SL Nos. 1A+1B of price format). Prices of Optional Item shall not be considered for Price bid evaluation. However, BHEL reserves the right (a) To include any of the optional items in scope of supply (as per customer contract requirements) and accordingly consider the same in evaluation. Any such scope increase and change in evaluation will be intimated to vendor during technical evaluation (before price bid opening). (b) To place PO for any of the Optional items with in the contract period. Hence bidders need to mandatorily quote reasonable prices for all optional items considering such requirement and keep the validity of the prices till the end of contract period.							
11) The Price of respective item shall be quoted Mandatorily as per the % of total prices mentioned above for Supply and E&C. Bidders need to Mandatorily quote reasonable prices for all OPTIONAL ITEMS considering such requirement and keep the validity of the prices till the end of contract period.							
12) Separate Purchase Orders will be issued for Supply portion and for Erection & Commissioning works of this project. The Purchase Order for Supply portion will be issued by BHEL-PE&SD whereas the Purchase Order for E&C portion will be issued by BHEL-Power Sector region (BHEL's Construction Management Division)							
13) Bidder to quote the base rates only. All Applicable taxes and duties to be indicated shall be indicated separately for the Supply Portion and Erection & Commissioning Portion							
14) <b>For LT Rail for Long Travel of Crane assembly</b> : Bidder to quote price for per meter length [for both sides] so that the same can be considered incase of any additional requirement. However Lowest Bidder(L1) evaluation shall be done based on present requirement (length of travel =20 m) .The variation in quantity can be from 0 to (+)10%. <b>For DSL required for Power supply to Crane assembly</b> : Bidder to quote price for per meter length so that the same can be considered incase of any additional requirement. However Lowest Bidder(L1) evaluation shall be done based on present requirement (length of travel =20 m) .The variation in quantity can be from 0 to (+)10%.							



<p>15.a) For all items including Optional items, prices to be furnished in this prescribed price bid format only for each individual item. The price to be quoted against sl no A to B shall be Weightage w.r.t Overall Price as mentioned above. No combined prices, common prices or any other format will be accepted and such bids may be liable for rejection.</p> <p>15 b) Bidder must NOT change the indicated item description, quantity &amp; units in the price bid format. Bidder should only fill the unit rates &amp; total price.</p> <p>15 c) Bidder to quote for ALL the items as per price bid format. Incomplete/partial offer may be liable for rejection.</p>
<p>16 a.) Commissioning spares are those spares which are required at the time of commissioning and shall be recommended (as per bidder's experience) and quoted by bidder. However commissioning spares indicated in the price bid format shall be quoted as minimum.</p> <p>16.b) Commissioning spare consumed over and above the recommended commissioning spares, during commissioning shall be supplied free of cost by the equipment vendor.</p>
<p>17)With respect to Mandatory Spares;</p> <p>A) If any of above items indicated by the specified name are not applicable, bidder to offer alternative item serving the same function as per equipment's design and indicate below the item being replaced.</p> <p>B) If bidder is not able to meet the above note, then bidder may mention "Not Applicable". However, if found applicable during detailed engg. stage or alternative item as per equipment design can serve the same function, bidder to supply the specified quantity with out any delivery and commercial implications to BHEL.</p>
<p>18) Reference document: <b>PY51709, R00 &amp; annexures.</b></p>
<p>19) Unpriced price bid format indicating as "Quoted" against each applicable item shall be submitted duly signed &amp; stamped along with technical offer by bidder as a token of concurrence that prices are submitted in this format only. The offer shall be liable for rejection in case if un-priced price bid format is not submitted or any modification is carried out in price bid format.</p>
<p>20) <b>In case the systems are being supplied from outside India</b>, reputed Third Party Inspection has to be considered and the charges should be included in the Main offer. The list of applicable third party shall be furnished during details Engg. For those bidders who are supplying from India, such third party inspection charges need not be considered and same will be arranged by BHEL/BHEL nominated inspection agency.</p>



**BHARAT HEAVY ELECTRICALS LIMITED**  
**PROJECT ENGINEERING & SYSTEMS DIVISION**  
**RAMACHANDRAPURI RAM, HYDERABAD - 502 032**



PRICE FORMAT (R00) FOR 7.5 T EOT CRANE FOR MILL BAY AREA  
CUSTOMER: M/S NATIONAL ALUMINIUM COMPANY LIMITED (NALCO), DAMANJODI, ODISHA  
PROJECT: 1X18.5 MW CO-GENERATION POWER PLANT, UNIT-VI  
CONSULTANT:M.N.DASTUR & COMPANY (P) LTD.

[illegible]



<p>10) <b>Main offer</b> consists of those items which will be part of main order after successful bidder is identified. <b>Optional Items</b> consists of those items which need to be quoted by bidder but may or may not be ordered by BHEL. Bidders are instructed to provide the pricing details listed under <b>Main offer</b> and <b>Optional items</b> as per the prescribed format. Offer will be evaluated based on total price for Supply and Erection &amp; Commissioning (i.e. Sl. Nos. 1A+1B of price format). Prices of Optional Item shall not be considered for Price bid evaluation. However, BHEL reserves the right</p> <p>(a) To include any of the optional items in scope of supply (as per customer contract requirements) and accordingly consider the same in evaluation. Any such scope increase and change in evaluation will be intimated to vendor during technical evaluation (before price bid opening).</p> <p>(b) To place PO for any of the Optional items within the contract period.</p> <p>Hence bidders need to mandatorily quote reasonable prices for all optional items considering such requirement and keep the validity of the prices till the end of contract period.</p>
<p>11) The Price of respective item shall be quoted Mandatorily as per the % of total prices mentioned above for Supply and E&amp;C. Bidders need to Mandatorily quote reasonable prices for all OPTIONAL ITEMS considering such requirement and keep the validity of the prices till the end of contract period.</p>
<p>12) Separate Purchase Orders will be issued for Supply portion and for Erection &amp; Commissioning works of this project. The Purchase Order for Supply portion will be issued by BHEL-PE&amp;SD whereas the Purchase Order for E&amp;C portion will be issued by BHEL-Power Sector region (BHEL's Construction Management Division)</p>
<p>13) Bidder to quote the base rates only. All Applicable taxes and duties to be indicated shall be indicated separately for the Supply Portion and Erection &amp; Commissioning Portion</p>
<p>14) <b>For LT Rail for Long Travel of Crane assembly</b> : Bidder to quote price for per meter length [for both sides] so that the same can be considered incase of any additional requirement. However Lowest Bidder (L1) evaluation shall be done based on present requirement (length of travel =37.5 m) .The variation in quantity can be from 0 to (+)10%.</p> <p><b>For DSL required for Power supply to Crane assembly</b> : Bidder to quote price for per meter length so that the same can be considered incase of any additional requirement. However Lowest Bidder (L1) evaluation shall be done based on present requirement (length of travel =37.5 m) .The variation in quantity can be from 0 to (+)10%.</p>
<p>15.a) For all items including Optional items, prices to be furnished in this prescribed price bid format only for each individual item. The price to be quoted against sl no A to B shall be Weightage w.r.t Overall Price as mentioned above. No combined prices, common prices or any other format will be accepted and such bids may be liable for rejection.</p> <p>15.b) Bidder must NOT change the indicated item description, quantity &amp; units in the price bid format. Bidder should only fill the unit rates &amp; total price.</p> <p>15.c) Bidder to quote for ALL the items as per price bid format. Incomplete/partial offer may be liable for rejection.</p>
<p>16.a) Commissioning spares are those spares which are required at the time of commissioning and shall be recommended (as per bidder's experience) and quoted by bidder. However commissioning spares indicated in the price bid format shall be quoted as minimum.</p> <p>16.b) Commissioning spare consumed over and above the recommended commissioning spares, during commissioning shall be supplied free of cost by the equipment vendor.</p>
<p>17) <del>With respect to Mandatory Spares:-</del></p> <p><del>A) If any of above items indicated by the specified name are not applicable, bidder to offer alternative item serving the same function as per equipment's design and indicate below the item being replaced.</del></p> <p><del>B) If bidder is not able to meet the above note, then bidder may mention "Not Applicable". However, if found applicable during detailed engg. stage or alternative item as per equipment design can serve the same function, bidder to supply the specified quantity with out any delivery and commercial implications to BHEL.</del></p>
<p>18) Reference document: <b>PY51709, R00 &amp; annexures</b></p>
<p>19) Unpriced price bid format indicating as "Quoted" against each applicable item shall be submitted duly signed &amp; stamped along with technical offer by bidder as a token of concurrence that prices are submitted in this format only. The offer shall be liable for rejection in case if un-priced price bid format is not submitted or any modification is carried out in price bid format.</p>
<p>20) <b>In case the systems are being supplied from outside India</b>, reputed Third Party Inspection has to be considered and the charges should be included in the Main offer. The list of applicable third party shall be furnished during details Engg. For those bidders who are supplying from India, such third party inspection charges need <u>not</u> be considered and same will be arranged by BHEL/BHEL nominated inspection agency.</p>





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# Annexure-3

**CHEKCLIST**

**FOR**

**S/G EOT CRANE FOR BFP AREA/ CHILLER PLANT AREA/ MILL BAY  
AREA**



**ANNEXURE-3 to BHEL TENDER SPECIFICATION (Doc. No. PY 51709)**

**CHECKLIST FOR SINGLE GIDER UNDER SLUNG EOT CRANE FOR BFP AREA/CHILLER PLANT AREA/MILL BAY AREA**

<b>Sl. No.</b>	<b>Description</b>	<b>Enclosed (Yes/ No)</b>
1.	Bidder to confirm that following documents are submitted along with offer:  a) Duly filled in EOT Crane datasheet [Annexure-4-A] b) Tentative GA drawing for BHEL' reference only. c) Un-priced copy of attached BHEL price bid formats indicating quoted/ not quoted against each row & column. [Annexure-2] d) Checklist [Annexure-3] e) Equipment qualification criteria / PTR / Reference Lists [Annexure: 6] f) No Deviation Certificate [Annexure-9]	
2.	Bidder to confirm that Performance requirement, Design and construction of the EOT Crane shall as per applicable BHEL & Customer specifications.	
3.	Bidder to confirm to the scope of supply as per clause no 6.0 of BHEL tender specification.	
4.	Bidder to confirm that the EOT cranes are offered as per span length & lift as specified in the specification.	
5.	Bidder to confirm that, Method of Crane control shall be as mentioned below: a) Radio Remote Control (1 No.).  Two sets of long life Nickel Cadmium batteries for the transmitter along with a battery charger shall be provided (i.e. 1 set installed battery + 1 set spare battery + 1 charger) for each radio remote.  b) Pendant push button type moving independent of crab along the full length of bridge on a separate track	
6.	Bidder to confirm that DSL conductor system is considered for Long travel of crane.	



7.	Bidder to confirm that festoon type flexible cable is considered for Trolley travel.	
8.	Bidder to confirm that Brakes for LT, CT & Hoist motion is considered in line with the specification requirement.	
9.	Bidder to confirm that the LT rails shall be as per IS3443.Flat rails are not acceptable.	
10.	Bidder to note that rail other than IS3443 or as per manufacturer standard practice/recommendation is strictly not acceptable.	
11.	Bidder to furnish a list of commissioning spares.	
12.	Bidder to furnish a list of special tools & tackles.	
13.	Bidder's confirmation required for furnishing a list of 3 year recommended spares in their offer separately with optional price as per price bid format.	
14.	Bidder to confirm that all accessories required to make EOT crane operation trouble free & all the accessories required during Erection & Commissioning shall be in their scope.	
15.	Bidder to furnish Reference list/Equipment Qualification criteria as per clause no 7.0 of BHEL specification.	
16.	Bidder to Confirm that all Inspection & acceptance, type Tests as required for each equipment, as per specification and Codes attached.	
17.	Bidder to Confirm that all sub vendor items shall be procured from the approved vendors listed in the bid package. [Refer Annexure-7].Sub vendor list furnished by the bidder shall be ignored by us.	
18.	Bidder to check the master document list and submit all the required documents as per the master document list (Annexure-8) without fail and take the approval of BHEL/Customer/Consultant.	
19.	Bidder to confirm that the Speed for Hoist Motion, Long Travel and Cross Travel is considered as specified in BHEL tender Specification.	
20.	Arrangement of Inspection agency [statutory / TPI certification as applicable for state] by vendor. The complete responsibility of coordinating with any of the statutory authority prior to and during the test load at site shall be in the scope of Bidder. Pl confirm.	
21.	Bidder to submit Annexure: 9 indicating as No Deviation along with their offer. Any specific deviations, with respect to specification requirement due to design constraints and OEM limitation, which are impractical to meet, shall be raised in form of pre-bid queries as per Annexure: 10 before submission of Techno Commercial offer.	
22.	Bidder to confirm that bidder has quoted as per BHEL price format only. Price quoted as per the price bid format, clearly indicating all the applicable items are quoted, and not applicable items are clearly highlighted. Un priced copy of the same is enclosed. [Refer Annexure-2].	



23.	Bidder to confirm that bidder has quoted individual price for each item mentioned in the seal priced bid. Bidder to confirm the same.	
24.	Bidder to confirm that the prices of respective items is matching with the weightage% of total price mentioned against each item.	
25.	Bidder to note that Necessary lugs & Glands shall be considered and supplied by Bidder, wherever required for cable termination.	
26.	Bidder to note that all consumables, chemicals, lubricants etc. required during E&C arranged by bidder. Further a detailed lubrication schedule having details about requirement of consumables, chemicals, lubricants, frequency of filling etc. to be furnished by bidder post order stage.	
27.	Painting schedule shall be as per Annexure-5 of Tender Specification, Bidder to Confirm.	
28.	Make of all the items shall be as per Annexure-8 (Sub-Vendor List). Bidder to confirm.	
29.	Bidder to confirm compliance with Annexure-9, Master Document List enclosed with Tender Specification, w.r.t list of documents, schedule of submission.	

DATE: \_\_\_\_\_

SIGNATURE:

NAME:

DESIGNATION:

COMPANY: \_\_\_\_\_





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# Annexure-4

## CUSTOMER/CONSULTANT SPECIFICATION AND BHEL STANDARD



**SECTION-XI-D****QUESTIONNAIRE – CRANES & HOISTS**

The Tenderer shall fill this questionnaire separately and submit with each copy of his offer. This information is required in this form to facilitate tender processing even though it may be duplicate information presented elsewhere in his offer. This data shall form a part of the contract with the successful Tenderer.

This questionnaire does not supersede instructions in the tender documents relating to the descriptive and other information to be submitted with the offer for a complete understanding of the equipment offered and its operation.

**I. DG AND SG (UNDER SLUNG & RAIL MOUNTED) EOT CRANES:**

1. Tenderer's name and address :
2. Quotation No. and date :
3. Location, Capacity & Qty, tons & Nos. :
4. Span, m :
5. Duty classification and relevant standard followed :
6. Total weight of crane including electrical equipment, t :
7. Total weight of trolley including electrical equipment, t :
8. Maximum wheel load without impact, t :
9. Crane Purpose & Location :
10. Power consumption  
- with 100% load :





Section-XI-D Questionnaire – Cranes & Hoists (cont'd)

- with 75% load :
- with 50% load :

**11.0 Main Hoist**

11.1 Speed, m / min.

- With safe working load :

No. of Speed ranges and  
percentage of rated  
speeds :

11.2 Lifting height, m

- Above floor level :
- Below floor level :

11.3 Wire rope

- Type and construction :
- Rope dia, mm :
- Tensile designation, KN :
- No. of falls/Br. Load, KN :
- Factor of safety :
- Make :

11.4 Rope drum

- Material of construction :
- Diameter x length, mm :

11.5 Rope sheaves – Main /  
equaliser

- Material :
- Diameter, mm :

11.6 Type and material of gear  
box :

Gears and pinions

- Helix angle :





Section-XI-D Questionnaire – Cranes & Hoists (cont'd)

- Material :
- Hardness, BHN :

Gear box

- Type, vertical/horizontal :
- Material of casing :

11.7 Motor

- No. of motors & type :
- Frame size :
- kW rating (computed / frame) :
- Duty rating :
- Synchronous speed/  
rated speed, rpm :
- No. of starts/hour :
- Class of insulation :
- Pull out torque :
- Type of enclosure :
- Type of cooling :
- Make :
- Confirm that motor is  
suitable for VSD with  
speed control range of 10  
to 100% :
- Confirm the process of  
insulation provided for  
motor (VPI) :

11.8 Brakes :

- Type and make :





Section-XI-D Questionnaire – Cranes & Hoists (cont'd)

- Quantity & size, mm :
- Computed torque rating, :  
kgm
- Min / max torque rating :  
of brake selected, kgm
- 11.9 Type and details of limit :  
switches
- Make :
- Quantity :
- 11.10 Make & type of flexible :  
couplings
- Between motor and gear :  
box
- Between gear box and :  
rope drum
- 11.11 Make & type of bearings :
- 11.12 Lifting hooks
- Type and material :
- Standard followed for the :  
hook
- 11.13 Type and rating of :  
resistances, where  
applicable
- 11.14 Type and details of VSD :  
controls (attach detailed  
write-up of Variable speed  
drive)
- 12.0 Auxiliary Hoist**
- 12.1 Speed
- With max. Safe working :  
load, m / min.





Section-XI-D Questionnaire – Cranes & Hoists (cont'd)

- Speed
- No Speed ranges and percentages of rated speeds :
- 12.2 Lifting height, m
- Above floor level :
  - Below floor level :
- 12.3 Wire rope
- Type and construction :
  - Rope dia, mm :
  - Tensile designation, KN :
  - No. of falls :
  - Factor of safety :
  - Make :
  - Breaking load, KN :
- 12.4 Rope drum
- Material of construction :
  - Diameter x length, mm :
- 12.5 Rope sheaves – Main / equaliser
- Material :
  - Diameter, mm :
- 12.6 Type and material of gear box :
- Gears and pinions
- Material :
  - Hardness, BHN :
- Gear Box
- Type :





Section-XI-D Questionnaire – Cranes & Hoists (cont'd)

- Material of casing :
- 12.7 Motor
- No. of motors & type :
- Frame size :
- kW rating (computed / frame) :
- Duty rating :
- Synchronous speed / rated speed, rpm :
- No. of starts / hour :
- Class of insulation :
- Pull out torque :
- Type of enclosure :
- Type of cooling :
- Make :
- Confirm that motor is suitable for VSD with speed control range of 10 to 100% :
- Confirm the process of insulation provided for motor (VPI) :
- 12.8 Brakes :
- Type and make :
- Quantity & size, mm :
- Computed torque rating, kgm :
- Min./max. torque rating of brake selected, kgm :





Section-XI-D Questionnaire – Cranes & Hoists (cont'd)

12.9 Type and details of limit switches :

- Make :

- Quantity :

12.10 Make & type of flexible couplings

- Between motor and gear box :

- Between gear box and rope drum :

12.11 Make & type of bearings :

12.12 Lifting hooks

- Type and material :

- Standard followed for the hook :

12.13 Type and rating of resistance :

12.14 Type and details of VSD controls (attach detailed write-up of Variable speed drive) :

**13.0 Trolley**

13.1 Speed, m / min. with maximum working load :  
Speed

13.2 Wheel track gauge, mm :

13.3 Wheel base, mm :

13.4 Diameter of wheels, mm :

13.5 Material and hardness of wheels :

13.6 Type & material of gear box :





Section-XI-D Questionnaire – Cranes & Hoists (cont'd)

13.7 Gears & Pinions

- Material :
- Hardness, BHN :

Gear Box

- Type, vertical/horizontal :
- Material of casing :

13.8 Size of trolley runway rail :

13.9 Motor

- No. of motors & type :
- Frame size :
- kW rating  
(computed/frame) :
- Duty rating :
- Synchronous speed /  
rated speed, rpm :
- No. of starts / hour :
- Class of insulation :
- Pull out torque :
- Type of cooling :
- Type of enclosure :
- Make :
- Confirm that motor is  
suitable for VSD with  
speed control range of 10  
to 100% :
- Confirm the process of  
insulation provided for  
motor (VPI) :





Section-XI-D Questionnaire – Cranes & Hoists (cont'd)

- 13.10 Brakes :
- Make and type of brake :
  - Quantity & size, mm :
  - Computed torque rating, :  
kgm
  - Min./max. torque rating :  
of brake selected, kgm
- 13.11 Make and type of bearings :
- 13.12 Make & type of flexible coupling
- Between motor and gear :  
box
  - Between gear box and :  
wheel
- 13.13 Limit switches
- Type :
  - Quantity :
  - Make :
- 13.14 Buffer force & compression :
- 14.0 Bridge**
- 14.1 Speed, m/min. with :  
maximum working load
- Speed :
- 14.2 Wheel base, mm :
- 14.3 Overall buffer dimension, :  
mm
- 14.4 Diameter of wheels, mm :
- 14.5 No. of wheels on each end :  
carriage





Section-XI-D Questionnaire – Cranes & Hoists (cont'd)

- 14.6 Material and hardness of wheels :
- 14.7 Type and material of gear box :
- 14.8 Gears & Pinions
- Material :
  - Hardness, BHN :
- Gear Box
- Type, vertical or horizontal :
  - Material of casing :
- 14.9 Motor
- No. of motors & type :
  - Frame size :
  - kW rating (computed/ frame) :
  - Duty rating :
  - Synchronous speed/rated :
  - No. of starts/hour :
  - class of insulation :
  - Type of enclosure :
  - Pull out torque :
  - Type of cooling :
  - Make :
  - Confirm that motor is suitable for VSD with speed control range of 10 to 100% :





Section-XI-D Questionnaire – Cranes & Hoists (cont'd)

- Confirm the process of insulation provided for motor (VPI) :
- 14.10 Brakes
  - Make and type of brakes :
  - Quantity & size, mm :
  - Computed torque rating, kgm :
  - Min. / max. torque rating of brake selected, kgm :
- 14.11 Make and type of bearings :
- 14.12 Make and type of flexible coupling
  - Between motor and gear box :
  - Between gear box and wheel :
- 14.13 Type and details of limit switches
  - Make :
  - Quantity :
- 14.14 Buffer force & compression :
- Electrical**
- 15.0 Operation of Crane from :
- 16.0 Make, type and insulation of flexible cable and details of cable and details of cable trolley for CT :
- 17.0 Details of Crane main power conductors and current collectors :
- 18.0 Enclosed general arrangement drawing of crane : Drawing No. \_\_\_\_\_





Section-XI-D Questionnaire – Cranes & Hoists (cont'd)

19.0 Whether details of electrical :  
controls and equipment as  
specified in the relevant  
clauses along with  
speed/torque curves for all  
drives enclosed

**Painting**

20.0 Painting system followed :

**Others**

21.0 Whether list of tools & :  
tackles quoted

22.0 Whether list of 2 years' :  
spares quoted

23.0 Whether list of :  
commissioning spares  
enclosed

24.0 Whether typical calculation :  
of motor kW & brake torque  
ratings submitted

25.0 Lubrication system followed :  
for crane / crab

**26.0 Type of tests proposed to  
be conducted**

- At works :

- At site :

27.0 Deviations if any from the :  
specification and details  
thereof

**II. ELECTRIC WIRE ROPE  
HOISTS**

**1.0 GENERAL**

1.1 Tenderer's name and :  
address





## **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.





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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.





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

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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°C.
5. Hoist motor shall have six numbers thermistors, two numbers per phase, embedded in the stator winding to protect the same from over heating. Thermistor connections shall be provided in a separate terminal box of motor. Thermistor 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%.





## Section-V- Cranes &amp; Hoists (cont'd)

<b>Sl. No.</b>	<b>Description</b>			
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





## Section-V- Cranes &amp; Hoists (cont'd)

<b>Sl. No.</b>	<b>Description</b>			
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.			





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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%, &  $\pm 5\%$  anticipated voltage and frequency variation respectively. Necessary step down transformers and converters shall be provided on the cranes and hoists:





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

- i) 415V 3-phase, 50 Hz, AC : For motor and electro-hydraulic thrusters.
- 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 thruster brakes shall be used for individual motors. LT motions shall be provided with suitable lever operated limit switches.





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

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  $\pm 3\%$ . 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°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





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

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.





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

**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.





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

*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





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

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.





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

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





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

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 thruster 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





## Section-V- Cranes &amp; Hoists (cont'd)

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/sec <sup>2</sup> 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.





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

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.






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

- 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  $\pm 5$  per cent and  $\pm 10\%$  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.






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

- 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.





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

- 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





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

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.

5.16.10.1.10 For 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





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

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





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

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.





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

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

## **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.





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

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:






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

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                                      | : | $\pm 6\text{mm}$ upto 40 Metres<br>$\pm 7.5\text{ mm}$ above 40 Metres |
| b) | Diagonal on wheels                                       | : | $\pm 5\text{ mm}$  |
| c) | Trolley track gauge                                      | : | $\pm 3\text{ mm}$  |
| d) | Long travel wheel alignment<br>(Horizontal and Vertical) | : | $\pm 0.5\text{ mm}$  |
| e) | Tilt of wheels or balance axle                           | : | $\pm 0.25\text{ mm}$   |






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

- 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	: $\pm 10\%$
Lowering	: $+20\%, -10\%$
Traversing	: $\pm 10\%$
Travelling	: $\pm 10\%$

- h) Wheel load :  $\pm 3\%$  of the calculated value





## Section-XIII- Performance Guarantee and price reduction Schedule (cont'd)

**PERFORMANCE GUARANTEE AND PRICE REDUCTION SCHEDULE****E) CRANES AND HOISTS**

The following shall be demonstrated:

<b>Sl. No.</b>	<b>Guaranteed parameters</b>	<b>Demonstrated Value</b>	<b>Acceptable tolerance limit</b>	<b>Remarks</b>
1.	Lifting capacity (SWL) of cranes/hoists, t	<b>A) EOT Cranes:</b> i) 35/5T – DG – (TG) ii) 7.5T – SG U/S-(BFP) iii) 15 T – SG U/S-(Mill bay) iv) 5 T – SG U/S-(Chiller plant)	NIL	Tenderer to rectify within reasonable time period.
2.	Total lifting height of cranes/hoists, m	<b>A) EOT Cranes:</b> i) 35/5T -16m/16.5m ii) 7.5T -10.5 m iii) 15 T - 6 m iv) 5 T - 6.5 m	NIL	Tenderer to rectify within reasonable time period.





## Section-XIII- Performance Guarantee and price reduction Schedule (cont'd)

Sl. No.	Guaranteed parameters	Demonstrated Value	Acceptable tolerance limit	Remarks
		<b>B) Electrical Hoists</b>		
3.	Operating speeds with and without SWL (in both directions) for various motions.	<b>A) EOT Cranes:</b> <b>i) 35/5T</b> - Main hoist, m/min-1 & 0.1	± 10%	Tenderer to rectify within reasonable time period.
		<b>ii) 7.5 T</b> - 8 m/min (Hoisting) - 10 m/min (CT) - 30 m/min (LT)	± 10%	Tenderer to rectify within reasonable time period.
		<b>iii) 15 T</b> - 8 m/min (Hoisting) - 10 m/min (CT) - 30 m/min (LT)	± 10%	Tenderer to rectify within reasonable time period.
		<b>iv) 5 T</b> - 8 m/min (Hoisting) - 10 m/min (CT) - 30 m/min (LT)	± 10%	Tenderer to rectify within reasonable time period.





## Section-XIII- Performance Guarantee and price reduction Schedule (cont'd)

Sl. No.	Guaranteed parameters	Demonstrated Value	Acceptable tolerance limit	Remarks
		<b>B) Electrical Hoists</b> i) 3 T - 8 m/min (Hoisting), 12 m/min (Travel)	± 10%	Tenderer to rectify within reasonable time period.
4.	Deflection of bridge girder with SWL, mm.	As per IS-800-2007, Table-6	Nil	Tenderer to rectify within reasonable time period.

**Note:**

\* DG –Double Girder, SG – Single Girder, U/S – Under Slung, t- tonne

1. If any changes w.r.t. the values, the same shall be indicated in the offer.





TABLE-4

**SPECIFICATION FOR GENERAL PURPOSE 415 V AC MOTORS**  
**(NOTE: TENDERER TO CONFIRM CLAUSE-WISE)**

Sl. No.	Description	Requirement	Confirmation by Tenderer
<b>1.0</b>	<b>General</b>	General Purpose 415V Motors, Energy efficient type, generally rated up to 180 KW, with robust industrial design, fully de-rated for the ambient and duty conditions specified and fully conforming to Indian standards for Design, Construction and Testing features	
<b>2.0</b>	<b>Applicable Standards</b>		
2.1	Flame proof enclosure for electrical apparatus	IEC: 60079-1, 2007	
2.2	Permissible limits of noise level by rotating electrical machines	IS: 12065, 1987 (2009)	
2.3	Mechanical vibration of rotating electrical machines	IS: 12075, 2008	
2.4	Dimensions of 3-phase foot/flange mounted induction motors / vertical shaft motors	IS: 1231 / IS: 2223 / IS: 2254	
2.5	Energy Efficient 3 phase squirrel cage induction motors.	IS: 12615, 2011	
2.6	Method of determination of Efficiency of rotating electrical machines	IS: 4889	
2.7	Designation of methods of cooling of rotating electrical machines	IS: 6362, 1995 (2017)	





## Section-III, Table-4 (cont'd)

Sl. No.	Description	Requirement	Confirmation by Tenderer
2.8	Rotating Electrical Machines - Rating & Performance	IS/IE:- 60034, Part-1 2004	
2.9	Degree of protection provided by enclosure for rotating electrical machinery.	IS/IEC: 60034, Part-5, 2000 (2007)	
2.10	Terminal marking and direction of rotation for electrical machines	IS/IEC: 60034, Part-8, 2002	
2.11	Methods of measuring temperature rise of electrical equipment	IS: 9678, 1980 (2009)	
2.12	Safety	Central Electricity Authority (CEA), I.E. Rules and guidelines of statutory authorities of Odisha State Government.	
<b>3.0</b>	<b>Environment</b>		
3.1	Voltage/System	415V $\pm$ 10%, Frequency 50 Hz $\pm$ 5%, 3 Phase, 4 wire System, solidly grounded neutral	
3.2	System Short circuit level	36 MVA	
3.3	Altitude/Temperature/RH	Less than 1000 m above MSL / 50 Deg C/ 100% RH	
3.4	Special requirements	Based on actual site requirements/ higher ambient where required	
3.5	Starting requirements for Direct On Line (DOL) starting	All DOL start motors shall be capable of starting and accelerating the coupled loads with 75% of the rated voltage at the motor terminals without injurious heating, within the rated hot thermal withstand time of the motor.	





## Section-III, Table-4 (cont'd)

<b>Sl. No.</b>	<b>Description</b>	<b>Requirement</b>	<b>Confirmation by Tenderer</b>
3.6	Derating	The motor as well as its various components shall be suitably derated for satisfactory operation for specified altitude, ambient temperature, relative humidity, voltage and frequency variations, derating for special requirements stated above.	
<b>4.0</b>	<b>Execution Options</b>		
4.1	Adoption of type of motor		
4.1.1	Squirrel cage induction motors	For continuous duty applications for centrifugal fans/pumps and compressor drives	
4.1.2	Inverter grade motors	For satisfactorily working with IGBT transistor based inverter supplies	
4.2	Location	Indoor / Outdoor	
4.3	Speed (no of Poles)	To suit mechanical equipment supplier's requirement.	
4.4	Type of Mounting	IM 1001 / IM 1002 / other types to suit mechanical equipment supplier's requirement	
4.5	Method of cooling	IC 410 / IC 411 ( as per IS 6362 )	
4.6	Duty	Continuous duty S1 / other intermittent duties like S2 / S3 / S4 or any other duty to suit driven equipment's requirement / process requirement.	
4.7	Type of Starting / Controls	DOL Starting / IGBT based Inverter Circuit for variable speed drives	
4.8	Type of braking	Type to suit the driven equipment's requirement.	
4.9	No of starts for continuous duty motors	4 cold starts or 3 hot starts on an hourly basis	
4.10	Overload requirement	To suit driven equipment's requirement.	





## Section-III, Table-4 (cont'd)

<b>Sl. No.</b>	<b>Description</b>	<b>Requirement</b>	<b>Confirmation by Tenderer</b>
4.11	Over speed requirement	To suit driven equipment's requirement.	
4.12	Degree of protection	IP 54 for indoor. IP 55 for outdoor with additional removable canopy protection over the motor.	
4.13	Accessories	Brakes / Clutches /Geared Limit switches / encoders /Embedded temperature detectors etc., as may be required for individual application and control	
<b>5.0</b>	<b>Construction details</b>		
5.1	Frame Sizes	To conform to IS / IEC standard frame sizes.	
5.2	Energy Efficient motors for continuous duty applications	Shall conform to category, "IE2 for the VFD application and IE3 for other application as per IS: 12615.	
5.3	Ratings	Ratings shall be as per the preferred series and shall be based on design ambient temperature of 50 deg. C. The rating shall suit the driven equipment's requirement. Nevertheless, the rating of the motors including the over-load requirement selected shall be based on the class of duty and the load imposed by the equipment with a minimum reserve of 10% over the maximum load demand of the driven equipment at the design duty or any other duty that may arise during operation.	
5.4	Starting Current requirements	To be limited to 6 times the rated full load current in the case of squirrel cage motors when started directly on line.	
5.5	Starting Torque Requirements	To suit driven equipment's requirement and in conjunction with the selection of the speed – torque characteristics described in 5.6 below.	





## Section-III, Table-4 (cont'd)

<b>Sl. No.</b>	<b>Description</b>	<b>Requirement</b>	<b>Confirmation by Tenderer</b>
5.6	Matching of Speed-Torque Characteristics	The speed-torque characteristics of the motor and its driven equipment shall be fully matched in order to obtain smooth acceleration without overheating of the motor and over-stressing of the mechanical parts of the driven equipment.	
5.7	Moment of Inertia	The motor inertia shall be taken into account along with that of the driven equipment to arrive at the starting time which shall be within the limit value set by the thermal withstand time (hot) specified for the motor.	
5.8	Pull out torque	Pull out torque as required by the driven equipment shall be considered. However, a minimum 200% at rated voltage and frequency for squirrel cage motors shall be considered.	
5.9	Construction aspects in brief		
5.9.1	Housing	Cast Iron / Fabricated steel	
5.9.2	Stator	Low loss, insulated CRGNO silicon steel	
5.9.3	Rotor	Die cast aluminium / copper bars	
5.9.4	Shaft	Carbon steel EN8 with open key ways as required	
5.9.5	End shield and bearing cover	Cast Iron	
5.9.6	Bearing and lubrication	Ball/roller bearing with Lithium complex based lubrication.	
5.9.7	Oil seal	Synthetic rubber	
5.9.8	Fan	Polypropylene / aluminum alloy, bi-directional and with aerodynamic design	
5.9.9	Fan cover	Deep drawn steel	
5.9.10	Motor feet	To be integrated cast with the stator to prevent breakage from vibrations.	





## Section-III, Table-4 (cont'd)

<b>Sl. No.</b>	<b>Description</b>	<b>Requirement</b>	<b>Confirmation by Tenderer</b>
5.10	Windings and insulation for stator and rotor		
5.10.1	Windings	99.9% pure, electrolytic grade copper windings	
5.10.2	Insulation	Class F for DOL/RDOL application. Class H for VFD application.	
5.11	Temperature Rise	Limited to that of Class B.	
5.12	Terminal Boxes	The terminal boxes shall be of adequate size for terminating the required no. and size of XLPE insulated, armoured, stranded aluminium conductor cables. Adequate clearance shall be given between live terminals and covers. All six terminals shall be brought out in the terminal box for making star or delta connections as needed. Material: Pressed steel / Cast iron - Degree of Protection IP 55 and shall be possible to mount at top. Terminal Plate: DMC /Epoxy board with steel / brass studs. The orientation of the terminal boxes shall be changeable at site through rotation by 90 degrees.	
5.13	Number of shaft extensions	To suit driven equipment's requirement.	
5.14	Rating Plate / Lifting hooks/ lugs / drain holes with plugs / guards for free shaft ends and couplings	Standard arrangement to be provided.	
5.15	Anti-condensation Heaters	To be provided through separate terminal boxes. Indoor duty = 37 KW and above; Outdoor duty = 30 kW and above.	
5.16	Limits of vibration	The motor shall be dynamically balanced and shall satisfy the requirement specified in IS:12075.	





## Section-III, Table-4 (cont'd)

Sl. No.	Description	Requirement	Confirmation by Tenderer
5.17	Limits of Noise level	The motor shall satisfy the requirement specified in IS: 12065 or lower values in specified cases / as per customer's requirement.	
5.18	<i>Temperature Detectors</i>	As required the motors shall have duplex type, two nos. per phase for winding temperature and two nos. for each bearing temperature, one for driven end & one for non driven end.	
5.19	<i>Special Requirement for Inverter grade Motors for satisfactory working in conjunction with IGBT Transistor based Inverters.</i>		
5.19.1	Increased insulation levels	For stator windings - turn to turn insulation, phase to phase insulation and ground insulation. (Insulation shall withstand a peak value of not less than 1600 V at the motor terminals)	
5.19.2	Formed coils	For higher frame sizes / kW ratings in place of wound coils	
5.19.3	Derating	Thermal derating due to reduced ventilation obtained in lower speeds for motors with IC 411 cooling. As an alternative, suitable separately powered cooling blowers mounted on the motor may be considered	
5.20	<b>Painting</b>	As per IS 5, Finish coat shall conform to shade 632 for outdoor equipment and shade 631 for indoor equipment	
6.0	<b>Safety features</b>		
6.1	Earthing	The Motor body shall be provided with two (2) separate earthing terminals for earthing in compliance with I.E. Rules.	
6.2	Canopy for motor	To be provided for all outdoor installed motors.	





Section-III, Table-4 (cont'd)

<b>Sl. No.</b>	<b>Description</b>	<b>Requirement</b>	<b>Confirmation by Tenderer</b>
7.0	<b>Documents</b>		
7.1	Performance Curves	Tenderer to furnish the following Performance Curves 1) Matched speed-torque curves of the motors superimposed with those of the driven load. 2) Performance curves for Starting Current, Starting Time, Efficiency & Power Factor for each motor 3) Thermal withstand curves for both Hot and Cold condition.	
7.2	Calculation / data sheets supplied by drive manufacturer	Tenderer to furnish required data sheets for the Motor. Tenderer shall also furnish calculation for Motor Sizing.	



## Section-I- General (cont'd)

### **3.11 Painting**

3.11.1 All items of equipment shall be thoroughly cleaned and painted with two coats of approved primer and minimum two coats of approved finish paint.

3.11.2 The term 'Painting' referred herein covers rust preventive and decorative organic, inorganic and metallic coating and surface protection for the equipment/ components including the following:

- Structural steelwork.
- Various equipment inclusive of electric motors, panels, control desks and accessories.
- Steel tanks, heat exchangers and vessels.
- Pipework including supports, hangers etc.

Surface preparation, being a pre-requisite for any paint application, shall be such as to clean the surface thoroughly of any materials which will be conducive to premature failure of the paint substrata.

All surfaces shall be cleaned of loose substances and foreign materials, such as dirt, rust, scale, oil, grease, welding flux etc. irrespective of whether the same has been spelt out in the standards or not in order that the prime coat is rigidly adhered to the virgin metal surface.

### **3.11.3 Painting system**

Paint shall be applied in accordance with paint manufacturer's recommendations. The work shall generally follow relevant Indian Standards.

All fabricated steel structures, vessels, heat exchangers which have surface temperature less than 80°C shall have a minimum of two primer coats prior to despatch to site. The paint system shall be PVC Copolymer based primer or alkyd resin based primer paint of approved make. Two finish coat of PVC-Copolymer paint or synthetic enameling alkyd resin paint as applicable shall be applied at site. The dry film thickness of the four coats shall not be less than 120 microns.





#### Section-I- General (cont'd)

All fabricated steel structures, vessels, heat exchangers which have surface temperature more than 80°C and less than 150°C shall have a minimum of two primer coat of Zinc ethyl silicate and one finish coat of high build epoxy polyamide enamel prior to dispatch to site. One finish coat of high build epoxy polyamide enamel paint shall be applied at site. The dry film thickness of the three (3) coats shall not be less than 120 microns. All standard bought-out items and machines such as pumps, fans, motors, valves, cylinders, electrical and instrumentation panels etc. shall generally be painted as per the manufacturers' standard and shall meet the requirement of the exposure condition and the specific system of painting thereof. These shall also have a minimum of two primer coats and one finish coat of paint with a total dry film thickness of not less than 105 microns.

Over-ground pipework inclusive of pipes, fittings, hangers, cable ducts etc., both insulated and non-insulated, shall be painted with two coats of alkyd based red-oxide or zinc-phosphate pigments as primer paint before despatch. The minimum dry film thickness per coat shall be 40 microns.

Non-insulated pipes, having a maximum surface temperature of 60°C shall be applied with one intermediate coat of single pack high build oil alkyd based paint with micaceous iron oxide and two finish coats of single pack air drying high gloss oil alkyd modified synthetic enamel paint with suitable pigments over and above the primary coats. The minimum dry film thickness per coat shall be 70 microns and 25 microns for intermediate and finish coat respectively.

#### 3.11.4 Colour code

Shades of finish coats of paint applied over the surfaces shall be as given below:

<b>Service</b>	<b>Colour</b>	<b>Shade as per IS:5</b>
Steam		
- Below 3.5 kscg	Band - Canary Yellow	309
- 3.5 to 20 kscg	Band - Gulf Red	473
- Above 20 and up to 40 kscg	Band - French Blue	166
- Above 40 kscg	Band - Signal Red	537





## Section-I- General (cont'd)

<b>Service</b>	<b>Colour</b>	<b>Shade as per IS:5</b>
Demineralised water	Base- Sea Green	217
	Band- Light Orange	557
Condensate	Base - Sea Green	217
	Band - Light Brown	410
Cooling water	Base - Sea Green	217
	Band - French Blue	166
Plant air	Base - Sky Blue	101
Instrument air	Base - Sky Blue	101
	Band - Silver Grey	628
Drinking water	Base - Sea Green	217
	First band - French Blue	66
	Second band - Signal Red	537
Electrical and Control Panels	Light Grey (Indoor)	631
	Dark Admiralty Grey (Outdoor)	632

Base colour shall be applied throughout the entire length for uninsulated pipes and for a 2 metre over the aluminium sheeting at places requiring colour bands for insulated pipes.

Colour bands shall be applied at battery limit points, intersection in pipe rack, near valves and junction points, mid-way of each piping system and at 50 metre interval for yard piping.

Flow direction shall be indicated by black or white arrow, in contrast to the colour on which they are superimposed.

### 3.12 Noise abatement

The tenderer shall adopt good engineering practices such as well balanced machinery, acoustically correct enclosures, structures and supports from resonance, acoustically designed fluid paths for ducting and pipework etc. The noise level shall be restricted to 85 dB(A) at 1 metre distance for all rotating equipment like ID fans, PA fans, FD fans, boiler feed pumps etc. **Suitable silencers shall be provided at the outlet of safety valve** to limit the noise level to 110 dB (A) at 10 metre distance during start-up/normal operation.



## **SHOP PAINTING CERTIFICATE**

Equipment/ : Item	Qty:	Project: Drg. No.
Painting Certificate No. and date:		

**Surface Preparation and Painting has been done as per Painting System (System No. ....) of General Specification No. .... for Painting applicable for the Project.**

**Details of Painting are as follows:**

<b><u>Surface Preparations</u></b>						
Required:						
Observed:						

<b><u>Inside Painting :</u></b>						
Coat Detail	Paint Detail	Paint Shades	No. of	Detail/Coat in Microns		Total DFT
		Adopted	Coat	Required	Observed	(in Micron)
Primer						
Coat						
Intermediate						
Coat						
Finish						
Coat						

**Outside Painting :**

Coat Detail	Paint Detail	Paint Shades	No. of	Detail/Coat in Microns		Total DFT
		Adopted	Coat	Required	Observed	(in Micron)
<b>Primer</b>						
<b>Coat</b>						
Intermediate						
Coat						
Finish						
Coat						

\_\_\_\_\_  
**Signature of Manufacturer**

\_\_\_\_\_  
**Signature of Contractor**





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## DOMESTIC PACKING

## COMMON GUIDELINES

## 1 GENERAL:

This standard lays down packing instructions for domestic packing of Components/Assemblies/Equipment to be despatched against Customer's contracts, for which there are no special instructions issued by the Engineering Departments.

The Components/Assemblies need to be packed suitably to avoid physical damage & corrosion during transit & storage. For specific applications the concerned engineering department shall issue a product standard. Reference of this product standard, must appear in the Shipping list/Packing List.

## 2 TYPES OF PACKING:

The following 5 types of packings have been standardized for packing of General Components/Assemblies.

- 1) 'OP' - Open Type.
- 2) 'PP' - Partially Packed.
- 3) 'CP' – Crate/Box Packing - Components/Equipment requiring physical protection.
- 4) 'CQ' - Case Packing - Small & Medium Components/ Assemblies/ Equipment which require corrosion & physical protection.
- 5) 'CR' - Case Packing - Electrical Components/Assemblies, which require special packing viz. Water Proof, Shock Proof etc...

## 3 DESCRIPTION OF TYPES OF PACKING:

The various types of packing, as standardized above, are described below.

## 3.1 'OP' - Open Type

In case, of components which are not affected by water & dust and do not require special protection, are generally not machined, shall be sent as open packages. However, these components may be sent in crates, wherever necessary.

## 3.2 'PP' - Partially Packed

Components which need special protection at selected portions only shall be despatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces should be protected with 70GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film to Specification No.AA51420. All sharp corners and edges shall be protected by rubber mats to prevent damage to the polyethylene film

## 3.3 'CP' - Crate Packing

Assemblies/Components which need only physical protection from the point of view of handling shall be despatched duly packed in crates.

## 3.4 'CQ' - Case Packing - Machined Components/Assemblies/Equipment

Small and medium sized components/assemblies/equipment due to size/weight and to avoid handling and pilferage problems shall be packed in Case/Containers. Wherever required adequate quantity of

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silica gel to AA55619 or VCI Powder/Tablets, packed in thin muslin cloth cotton bags shall be suitably placed. Small machines/components of less weight shall be provided with suitable cushioning by Rubberised coir. The components inside the case shall be entirely covered with 70GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No. AA51420, wherever required.

### **3.5 'CR' - Case Packing - Electrical & Electronic Components/Assemblies**

Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons. Adequate quantity of Silica gel to AA55619 packed in cotton bags of 100grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with 70GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No. AA51420 before being packed in the cases. VCI Powder/Tablets can be used as an alternative to Silica Gel to AA 55619.

Empty space in the cartons shall be filled with rubberized coir to get proper cushioning effect. The cartons shall be manufactured from corrugated Fiber Board, meeting requirements of AA51414.

## **4 PREPARATION OF PACKING CASES**

### **4.1 DOMESTIC:**

Based on the availability, the wood shall be Rubber wood (Havea Brasiliensis)/Pine wood for packing of cubicles, loose items, spares and photovoltaic items meant for customers in India.

### **4.2 DIMENSIONS:**

- Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25 +2/-3 mm.
- Width of all planks including the tongue shall be more than 125mm and after planing it shall be minimum 100mm.
- Minimum number of planks shall be used for a shook.
- Horizontal, vertical, diagonal planks shall be given for binding (number of such planks depend on the dimension of panel).
- External sides of front and rear planks to be planed to facilitate writing of address and other markings.
- Width of binding planks shall be minimum 100mm.
- Distance between any 2 binding planks shall be less than 750mm.
- diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm
- Distance of the outer edges of these planks from the edge of case shall be less than 250mm.
- Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.

### **4.3 JOINTING OF PLANKS**

Single length planks shall be used for cubicles whose overall length is less than 2400mm. For cubicles of length more than 2400mm, jointing is permitted. The jointing shall be done with one single or maximum of 2 planks of wood same as other planks of width 250 mm (minimum) with two rows of nails on either side of the joint in zigzag manner. From the joint along height side, it shall be of lap joint with overlap of at least the width of plank.

### **4.4 TONGUE AND GROOVE JOINTS**

Two Consecutive planks shall be joined by tongue and groove joint. Depth of tongue shall be 12+1 mm, thickness of tongue shall be 8 +1 mm. The groove dimensions shall be such that the tongue fits tightly into the groove to make a good joint. This type of joint can be done based on the product requirement wherever required.

### **4.5 PERMISSIBLE DEFECTS**

Wood shall be free from knots, bows, visible sign of infection and any kind of decay caused by insects, fungus, etc.





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**End splits:** Longest end splits at each end shall be measured and lengths added together. The added length shall not exceed 60mm per meter run of shook's. Wood pins shall be used to prevent further development of split.

**Surface cracks:** Surface cracks with a maximum depth of 3mm are permissible. A continuous crack of any depth all along the length is not allowed.

### 4.6 CHEMICAL TREATMENTS FOR PRESERVATION OF WOOD

- 1) This treatment provides protection to the packing wood against deterioration due to fungi and attack by termites, borers and marine organism and any kind of infections.
- 2) The wooden planks, after making tongues / grooves shall be treated with chemicals. For pine wood, treatment with ASCU/ CCA solution need not be done.
- 3) The chemical used shall be ready mix ASCU paste. This consists of Arsenic pent oxide, copper sulphate sodium dichromate. This Paste shall be mixed at the rate of 1 kg of paste per 10 liters of water to the extent of water used. Alternate this CCA paste as mentioned at Para 4.6.5) can also be used.
- 4) The chemical treatment shall be done at the premises of the contractor. A cement concrete tank of capacity to hold a minimum of 2000liters of solution shall be constructed. The solution shall be prepared in the presence of BHEL Representative by contractor. The wooden planks shall be soaked in the solution for a minimum of 12 hours. The solution shall be replenished after treating a maximum of 12 cubic meters of wood. A log book shall be maintained by the contractor to give the details of date of preparation of solution, quantity of solution prepared, quantity of chemicals used, Quantity of wood treated and the details of replenishment. Samples of solutions before mixing will be tested at the laboratories designated by BHEL. The testing fees to be paid to the laboratories will have to be borne by the contractor. The paste shall be tested as and when required.
- 5) Specifications for water soluble type wood preservatives: Copper – Chromium – Arsenic [CCA]: Copper – Chromium – Arsenic preservative formulation shall be as per IS:10013 Part – II – 1981 shall consist of following active ingredients in nominal proportions by weight as shown below:

– Arsenic Pent oxide	AS <sub>2</sub> O <sub>5</sub> 2H <sub>2</sub> O	12.5
– Copper Sulphate	CuSO <sub>4</sub> 5H <sub>2</sub> O	37.5
– Sodium Dichromate	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> 5H <sub>2</sub> O	50.0
– Or Potassium Dichromate	K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	

### 4.7 OTHER MATERIALS

#### 4.7.1 NAILS

The dia. of the nails shall be 3.15mm. The length of the nails shall be 65mm wherever two planks of 25mm thickness are joined and 75mm wherever a 25mm planks is joined to a 50mm plank.

#### 4.7.2 BLUE NAILS

These are used for nailing bituminized Kraft paper/hessian cloth to the planks. The length of the nails shall be 16mm.

#### 4.7.3 HOOP IRON STRIPS

These are used for strapping the boxes. The width of the strips shall be 19+1mm and thickness 0.6 +0.01mm. The material shall be free from rust.

#### 4.7.4 CLIPS

These shall be used for strapping the hoop iron strips on the boxes.

#### 4.7.5 BRACKETS

These brackets are used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of thickness min 2mm and width 25+1mm. The brackets shall be of "L" shape, the length of each side being 100+2mm. Two holes shall be provided towards the end of each side for screwing /nailing.



**4.7.6 FASTENERS**

Bolts, double nuts, spring washers will have to be used for packing of some special items like transformers, reactors, breakers, etc., to hold the job to the bottom plank of the box. The bolts, nuts, washers will be provided by the vendor. Drilling of holes will have to be done using contractor's tools.

**4.7.7 MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM**

70GSM (Colourless) Multi Layered Cross Laminated Polythelene Film Specification No: AA51420 are used to make covers to the jobs individually. The cross lamination gives qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays.

**4.7.8 RUBBERISED COIR:**

The rubberized coir is used as cushioning material. For the packing of loose items, items are to be arrested by using rubberized coir. For the packing of cubicles rubberized coir of thickness 25mm and width 75mm shall be used.

**4.7.9 FOAM RUBBER / 'U' FOAM:**

This is used for covering the delicate items. This material is provided by the vendor.

**4.7.10 MARKING PLATE:**

This shall be of anodized aluminium sheet. Details and specifications are given in Fig-4

**4.7.11 PACKING SLIP HOLDER:**

This shall be of galvanized iron tinned sheet /Aluminium sheet

**4.7.12 SILICA GEL:**

This shall be of indicating type to conform to IS: 3401/AA55619.

**4.7.13 COTTON BAGS:**

These are used for holding silica gel. The bags shall have the following matter indicated on them:

---

BHEL-UNIT NAME	PLACE-PINCODE
SILICA GEL	INDICATING TYPE
BLUE :	ACTIVE
ROSE :	REDUCED ACTIVITY
WHITE :	NO ACTIVITY. TO BE REPLACED WITH FRESH SILICA GEL

---

**4.7.14 COTTON/ PLASTIC TAPE:**

This is used for tying small items. And also to prevent vibrations of moving parts within the cubicles.

**4.7.15 MARKING INK:**

The ink used normally is black in color. In some special cases other color also will have to be used. The ink shall be non-fading/indelible and non-washable by water.

**4.7.16 POLYETHYLENE BAGS:**

These are to be used for keeping the Packing slips. The bag shall be of size 70mm X 100mm (minimum).





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**4.7.17 Hessian cloth, twine thread, paint will have to be used in packing certain items.**

**4.7.18 Mechanical Latching clamps:**

For CLW Railway panels and similar Panels self-locking clamps can also be used on need basis in conjunction with or apart from regular bolt and nut fixing arrangement. For reusable boxes, these clamps provide easy locking and unlocking arrangement. These clamps will be made available from BHEL in some cases.

**4.7.19 STICKERS**

The following stickers to be put by the vendor on cubicles/Boxes after packing.

1. Case No sticker: 2 nos. Size 25.Cm x 0.45Cm
- 6) BHEL Monogram sticker: 1 no. Size 1.75Cm x 2.3Cm
- 7) Address sticker: 2 nos. Size 3.8Cm x 3.0Cm
- 8) Direction sticker " Front " & " Back " - 4 nos. Size 2.0Cm x 0.75Cm
- 9) Chain Mark Sticker: 4 Nos. Size – 3.0Cm x 0.75Cm
- 10) "Fragile " sticker: 2 Nos Size. 2.1Cm x 1.5Cm
- 11) "DO NOT STACK " sticker - 2 Nos. Size 3.0Cm x 2.2Cm

### **5 PACKING OF CUBICLES WITH RUBBER WOOD:**

**5.1** The packing is to be done as per clause 4 in all respects.

**5.2** The cubicles are already fixed on wooden pallets. Hence the contractor need not arrange the bottom pallets normally.

**5.3** The cubicles will be of different sizes both widthwise and lengthwise. The cubicles may be made up of single suite, 2 Suite, 3 Suite, 4 Suite, etc., The width of the cubicles generally varies from 400 mm to 1650mm. The length of the cubicle, generally varies from 1500 mm to 4800 mm. The height is normally 2430 mm. In some cases, the height may be less/more.

#### **5.4 MULTI LAYER CROSS LAMINATED POLY FILM**

The inner surface of 4 sides of shoo's shall be nailed with Multi-layer cross laminated poly film (as per 4.7.7) using blue nails (as per 4.7.2) wherever 2 pieces of Cross laminated poly film are used, the joint shall have an overlap of minimum 20mm.

The inner surface of top cover shall be nailed with Multi-layer cross laminated poly film (as per 4.7.7). This sheet shall project outside on 4 sides by at least 100mm and shall be nailed properly on sides. Joining of sheets should have overlap of minimum 20mm.

The cubicles shall be covered with Multi-layer cross laminated poly film (as per 4.7.7).

#### **5.5 SILICA GEL:**

Silica gel (as per 4.3.15) packed in cotton bags shall be kept at different places inside the cubicle as per BHEL-Unit directions. Each suit of cubicle shall be provided with 1 kg of Silica gel (for a 4 suit cubicle 4 kgs of Silica Gel to be used. The bag containing silica gel to be as per 4.7.13).

#### **5.6 LOOSE PARTS:**

Any loose parts in the cubicles shall be tied using cotton/ plastic tape. Wooden battens shall be provided wherever necessary.

#### **5.7 WOODEN BATTENS:**

In case of cubicle which are not rectangular in shape like control desks, sufficient number of wooden rafters/battens of proper size shall be provided to give strength to the package.

#### **5.8 RUBBERISED COIR:**

Gap between the cubicle and the case shall be filled with rubberized coir (as per 4.7.8) with distance between consecutive layers less than 500mm.



**5.9 CLAMPING:**

Packing shall be bound at edges by nailing M.S. Clamps / Brackets (as per 4.7.5). Each vertical edge shall have minimum 3 clamps. Top horizontal edges will have one clamp for every meter length of package. However, minimum 4 clamps shall be nailed at the top for any cubicle.

**5.10 PACKING SLIP:**

Packing slip kept in the polyethylene bag (As per 4.7.16) shall be placed in the box at appropriate place. In addition, one more packing slip covered in polyethylene cover and packing slip holder (as per 4.7.11) shall be nailed to front / rear of case.

**5.11 MARKING PLATE:**

One no. (As per 4.7.10) shall be nailed to the front side of the case.

**5.12 CASE MOUNTING:**

After complete packing, stencil marking of various details and marking of symbols shall be done as per BHEL instructions using indelible / non washable marking ink.

**5.13 Different types (Typical) of Cubicles with sizes for Packing**

1. Single suite cubicle - 900 x 950 x 2500
2. Two suite cubicle - 1650 x 950 x 2500
3. Three suite cubicle - 2400 x 950 x 2500
4. Four suite cubicle - 3150 x 950 x 2500
5. Regulation cub - 1300 x 1350 x 2500
6. Thy cub - 2870 x 1350 x 2500
7. VFD Cub - 3800 x 1550 x 2500

**5.14 PACKING OF CUBICLES WITH PINE WOOD**

Packing of cubicles for export shall be done exactly in same manner as described at Cl.No 5 except for the following changes: -

Wood shall be Silver oak/ Pine wood instead of rubber wood.

- Double polyethylene petticoat instead of one.
- Fumigation may have to be done if required (BHEL Scope).

**6 PACKING OF LOOSE ITEMS/SPARES USING RUBBER WOOD:**

- 1) Shape of cases shall be square, rectangular with single gabled roof or with double gabled roof depending on the nature of the job to be packed. Construction shall be as per drawings enclosed. Only gable will be additional as required.
- 2) Wood shall be rubber wood with Tongue and Groove joint as per clause 4.4.
- 3) Chemical treatment as per Clause 4.6 to be done.
- 4) Width of planks shall be at least 100 mm. Width of binding planks (battens) shall be at least 75mm.
- 5) External surface of planks on front and rear shall be plane 100% (except bottom plank).
- 6) Inner surfaces of all 6 sides shall be lined with bitumen coated hessian polyethylene Kraft paper (as per clause 4.7.7) using blue nails.
- 7) Rubberized coir of minimum 25mm thickness and 100 mm width shall be nailed to inner surfaces of bottom and 4 sides of box.
- 8) Internal packing: Items that go into the box shall be packed using 70GSM, (Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No: AA51420. Any space left Between the job and the sides and the top of the box shall be filled with rubberized coir to get proper cushioning effect .
- 9) Certain items like transformers, reactors, breakers, etc., shall be bolted to the bottom of the box using bolts, nuts and washers.





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- 10) Silica gel as per clause 4.7.12 held in cotton bags as per clause 4.7.13 shall be kept at proper places in the box.
- 11) Packing slip kept in polyethylene bag (clause 4.7.16) shall be placed in the box.
- 12) Marking plate as per clause 4.7.10 shall be nailed to side of the box.
- 13) Two numbers of hoop iron strips as per clause 4.7.3 shall be strapped tightly on the case using clips.
- 14) Stencil marking of various details and marking of various symbols shall be done as per BHEL instructions using indelible/non-washable marking ink.
- 15) Loose items to be kept inside the cubicle
- The components which are removed from cubicle for shipping purpose only, such as meters shall be kept inside the cubicle individually, kept in wooden box and tied firmly in bottom of Cubicle.
  - Other items which are given loose in addition to cubicle shall be packed in separate boxes.

## 7 BOX SIZES

### 7.1 BOX SIZES

**Table 1 – SPARES WOODEN BOX DETAILS**

SNO	BOX TYPE	BOX SIZE (in mm)	BOX Wt (in KG)	Carrying Capacity
1	A	800 X 200 X 200	15	
2	B	1500 X 200 X 200	22	
3	C	2000 X 200 X 200	27	
4	D	1100 X 200 X 200	15	
5	E	200 X 200 X 200	5	
6	F	320 X 250 X 260	13	
7	G	320 X 250 X 430	16	
8	H	430 X 370 X 430	23	
9	I	1100 X 400 X 400	45	
10	J	1500 X 500 X 400	65	
11	K	2000 X 500 X 400	93	
12	L	2500 X 500 X 400	88	
13	M	900 X 600 X 600	100	
14	N	3000 X 400 X 400	60	
15	P	600 X 500 X 400	35	
16	Q	710 X 630 X 600	90	
17	R	850 X 630 X 670	102	
18	S	1000 X 770 X 670	140	
19	T	2500 X 850 X 800	180	
20	U	1500 X 700 X 700	120	
21	W	1200X900X600	120	
22	Y	450 X 200 X 200	10	

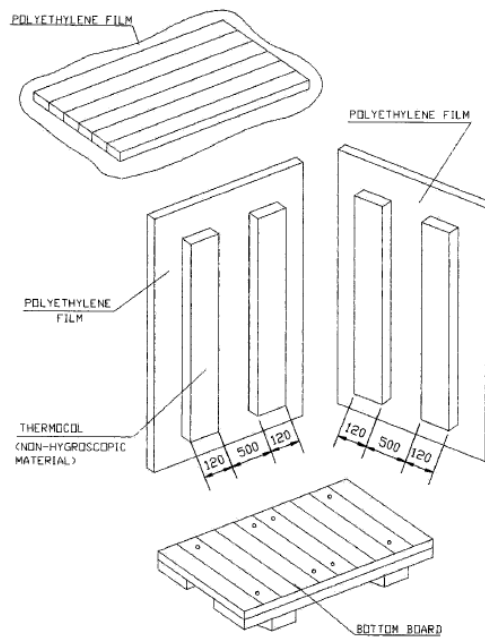


**7.2 BOX SIZES****Table 2 – VALVES WOODEN BOX DETAILS**

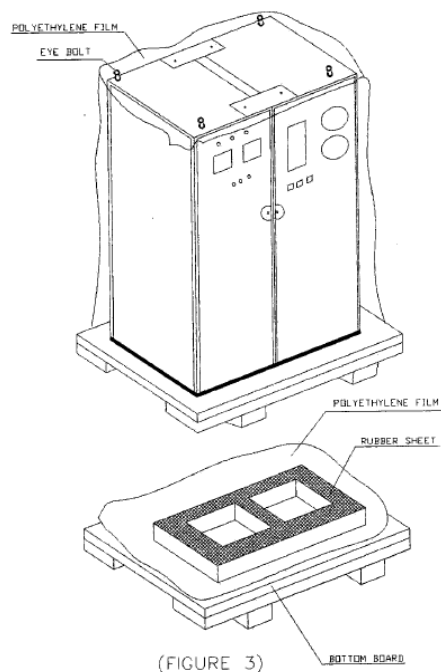
BOX TYPE	BOX SIZE (in MM)	BOX Wt (in KG)	Carrying Capacity
1A	320X250X260	10	
1	320X250X430	15	
2	430X370X430	25	
3	670X670X470	65	
4	720X630X600	75	
6	1000X770X660	100	
7	1100X430X670	80	
8	1200X1200X900	80	
10	1300X770X1050	155	
11	2500X850X800	225	
12	2000X1500X1200	305	
14	1850X1050X1250	260	
15	2000X800X800	180	
17	2600X1500X1600	470	
21	250X250X600	20	
22	250X250X880	30	
23	300X300X700	25	
24	380X380X880	45	
25		25	
26	510X510X1400	60	
27	570X570X1400	80	
28	575X575X1875	105	
29	3600X1100X1100	390	
30	900X500X800	110	
52	2000X950X740	225	
53	1600X1120X700	220	
54	2500X2000X1200	490	
55	2900X1900X1400	525	
56	3000X1000X900	370	
57	3200X2200X950	450	
58	2150X1100X750	325	
61	2000X2000X700	130	
62	700X1200X1325	130	



**TYPICAL PATTERN OF WOODEN BOX**



**Figure 1**



**Figure 2**



### 7.3 STANDARD BOX SIZES

#### WOODEN BOXES:

SL NO	TYPE	DIMENSION IN MM			WEIGHT	CARRYING CAPACITY (KGS)
		LENGTH	BREADTH	HEIGHT		
01	I	2370	1570	1650	675	4000
02	IIA	1570	720	885	200	2500
03	II	1200	900	600	150	2000
04	III	900	600	600	100	1000
05	IV	600	450	450	40	750
06	V	600	300	300	35	500

#### STEEL BOXES:

SL NO	TYPE	DIMENSION IN MM			WEIGHT	CARRYING CAPACITY (KGS)
		LENGTH	BREADTH	HEIGHT		
07	I	2480	1680	1500	339	4500
08	II	1200	900	600	061	2000
09	IIB	1800	850	950	115	2500
10	III	900	600	600	029	1000
11	IV	600	450	500	019	750
12	V	400	350	300	011	500

**Table 3**

### 7.4 STEEL CONTAINERS

Steel containers for packing can be used in case of repeated supplies of the same equipment. Empty steel containers are to be returned back from customer's end and to be reused for the next supplies. The containers are to be made of structural steel as per AA10108 with proper reinforcement with I, C and T Sections.

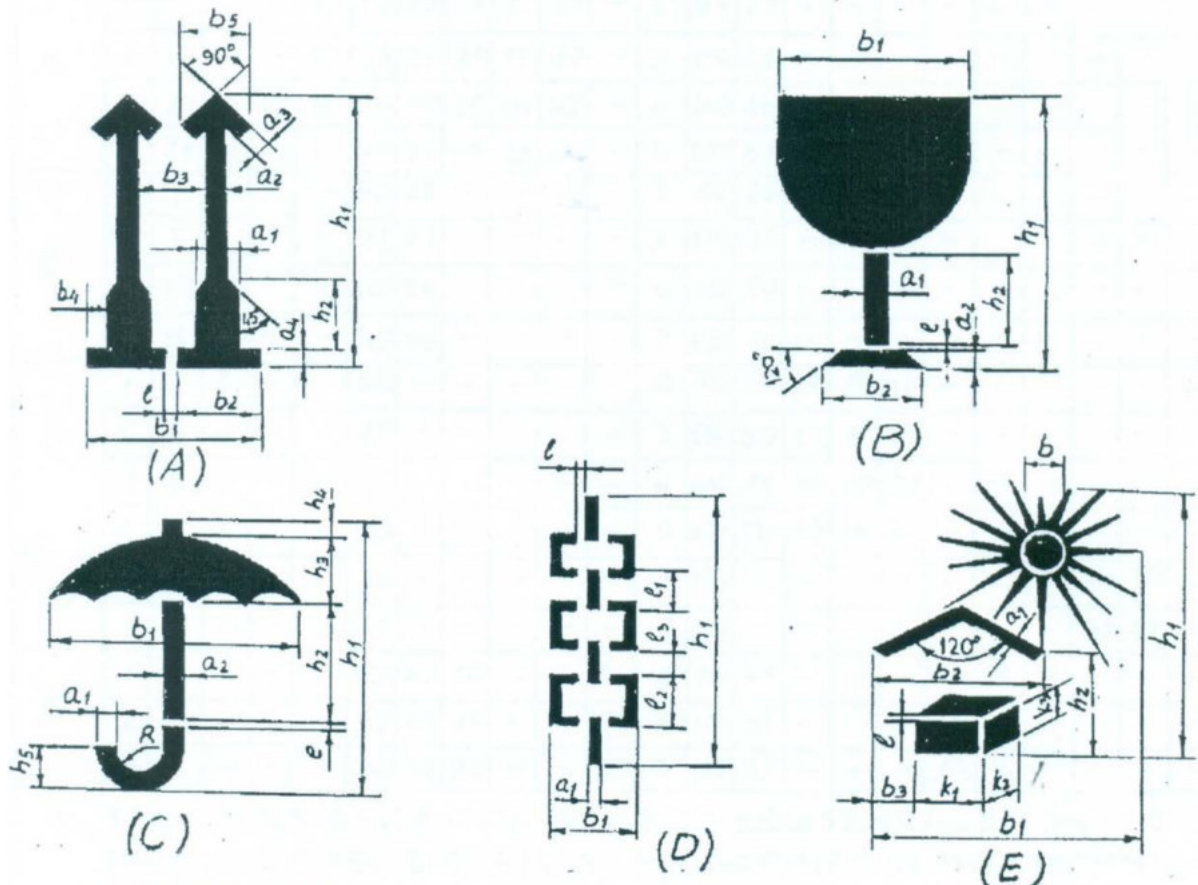
- Following precautions are to be taken during packing: -
- Put the machine in the steel container properly,
- Cover the machine with polythene.
- To arrest the movement in the steel container necessary wooden Blocks/Battens may be put.
- Put cover on steel, container and Bolt Properly



## 8 MARKINGS/STENCILINGS

### MARKINGS ON PACKING CASES

1. THIS PLANT STANDARD PRESCRIBES THE VARIOUS CAUTION SIGNS AND OTHER MARKINGS ON PACKING CASES.
2. DIMENSIONS IN THE TABLE 1 SHALL BE USED FOR MAKING STENCILS ONLY.



- A. UPRIGHT  
B. FRAGILE  
C. PROTECTION FROM FALLING OR CONDENSING MOISTURE.  
D. SLINGING POSITION  
E. PROTECTION FROM DIRECT RADIATIONS.



Figure 3



DESIGN- ATION		DIMENSION IN MM																							
		a1	a2	a3	a4	b1	b2	b3	b4	b5	b	l	h1	h2	h3	h4	h5	k1	k2	k3	l1	l2	l3	R	
A	1	12	5	5	4	52	25	19	8	21		2	84	23											
	2	17	7	7	6	75	36	29	11	30		3	119	33											
	3	24	10	10	8	104	50	38	16	42		4	168	46											
	4	34	14	14	11	147	71	59	23	60		5	239	65											
B	1	5	5			50	33					2	84	25											
	2	7	7			71	47					3	119	36											
	3	10	10			100	66					4	168	50											
	4	14	14			142	94					5	239	71											
C	1	4	3			66						2	80	39	19	5	11							6	
	2	6	4			85						3	114	55	27	7	16							9	
	3	8	6			120						4	160	78	38	10	22							12	
	4	11	9			170						5	227	110	54	14	31							17	
D	1	6				30						4	148								30	30	10		
	2	9				42						5	209								42	42	14		
E	1	3				69	47	10			16	2	91	26				17	8	11					
	2	4				98	67	15			23	3	128	33				24	11	16					
	3	6				138	94	20			32	4	182	62				34	16	22					

**Table 4**

Black and Red Marking Ink to IS:1234 "Ink, Stencil, Oil Base, For Marking Porous Surfaces" or duplicating ink stencilling, oil base for marking porous surfaces.

All cases containing fragile items are to be stencilled with red marking and stencilling paint/ink

**"HANDLE WITH CARE", "FRAGILE DO NOT TURN OVER".**

Besides the caution signs the product information's shall be stencilled of letters with 13mm to 50mm height.

In case of consignment consists of more than one package, each package shall carry its package no as given in shipping list. All caution signs shall be stencilled in high quality full glossy out door finishing paint red in colour (AA56126). All other markings shall be carried out in black enamel(AA56126).

Caution signs & other markings shall be stencilled on both the end shooks & the side shooks.

Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.

Note: Incase the size of package is small for using the stencils, then hand written letters/figures shall be allowed.



225			
BHEL-EDN-BANGALORE-26			
CONSIGNEE			
MATERIAL			
CUSTOMER REF.		MO. NO.	
DESPATCH ADVICE NOTE NO.		CASE NO.	
DIMENSIONS(MM) LXBXH		NET WT -KGS	GROSS WT -KGS
SPECIAL INSTRUCTIONS	HANDLE WITH CARE – KEEP DRY DO NOT DROP – DO NOT TILT		
		170	

Figure 4 – TYPICAL MARKING PLATE

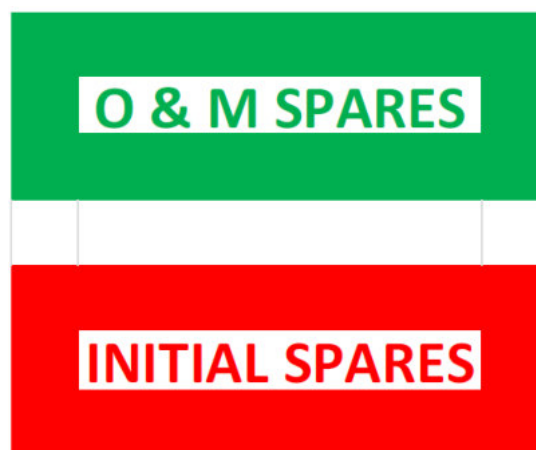


Figure 5

Easy spares [Initial and O&M ] Traceability and Identification at units and as well as at sites:

## 9 RECYCLING OF INCOMING WOODEN PACKING CASES

### OBJECTIVES

- To utilize useable wood of incoming packing cases, for manufacturing of new packing boxes.
- To recycle incoming wooden packing cases, as such, wherever possible.





- 1) All incoming wooden packing cases received from suppliers /customers will be opened carefully, with the intention of reusing them, by Shop.
- 2) After carefully taking out the contents, the empty wooden packing cases will be shifted by Shop to the specified locations i.e. bin / nearly spaces, already earmarked in stores.
- 3) Material shifting contractor engaged by store, will collect all such wooden packing cases and scrap wood from specified points, on a regular basis.
- 4) After collecting / loading the empty packing cases/ scrap wood, contractor will take the carrier first to weighment bridge for weighment, thereafter, he will go to Carpentry, where Carpentry representative will identify the packing cases which can be used by Carpentry for manufacturing of New Packing Boxes. All such identified packing boxes will be unloaded and handed over to Carpentry by contractor.
- 5) These packing boxes will be made re-useable after necessary rectification and additional work.
- 6) Contractor will again take the carrier for weighment and this second reading will also be recorded on the same "Weighment Slip".
- 7) Weight of empty packing cases / scrap wood taken will be calculated on the basis of 1st and 2nd weighment readings recorded on the "Weighment Slip". A copy of "Weighment Slip" (where both the weighment readings are recorded) will be given by the contractor to the carpentry representative. Based on this "Weighment Slip", carpentry will maintain a register in which details of quantity received will be recorded.
- 8) All "Weighment Slips" will invariably be signed by carpentry representative (even when no boxes have been unloaded by carpentry). Store will accept the scrap wood only if "Weighment Slips" are signed by carpentry representative.
- 9) Balance empty packing cases / scrap wood will be handed over by contractor to Store, for storing in scrap yard.
- 10) A separate area in Scrap yard will be provided, for executing the work of de-nailing of wooden packing cases, under supervision of carpentry.
- 11) Carpentry contractor will identify packing cases / scrap wood for denailing, which will be handed over to him by Store, at Scrap yard, for denailing and further operation.
- 12) Quality and Carpentry will jointly inspect the wood generated by de-nailing process and will prepare "INSPECTION CUM RECEIPT REPORT OF USEABLE WOOD RECEIVED FROM TPS –STORE BY CARPENTRY".
- 13) After acceptance of the wood by Quality and Carpentry, the same will be shifted to carpentry for receipt and its record will be maintained by carpentry.
- 14) This will be a Permanent Productivity Project executed by carpentry. "Productivity Savings" duly verified at the current Purchase Order rate of wood, will be sent every month to Resource Management Department, for highlighting it in their monthly progress report.

## 10 STANDARD METHOD OF PACKING

Table 5 –

### STANDARD METHOD OF PACKING

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
PRESSURE VESSELS								
TOWERS					O			
TANKS					O			
VESSELS					O			
GASKETS	O							
FASTENERS	O							




<div><div>बी एच ई एम</div><div>BHEL</div></div>	CORPORATE STANDARD						AA0490010	
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STANDARD METHOD OF PACKING								
DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
COVERS		O						
EXCHANGERS								
HEAT EXCHANGERS					O			
TUBE BUNDLE	O							
SHELL					O			
AIR FIN COOLERS					O			
COLOUMNS, MOTOR SUSPENSIONS, PLENUM CHAMBERS, SCREEN GUARDS, ETC					O			
BEARING BLOCKS	O							
FANS	O	O						
MOTORS	O							
GASKETS	O							
FASTENERS	O							
TEST FLANGES			O					
TEST RINGS			O					
COVERS			O					
DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
CRYOGENIC VESSELS								
COLD CONVERTERS					O			
HORIZONTAL STORAGE TANKS					O			
TRANSPORTATION TANK					O			
COLD BOX					O			
DRYING UNIT					O			
DRYING BOTTLES					O			
MOISTURE SEPARATORS					O			
SILENCERS					O			
ONGC SKIDS					O			
VAPORISER		O						
SPECIAL PRODUCTS								
SI/VI PIPING		O						
CRO BIO CONTAINERS	O							
AIR BOTTLES	O							
TITANIUM BOTTLE	O							
WAR HEAD CONTAINER	O							
MISSILE CONTAINER	O							
FUEL CONTAINER	O							
AIR LOCK ASSEMBLY	O							
DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
BOILERS								



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BOILER DRUMS					O						
BOILER ITEMS											
COILS			O								
PANELS					O						
HEADERS			O		O						
FEEDERS											
MACHINED ITEMS											
SHELL SEGMENTS					O						
SHELL SEGMENTS IN STACKS					O						
SPHERE PETALS											
COLOUMNS, BASE PLATES, TIERCOS, PIPES, NOZZLE E1, F1, INTERNAL PIPES, PADS ETC.					O						
ROLLERS	O										
VALVE TRAYS											
VALVE TRAY COMPONENTS	O										
LATTICE GIRDERS		O									
FASTENERS	O										
GASKETS	O										
DESCRIPTION				CA SE	CRA TE	SK ID	BUN DLE	BA RE	DR UM	METAL DRUM	FIBRE DRUM
SUB CONTRACTS											
FAB STRUCTURALS								O			
SUPPORTING STRUCTURALS								O			
STRUCTURE SUB ASSEMBLY								O			
FAB PIPES								O			
GRATINGS								O			
STAIR CASES								O			
HANDRAILS/ PLATFORMS								O			
BOUGHT OUT COMPONENTS											
IRON & STEEL (LIKE PLATES, BEAMS, ANGLES, CHANNELS ETC.)								O			
PIPE FITTINGS											
CS PIPES, TUBES								O			
SS PIPES, TUBES								O			
FIN TUBES				O							
ELBOWS					O			O			
FLANGES				O	O						
VALVES				O							
GAUGES				O							
DEMISTERS					O						
DESCRIPTION				CA SE	CRA TE	SKI D	BUND LE	BA RE	DR UM	METAL DRUM	FIBRE DRUM



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ABSORBANTS (LIKE MOLECULAR SIEVES, ACTIVATED ALUMINA, MOBILE SORBID)									
PAINT TINS									
PAINT DRUMS									
IGNITORS									
SPRAY NOZZLES									
ELECTRICAL INSTRUMENTATION									
MOTORS, PUMPS, COMPRESSORS, TURBINES									
SWITCH BOARDS, DISTRIBUTION BOARDS, STARTERS, JUNCTION BOXES									
INDICATORS, VIBRATOR SWITCHES									
CABLE BUNDLES, CABLE DRUMS									
CABLE TRAYS, CABLE RACKS, EARTHING MATERIAL									
OPERATIONAL SPARES									

### 11 PROCEDURE FOR HANDLING OF COMPONENTS

The purpose of this procedure is to protect the quality of the components/equipment while handling in various stages of manufacturing packing & despatching.

**11.1** Adequate care shall be taken in handling the material, and components to avoid damage during receipts, storage issue manufacture & despatch operations.

**11.2** Appropriate material handling equipment like fork lifters, cranes etc. shall be used where needed.

**11.3** Lifting by crane and transportation by trolley of critical items and large components like rotors castings etc. shall be done carefully.

**11.4** For critical items, where specified, special handling fixtures shall be used for lifting.

**11.5** Slings and shackles used for lifting the components/equipment shall be checked for fitness and suitability before use.

**11.6** Slings used on machined surfaces shall be suitably padded. No slings shall be used on journal surfaces.

**11.7** Precision machined components like blades, catches, rollers etc. shall be lifted using suitable wooden pallets.

**11.8 HANDLING OF COMPONENTS ON RECEIPT/DESPATCH**

Before loading/unloading a packing case from the carrier look for the following shipping instructions painted on the packing case.

- The markings showing the upright position.
- The markings showing the sling position
- Markings showing the fragile contents.
- Other required markings as per CI.no:08





- 11.8.1** Appropriate cranes and slings should be used for different components/ cases. Slings should normally make an angle as minimum as possible (width wise) but in no case more than 15°.
- 11.8.2** Handling and lifting should be done without jerks or impacts.
- 11.8.3** Immediately after receipt of the goods, the packing should be examined all-round for any sign of damage. If necessary, lift the cover or a number of boards of the case so as to make the contents visible. In the event of sealed packing being used the plastic sheeting should not be damaged. It is imperative that the packing material is restored in original condition after the inspection.
- 11.8.4** On receipt of the equipment it should be checked with the shipping list and missing or damage if any should be reported immediately. It is important to arrange for immediate examination to determine the extent of the damage, the cause of the damage and where applicable the person or persons responsible for the damage. According to general practice when transporting by railway or by road vehicle the carrier concerned should be immediately called upon (within specified periods) for jointly establishing a statement of the damage. This is essential as a basis for a subsequent claim and possible damage report to the insurance company.
- 11.8.5** Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.
- 11.8.6** Silica gel and such other chemicals kept in the box as desiccants and indicators should also be left in the box itself.

## **12 GENERAL GUIDELINES FOR ODC TRANSPORTATION/DESPATCH**

Based on the Dimensions/Weight indicated in the Transportation Sketch, the type of Trailer is decided and indicated in the Tender Enquiry.

### **12.1 TRANSPORTATION:**

#### **1. LOW BED TRAILERS (LB 8):**

Well Bed Length:	10000mm
Over Gooseneck:	13000mm
Width:	3000mm
Carrying Capacity:	40MT

#### **2. LOW BED TRAILERS (LB 16):**

Well Bed Length:	12000mm
Over Gooseneck:	16000mm
Width:	3000mm
Carrying Capacity:	75MT

#### **3. TOW TYPE TRAILERS (WITH FRONT DOLLEY 16 TYRES): 12000MM length (for Exceptional equipment length: 30000mm and above)**

Bigger Dia equipment are loaded in the Well with overhanging.

Smaller Dia equipment with excess length are loaded over Gooseneck with rear hanging.

The Vehicle Dimensions are defined above are only guidelines for selection based on actual Dimensions/ Weight of the Consignment

### **12.2 PACKING:**

For all ODCs, Wooden Saddles are cut to the diameter of equipment as per the Transportation Sketch.

For Diameter up to 4000mm



Wooden Saddles Length: 1836/2743mm (6'0"/9'0")  
Width: 300mm (1'0")  
Height: Saddle + one/two wedges a top.  
For Diameter up to 4000mm  
Wooden Saddles Length: 3353mm (11'0")  
Width: 300mm (1'0")  
Height: Saddle + three/four wedges a top.

NUMBER OF SADDLES:  
Minimum: 3 in case of Loading inside Well  
+ 1 when loaded on Gooseneck.  
Maximum: 4 in case of Loading inside Well  
+2 when loaded on Gooseneck.

For Securing the equipment firmly on the Trailer, 19mm (3/4"), wire rope with 25mm (1") Heavy Duty Turn Buckles / BD Clamps are used as Lashing for the equipment.

## 12.3 NUMBER OF LASHINGS ARE:

	CONSIGNMENT LOADED INSIDE WELL BED	CONSIGNMENT LOADED OVER GOOSENECK
a) up to 40MT	4 (2 Single Line lashing 2 Double Line Lashing)	5 (3 Single Line Lashing 2 Double Line Lashing)
b) 40MT to 60MT	5 (3 Single Line Lashing 2 Double Line Lashing)	5 (Single Line Lashing 3 Double Line Lashing)
c) 60MT and above	5 (2 Single Line Lashing 3 Double Line Lashing)	6 (3 Single Line Lashing 3 Double Line Lashing)

## 13 GUIDELINES FOR HANDLING/LOADING/LASHING

### 13.1 HANDLING



Figure 6

Before unloading the jobs Completely painted and neatly stencilled will be checked.

Pipes with split type end cover will be checked



**Figure 7**

All Coil Tubes to be provided with End Caps.

**Figure 8**

Neatly stacked Coil Assemblies.



**Figure 9**

Columns to be lifted with Nylon belts. This protect painting, edges and attachments.

**Figure 10**

### 13.2 LOADING

All the components to be transported by putting inside the properly fabricated Crating



**Figure 11**

Small components may fall down while transporting without closed crating and there are chances of missing of small parts. Hence, it is always better to transport small components in closed containers/crating. Loose to be being shipped in a closed crating.

**Figure 12**



No component loaded over the crating.



**Figure 13**

Headers supported with wooden V blocks at 3 meters interval.



**Figure 14**

Spacers in between each coil assembly.



**Figure 15**

Goose pipe to be provided with rubber pad protects removal of painting and damage to the job.

**Figure 16**

### **13.3 LASHING**

Use Nylon belts only for lashing of all components. It prevents removal off painting and cut in the materials.



**Figure 17**

Nylon Belts used for lashing the beams.

**Figure 18**

#### **14 PRODUCT WISE SPECIAL INSTRUCTION**

Additional instructions of packing not included in this standard shall be covered by individual product standard



**15 REFERRED STANDARDS (Latest publications including amendments):**

- |            |            |            |            |
|------------|------------|------------|------------|
| 1) AA51420 | 2) AA55619 | 3) AA51414 | 4) IS:3401 |
| 5) AA10108 | 6) AA56126 |            |            |






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# Annexure-5

## QUALITY GUIDLINES & QAP FORMATS



Form No.	 <b>HYDERABAD</b>	<b>PRODUCT STANDARD</b> PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE 5
			Rev No. 00
			Page 2 of 3
<b>COPYRIGHT AND CONFIDENTIAL</b> 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.	<p style="text-align: center;"><b><u>GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN</u></b></p> <ol style="list-style-type: none"> <li>QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.</li> <li>Each page of QAP shall contain the following information.           <ol style="list-style-type: none"> <li>Vendor's name &amp; address.</li> <li>Customer: BHEL, Hyderabad.</li> <li>Project.</li> <li>BHEL Product Standard Number/revision number as referred in P.O.</li> <li>BHEL Purchase Order Number &amp; Date.</li> <li>Product as per P.O. description.</li> <li>QAP Number (unique and shall not repeat)/revision number/date.</li> <li>Page number and number of pages</li> </ol> </li> <li>QAP shall contain four parts / stages as follows.           <ol style="list-style-type: none"> <li>Raw materials and bought out items.</li> <li>In process Control / Inspection.</li> <li>Final assembly, Inspection &amp; Testing.</li> <li>Painting, preservation &amp; packing.</li> </ol> </li> <li>Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc.).</li> <li>Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT, DP etc.), hydrostatic test, calibration check etc.)</li> <li>Under 'Class', indicate minor, major or critical depending on the importance of characteristic.</li> <li>Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)</li> <li>Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)</li> <li>Under 'Reference document' and 'Acceptance norms', appropriate National &amp; International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practice etc.". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review &amp; approval by our Engineering dept.</li> <li>Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc.</li> <li>Please refer 'Agency' in QAP format. Under P: Perform, W: Witness, V: Verify Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR 2: (Vendor / Sub vendor)</li> </ol>		
	Ref. Doc		



Form No.	 <b>HYDERABAD</b>	<b>PRODUCT STANDARD</b> PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE 5
			Rev No. 00
			Page 3 of 3
COPYRIGHT AND CONFIDENTIAL 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.	<p>Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, Under Witness (W) column use 1. Under 'Verify' column, use code 1.</p> <p>12. Under 'D' please put ( <input type="checkbox"/> Tick) against each characteristic where vendor proposes to submit test certificate/report etc. OR as required as per BHEL Specification.</p> <p>13. Vendor's signature &amp; stamp should be available on each page of QAP.</p> <p>14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification &amp; Approved Drawings.</p> <p>15. The following operations/characteristics/check points may be included (AS APPROPRIATE)</p> <ul style="list-style-type: none"> <li>a) Visual check</li> <li>b) Dimensional check</li> <li>c) Mechanical and Chemical properties.</li> <li>d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc. as the case may be.)</li> <li>e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc.</li> <li>f) Check for correctness for all components mounted as per General arrangement drawing, Bill of Materials (BOM), etc. for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc.</li> <li>g) Verification of test certificate for protection class for the enclosures.</li> <li>h) Mechanical functioning of switches.</li> <li>i) Continuity of earthing and provision of earth points.</li> <li>j) Colour coding of wiring, size, tightness &amp; dressing of wiring.</li> <li>k) Review of test certificates of assembled items, raw materials, internal test reports etc.</li> <li>l) Witness of functional checks, which may include mechanical run &amp; electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc.</li> <li>m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc.</li> <li>n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.)</li> <li>o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non-Destructive Tests.</li> <li>p) Tests on Galvanized items (Visual, Hammer Test, Knife Test, Thickness, Pierce Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating)</li> <li>q) All tests as per BHEL Product Standard &amp; approved drawings including Type tests and Routine tests on individual items and on System as a whole.</li> <li>r) Packing and Preservation.</li> </ul> <p>16. <b>QAP Format enclosed.</b></p> <p>17. <b>Typical Manufacturing QAP(s) is /are attached.</b></p>		
	Ref. Doc		



**INSPECTION PROCEDURE (IP) FOR ELECTRICAL EQUIPMENT AT MANUFACTURERS' WORKS**

**Project** : NALCO CGPP  
**Contractor's Name** :  
**Package Description** : BOILER & TURBOGENERATOR

**Contract/P.O. No.** :  
**Contract Specification Reference** : NALCO CGPP-3CA01-PWR-01(R1)  
**IP No. & Rev.** : IP-28812-E-XX Rev. 0

List-A			List-A			List-B			
Test & Test Certificates			Test & Test Certificates			Documents			
1	Visual & Workmanship	16	Dynamic Balancing	31	Galvanizing test	B1	GA Drawing duly approved	B13	Manufacturer's conformity Certificate
2	Dimensional	17	Oil BDV Test	32	Flame Proof Test	B2	Data Sheet duly approved	B14	Contractor's Internal Test Report
3	Ultrasonic Test	18	Measurement of tan delta & capacitance	33	Measurement of Noise	B3	BOM duly approved	B15	Test Certificate for bought-out items
4	Routine test as per relevant standard	19	FRLS Tests	34	Measurement of Vibration	B4	SLD/Schematic duly approved		
5	Acceptance Test as per relevant standard	20	Contact resistance measurement	35	Load test	B5	Terminal Plan duly approved		
6	Type test as per relevant standard	21	Environmental tests	36	Measurement of no load current	B6	Cable Schedule/Earthing Schedule		
7	Pressure/Vacuum test	22	Operational & Fuctional Tests	37	Checking for ease of maintenance	B7	Manufacturer's Catalogue		
8	High Voltage Test	23	Burn-in tests	38	Checking for safety provisions	B8	Control Philosphy		
9	Measurement of Insulation Resistance	24	Measurement of shaft voltage	39	Relay operation check by current injection (Primary/Secondary)	B9	Painting Certificate		
10	Enclosure Protection	25	Measurement of ripples			B10	Calibration Certificates from NABL accredited Laboratory		
11	Painting Shade & Thickness Check	26	Measurement of harmonics	40	Measurement of Gain/SNR/Attenuation	B11	Functional Description		
12	Temperature Rise Test	27	LPT Tests			B12	Test Certificates from statutory bodies like CMRI/ NEPA/UL/FM/ BASEFA		
13	Impulse Test	28	Physical & Chemical Properties						
14	Oil leakage test	29	Over speed test						
15	PI Value measurement	30	Short Circuit Test						

**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/set, substantial quantity shall be offered for economy of inspection & lot/set break-up details should be certified by the competent authority.
- 5) Attempt shall be exercised to furnish IP for all the items if the package in single lot.
- 6) Calibration Cetificate of all measuring Instruments and Gauges used in inspection & testing shall be from NABL Lab.

Sl. No.	Contract/ Billing Schedule/ Item No.	Equipment/Item Description	Qty.	In-Process Inspection (Select from List-A)			Final Inspection (Select from List-A)			Acceptance Norm (Indicate applicable Standards, Methods, Procedures] & Documents from List B	Test Certificates & Documents to be submitted by Contractor (Select from List A&B)	Remarks/Sampling Plan, if any
				M	C	D	M	C	D			

**Abbreviation:-**


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

Signature of Contractor & Seal  
Name:

Signature of Client  
Name:

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



		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: EOT CRANE			REV NO:		DATE:			
								PAGE 4 OF 4					
SL NO	COMPONENT S	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
1.0	RAW MATERIALS & BOUGHT OUT ITEMS												
1.1	Structure Material for Bridge Girder, End Carriage & Trolley Frame	Visual & Dimensional Inspection	Major	Visual & Measurement	100% / Sample	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	IR	√	2	-	1	UT For plate thick more than 50 mm
		Chemical & Mechanical Properties		UT, Chemical & Physical				MTC					
1.2	Rope drum if seamless pipe	NDT & Chemical	Major	UT & Chemical	100% / Sample	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	TC	√	2	-	1	
1.3	i) Rods for Pinion , Shaft ii) Forging for Gear , Wheel	Visual & Dimensional Inspection	Major	Visual & Measurement	100% / Sample	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	IR	√	2	-	1	
		Chemical Properties & NDT		UT & Chemical				TC					
		Hardness		Hardness									

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE **1 FOR BHEL (OR BHEL NOMINATED INSPECTION AGENCY) AND CUSTOMER/CONSULTANT/CUSTOMER'S TPIA** & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. \* FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.



**TYPICAL MANUFACTURING QUALITY PLAN**

MQP. NO.:

PROJECT ENGINEERING & SYSTEMS DIVISION  
BHEL,  
RC PURAM, HYD-502032PROJECT:  
PACKAGE: **EOT CRANE**

REV NO:

DATE:

PAGE 4 OF 4

SL NO	COMPONENT S	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
1.4	Hook	Chemical / Physical Properties ,NTD & proof load test	Major	Chemical & UT & Magnetic particle test after and before proof load test.	Sample and NDT & proof loading 100%	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	TC	√	2	–	1	
1.5	Wire Rope	Size Destructive Test, Proof load test & Dimension	Major	Dimensions Destructive Test	As Per IS	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	TC	√	2	–	1	
1.6	Bearings	Visual	Major	Test report	100%	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	TC	√	2	–	1	
1.7	Motors	Verification of Rating	Major	Routine Test & Type test Report	100%	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	TC	√	2	–	1	

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## TYPICAL MANUFACTURING QUALITY PLAN

MQP. NO.:

PROJECT ENGINEERING & SYSTEMS DIVISION  
BHEL,  
RC PURAM, HYD-502032

PROJECT:  
PACKAGE: **EOT CRANE**

REV NO:


DATE:

PAGE 4 OF 4

SL NO	COMPONENT S	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
1.8	Brake & Limit switch	Visual	Major	Routine test Report	100%	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	TC	√	2	–	1	
<b>2.0</b>	<b>INPROCESS INSPECTION</b>												
2.1	Bridge Girders	Visual/Dimensions	Major	Visual & measurement	100%	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	IIR	√	2	–	1	
		Radiography for Butt joint		RT				RT report					
2.2	End Carriage	Visual/Dimensions	Major	Visual/Dimensions	100%	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	IIR / DP report	√	2	–	1	
		NDT		DP									
2.3	Gear Box Housing	Oil leakage	Major	Oil Leakage test	Major	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	IIR report	√	2	–	1	

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		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: EOT CRANE			REV NO:		DATE:			
								PAGE 4 OF 4					
SL NO	COMPONENT S	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
2.4	Welding	Welder Qualification, WPS	Major	Verification	100%	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	WPS, PQR	√	2	—	1	

<b>3.0 FINAL INSPECTION &amp; TESTING</b>													
3.1	Crane	Dimensions check for assembled crane & Free running of all motion. Speed and Current all motion at no load .load test SWL and deflection test, & 125% of over load test for hoist and cross travel.	Major	Measuremen t and Testing	100%	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	Test report	√	2	1	–	
3.2		HV, IR Correctness of wiring & continuity check, BOM check, CCOE and statutory approvals (as applicable)	Major	Testing	100%	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	Test report	√	2	1	–	

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		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: EOT CRANE			REV NO:		DATE:			
								PAGE 4 OF 4					
SL NO	COMPONENT S	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTU M OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
4.0	PRESERVATION & PACKING												
4.1	Painting	Visual/shade, DFT, Peel off test	Major	Visual Measure Test	100%	Approved Drawing. / Data sheet/ Tech Spec	Approved Drawing. / Data sheet/ Tech Spec	IR	✓	2	1	-	
4.2	Name Plate Fixing	Visual	Major	Visual	100%			Test Certificate		2	1		
4.3	Packing	Packing	Major	Visual	100%			Packing list		2	-	1	

**Abbreviations: -**

MTC – Material Test certificate  
 IBR – Indian Boiler Regulations  
 DFT – Dry Film Thickness  
 TC – Test Certificate  
 EL – Elongation  
 PMI – Positive Material Identification


WPS – Welding Procedure Specification  
 PQR – Procedure Qualification Record  
 WPQ – Welder Performance Qualification  
 NDE – Non Destructive Examination  
 ID – Internal Diameter  
 OD – Outer Diameter

**NOTES:**

1. This typical MQP should be read along with specification (latest revision as per PO), approved drawings & approved datasheet, approved BOM (as applicable).
2. Approved drawing/datasheet & specification shall prevail over quality plan in case contradiction if any.
3. Material test certificate shall include tensile, impact, hardness, bend, IGC, hot tensile, grain size, chemical analysis etc. as required by applicable material code /approved drawing/data sheet.
4. WPS/PQR/WPQ to be submitted for review wherever required. All welding shall be done by qualified welders. Duly endorsed documents will be submitted to BHEL/TPIA's review.
5. Hydro test shall be done in un-painted condition as per approved procedure/relevant code.
6. Any other tests/ checks indicated in specification, P.O., or drawing/data sheet & any additional checks envisaged by BHEL/Customer as part of correspondence to ensure workmanship, finish, aesthetics, etc. shall also be conducted and witnessed/verified by BHEL /TPIA /Customer as per project requirement.

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		<b>TYPICAL MANUFACTURING QUALITY PLAN</b>						MQP. NO.:					
								REV NO:		DATE:			
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: <b>EOT CRANE</b>			PAGE 4 OF 4					
SL NO	COMPONENT S	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	

7. All documents issued by statutory authorities such as CCOE /IBR, CMRI, ATEX etc., shall be submitted during inspection.
8. Only type test certificate of same design and same Material of Construction of equipment to be submitted, wherever required.
9. All the relevant test reports /certificates shall be submitted during inspection. The reviewed and certified documents by BHEL/TPIA/Customer shall be submitted to BHEL as documentation package.
10. All sub-ordered items, bought out items, electrical & instrumentation Items shall be procured from approved / agreed vendor list with BHEL/BHEL's Customer.
11. Material Test certificates for physical & chemical properties shall be submitted as per agreed ITP. Test Certificates submitted shall be from approved laboratories accredited by NABL. Materials used for manufacturing shall not be more than five years old.
12. Type test certificate for electrical, electronics and instrumentation items shall be furnished which in general shall not be more than 5 years old from the effective date of contract. In case Type test certificates are not available, Vendor/Supplier shall organize Type test for such items at their cost.

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

FM-IV/Rev. 22

**List of Dasturco Inspection Centres**

1.	EAST	M.N. Dastur & Company (P) Ltd. P-17 Mission Row Extension Kolkata 700 013  Attn.: Mr. A. K. Dutta	FAX : 033 2225 1422/2225-7101  PHONE : 033 2225 5420 (10 lines) Extn 2225 0500 (10 lines) 719  E-Mail : <a href="mailto:inspection.kol@dastur.com">inspection.kol@dastur.com</a> & <a href="mailto:Arun.Dt@dastur.com">Arun.Dt@dastur.com</a>
2.	WEST	M.N. Dastur & Company (P) Ltd. “Engineering Centre” 9 Mathew Road Mumbai 400 004  Attn.: Mr. G.S. Kulkarni	FAX : 022 2363 0906  PHONE : 022 2363 2880 (4 Lines) 2363 2901 (5 Lines)  E-Mail : <a href="mailto:inspection.mum@dastur.com">inspection.mum@dastur.com</a> <a href="mailto:kulkarni.gs@dastur.com">kulkarni.gs@dastur.com</a>
3.	SOUTH	M.N. Dastur & Company (P) Ltd. “Engineering Centre” 480, Anna Salai, Nandanam Chennai 600 035  Attn.: Mr. V.M. Subramanian	FAX : 044 2434 3712  PHONE : 044 2434 2206/2303/2002 2434 2348/2340  E-Mail : <a href="mailto:inspection.chn@dastur.com">inspection.chn@dastur.com</a> <a href="mailto:subramanian.vm@dastur.com">subramanian.vm@dastur.com</a>
4.	NORTH	M.N. Dastur & Company (P) Ltd. 232B, Okhla Industrial Estate, Phase-III First Floor New Delhi – 110 020  Attn.: Mr. K. S. Duggal	FAX : 011 2632 5863  PHONE : 011 2632 6838/6323  E-Mail : <a href="mailto:Inspection.Del@dastur.com">Inspection.Del@dastur.com</a> <a href="mailto:Kanwaljeet.D@dastur.com">Kanwaljeet.D@dastur.com</a>

**Geographical jurisdiction of Inspection Centres:**

EAST :	West Bengal, Odisha, Jharkhand, Bihar, Chhattisgarh, Tripura, Meghalaya, Assam, Sikkim, Arunachal Pradesh, Nagaland, Mizoram, Manipur
WEST :	Maharashtra, Gujarat, Goa, Diu, Daman, Dadra Nagar Haveli
SOUTH :	Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Kerala, Pondicherry
NORTH :	Delhi, Uttar Pradesh, Haryana, Madhya Pradesh, Himachal Pradesh, Punjab, Rajasthan, Uttarakhand, J&K



**M.N. DASTUR & COMPANY (P) LTD.  
INSPECTION DIVISION**

Form: FM-V Rev. 01

**Inspection Call Format**

Contractor's Inspection Call No. \_\_\_\_\_

Dated - \_\_\_\_\_

**A. General Information:**

Project		Client	
Package		Order No. on Contractor	
Contact Persons with mobile & email ID	Contractor:  Manufacturer:	Place of Insp. with full address and landmark	
Proposed date of insp.		Estimated duration of Insp.	
Manufacturer's off day		Order no. on Manufacturer	

**B. Items Offered:**

Item/BS No.	Item Description	Quantity *		
		Ordered	Offered now	Accepted earlier

\* In case of lot, break up of lot shall be furnished from duly approved document/drawing.

**C. Document Enclosed (1 set hard copy & 1 soft copy) for ready reference:**

Document	Letter ref. of Dastur	Document No. & Rev.	Approval status
IP/ QAP			
Drawings/ Data-sheet			

**D. Test Certificate (TC) Enclosed as per IP(3 sets hard copy & 1 soft copy):**

TC No.	TC Description	TC No.	TC Description

Sign, Name & Designation  
For CONTRACTOR

**Note:**

1. Use Annexure wherever space is inadequate
2. Manufacturing/Fabrication drawings duly approved by designer of Contractor/ Vendor shall be made available to Dastur during physical inspection or for document review wherever applicable.
3. It will be the sole responsibility of the Contractor to indicate correct Billing Schedule (BS) No. and Item Description. For any error on this account by Contractor, Dastur will not be liable to issue any amendment.



## Page No.: 1 of

**Contractor-**

**Inspection Agency**  
M.N. Dastur & Co. (P) Ltd.



**M.N. DASTUR & COMPANY (P) LTD.**

**JOINT INSPECTION REPORT**  
**(Continuation Sheet)**

Page No.: 2 of

JIR No. &amp; date :

[illegible]

**Manufacturer**  
Name

**Main Contractor**  
Name:

**Inspection Agency**  
M.N. Dastur & Co. (P) Ltd.



## **SHOP PAINTING CERTIFICATE**

Equipment/ : Item	Qty:	Project:
Painting Certificate No. and date:		Drg. No.

**Surface Preparation and Painting has been done as per Painting System (System No. ....) of General Specification No. .... for Painting applicable for the Project.**

**Details of Painting are as follows:**

<b><u>Surface Preparations</u></b>					
Required:					
Observed:					

<b><u>Inside Painting :</u></b>					
<b>Coat Detail</b>	<b>Paint Detail</b>	<b>Paint Shades Adopted</b>	<b>No. of Coat</b>	<b>Detail/Coat in Microns</b>	
				<b>Required</b>	<b>Observed</b>
Primer					
Coat					
Intermediate					
Coat					
Finish					
Coat					

**Outside Painting :**

<b>Coat Detail</b>	<b>Paint Detail</b>	<b>Paint Shades Adopted</b>	<b>No. of Coat</b>	<b>Detail/Coat in Microns</b>	
				<b>Required</b>	<b>Observed</b>
<b>Primer</b>					
<b>Coat</b>					
Intermediate					
Coat					
Finish					
Coat					

\_\_\_\_\_  
**Signature of Manufacturer**

\_\_\_\_\_  
**Signature of Contractor**



DASTURCO



**M.N. DASTUR & COMPANY (P) LTD.**  
**INSPECTION DIVISION**

**INSPECTION CERTIFICATE**

**Inspection category: Physical Inspection/ Document review**

Certificate No.

Date:

Issuing Office :

Client:
Package No, & Description:
Contractor:
Ref. Inspection Call No. and date
Manufacturer & Place of Inspection:

Project:			
Order No.& dt. on Contractor:			
Date(s) of Inspection:			
JIR Ref. for Physical Inspection:			
Test reports verified (put tick)			
MTC	Dimension	Performance	Routine
Pressure	Acceptance	No load/Run	Others

The following items of equipment are released on the basis of review of test certificates / physical inspection and witness of tests as applicable as per approved QAP/IP. This is subject to further inspection by the Purchaser or his representative/s who may consider it fit prior to, or, after dispatch:

Item/BS No.	Description of Items	Quantity			
		Ordered	Offered	Accepted	Cumulative

Remarks: 1.  
2.  
3.

Drawing Nos. with Rev.:	
1.	
2.	
3.	
Copy to:-	
1. Client – 1 copy	5. Insp Kol – 1 copy
2. Contractor- 2 copies	6.
3. Site Office – 1 copy	7.
4. Project Manager – 1 copy	

Reviewed/Inspected by:

Name &amp; Designation

Certificate released by:

For M.N. DASTUR &amp; COMPANY (P) LTD.

(Signature)

Name&amp; Designation:

(put stamp)

Note:

- This Inspection Certificate (IC) does not absolve the responsibility of the contractor / manufacturer from their contractual obligations nor shall it preclude subsequent rejection / replacement / rectification if found not meeting the specifications and shall not accrue any responsibility, to the inspection agency signing this document in any way at any time after dispatch from the manufacturer's works / premises.
- Quantity indicated above may defer from billing schedule quantity due to engineering requirements.
- This IC is released upon receipt of compliance of comments on documents and/or compliance of Joint Inspection Report observations. Refer "Remarks" above for reference of such compliances and concessions / re-approval granted, if any, against deviations by Designer / Client.

Inspected & accepted items / Samples Punched/Stamped thus:	
--	--

Continued in Sheet No.



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

Form: FM-VII Rev.01

Continuation sheet No.-

Inspection Certificate No. and date –

Item/BS No.	Description of Items	Quantity			
		Ordered	Offered	Accepted	Cumulative

Certificate released by:  
For M.N. DASTUR & COMPANY (P) LTD.

(Signature)

Name& Designation:

(put stamp)



ESP-001- 2A Rev.00		<b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>		Std. / Doc. Number	
				Rev. No.	00

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# Annexure-6

## EQUIPMENT QUALIFICATION FORMAT





भारत हेवी इलेक्ट्रिकल्स लिमिटेड

**BHARAT HEAVY ELECTRICALS LIMITED**

रामचन्द्रापुरम हैदराबाद - 32

**RAMACHANDRAPURAM: HYDERABAD - 502 032.**

परियोजना इंजीनियरिंग विभाग

**PROJECT ENGINEERING & SYSTEMS DIVISION**

**PROJECT :** Installation of Steam & Power Plant for 5<sup>th</sup> Stream Alumina Refinery Expansion at Damanjodi, Odisha under Phase-3 Expansion of M&R Complex

**CUSTOMER:** M/s. National Aluminium Company Limited (NALCO), Bhubaneswar, Odisha

**CONSULTANT:** M/s M. N. Dastur & Company (P) Ltd., Chennai

विषय / SUB : **EQUIPMENT QUALIFICATION CRITERIA & FORMAT**

**1. TECHNICAL CRITERIA:**

The bidder shall be an established manufacturer of Single -girder EOT Cranes & shall have adequate engineering, manufacturing & testing facilities of cranes. Bidder shall have experience in Erection & Commissioning of EOT crane.

Bidder shall meet the following qualification criteria for the offered equipment:

Bidder should have supplied **at least TWO Units** (not in the same order) of EOT Crane of the proposed model, which shall be identical or validly similar in terms of Model, Capacity, Span Length, Lift and testing requirements etc. in the last EIGHT YEARS and at least ONE of these units should have been in trouble free operation at site for the PAST 4 YEARS without any major problem as on initial enquiry submission due date.

The reference crane must have been designed, manufactured, tested (at works / at site) and supplied from the proposed manufacturing plant.

**2. DOCUMENTATION REQUIRED:**

Bidder shall submit the following (in English) document(s)/ reference(s) / data alongwith Technical offer for assessment of Purchaser :

- i. Duly filled-in enclosed format (**Annexure-6A**) with bidder's reference list for offered crane model.
- ii. Copy of Purchase Order OR LOI OR Invoice of at least two references meeting above Technical criteria
- iii. Engineering document (such as Datasheet / Drawing), indicating the details of Capacity, Span length, Lift, Model number etc of the same references as above.



**ANNEXURE-6A: EXPERIENCE RECORD PROFORMA**

Sl. No.	Name of Customer	Qty.	Capacity (Ton) (Main Crane / Aux. crane)	Span (mtrs.)	Lift (mtrs.)	Travel (mtrs.)	Type (Single Girder )	Purchase Order Ref.No. & Date (copy to be enclosed)	Datasheet / Drawings / Performance certificate etc (Enclosed / Not enclosed)	Remarks





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# Annexure-7

## Sub Vendor list



Geared coupling	: HICLIFF/FENNER/ELECON/ UNIVERSAL/FMG/NAW
Wire rope	: USHA MARTIN/BOMBAY WIRE ROPE/ FORT WILLIAMS/ UNITED WIRE ROPE
Hook	: MOZUMDAR & MOSUMDAR /HERMAN & MOHATTA/ EE KARACHIWALA/STEEL FORGINGS/FORGING ENTERPRISE
Gear Box	: NAW/ELECON/SHANTHI
LT AC Sq-cage induction Motor (General purpose)	: SIEMENS/CGL/ABB/ MARATHON/ BBL/BHEL/ KIRLOSKAR
LT AC Motor (Flame proof)	: KIRLOKAR (KEC)/CGL/SIEMENS / BBL /MARATHON/ABB
L.T. Geared Motor	: KIRLOSKAR (KEC)/POWER BUILD/ IC/BB/SEW/FIMET/REMI/WEG/ ABB/SIEMENS
DC Motors	: CGL/MARATHON/KIRLOSKAR/ BHEL /ABB/SIEMENS
VVVF Drive	: SIEMENS/ABB/ROCKWELL / SCHNEIDER/L&T/BHEL/CGL/GE- POWER
HRC Fuses	: SIEMENS/SCHNEIDER/ABB/L&T/ GE POWER/BUSSMAN



L.T. Capacitor	: UNISTAR/CGL/SCHNEIDER/SAVIN / KHATAU/MEHER/VPT/HAVELL'S/ PCPL/PE/AS/CEPL/EPCOS/ABB
Semiconductor Fuse	: SCHNEIDER/SIEMENS/COOPER BUSSMAN/ABB
Thyristor	: SIEMENS/BHEL/HIND RECTIFIER/ ABB
LT Vacuum Contactor	: GE/SCHNEIDER/L&T / SIEMENS/ ABB
Control Switch	: SIEMENS/KAYCEE/SCHNEIDER / L&T/VAISHNO/C&S/ABB
Push Button	: SIEMENS/BCH/L&T/VAISHNO /C&S/SCHNEIDER/TECHNIC/ KAYCEE/ HOTLINE/ESSEN/ABB
Limit Switch	: AG SYSTEMS/JAY BALAJI / TECHNOCRATS/KAKKU/SIEMENS/ BCH (may be considered only for light duty)/SCHNEIDER
Emergency Switch/Belt Sway Switch/Pull Cord Switch/ Belt Slip Switch	: JSI/AG SYSTEMS/PB/JAI BALAJI/ BETA SYSTEMS/ IMSS/UIC/IS/ KAKKU
Indicating Lamp ( Including Cluster LED type)	: SIEMENS/VAISHNO/TECHNIK/ BINAY/ESSEN/BCH/SWITCHING CIRCUIT/RISHAB/L&T/ABB/ SCHNEIDER
Proximity Limit Switches (Non-contact type)	: JSI/AG SYSTEMS/ROCKWELL /TELEMECHANIQUE/ACCENT/ SCHNEIDER/SIEMENS
LT Cable Termination Kit/straight through jointing kits	: TYCO(RAYCHEM)/3MECI (MSEAL- MECP)/DENSION/CCI



Cable Lugs	: DOWELLS/FORWARD/COMMET/3D /RATAN ENGG/ABB.
Cable Gland	: ELECTROMAG/CC I/COMMET / PHOENIX/DOWELLS /RATAN ENGG.
Terminal Block	: ELMEX/ESSEN/CONNECTWELL/ C&S/WAGO/PHOINEX/ABB.
Cable Coupler	: A. BOND STRAND/ABB.
Weather proof outdoor Junction Box	: ELECMECH/TECHNOCOM/ABB
Cable Tray / Rack	: RATAN ENGG./INDIANA/IDS COMPOSITES/INDIA ELECTRICALS SYNDICATE /PREMIER/ TECHNO
DC EM Brake	: BCH/STROM KRAFT/ELECTROMAG/ ELECTROMECH CORPN./EPC/IS
Thrustor brake	: IS/STROMKRAFT /ELECTROMAG /ELECTROMECH/EPCC
Power Supply Unit	: SIEMENS/PHONEX/MTL/ APLAB/ ELNOVA/MCTH/ CYBERNICS/ COSEL/ ABB
Push Buttons	: BCH/L&T/SIEMENS/ SCHNEIDER-TELEMECANIQUE/ABB
LED Lamp	: GE/BCH/SCHNEIDER-TELEMECANIQUE/BINARY/ ABB/ SIEMENS
Limit switches	: ABB/JAY BALAJI/ ELECTROMAG/ KAKKU/ SIEMENS/HONEYWELL/ TELE-MECHANIQUE/ ALLEN-BRADLEY/GO-SWITCH (EMERSON)/ SCHINDER



Junction Boxes

: BALIGA/PYROTECH/HENSEL/EXPROT  
ECTA/FLEXPPO/FLAMEPACK/SUDHIR  
SWITCHGEAR/ RITTAL/ABB





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# Annexure-8

## Master DOC List



[illegible]



MASTER DOCUMENT LIST -SINGLE GIDER UNDER SLUNG EOT CRANE FOR BFP AREA/CHILLER PLANT AREA/MILL BAY AREA																				
	Vendor Name:				PROJECT:									Supplier Doc- No:						
	Vendor Contact Person:				BHEL PO No.			PO Dly. Date:						Rev- No.						
	Vendor contact No.				Supplier's Job No.									Date:						
	SYSTEM/PACKAGE:	EOT Crane				TODAY-DATE		Submission status to BHEL												
Sl.No	DRG/DOC. NAME	DRG/DOC NO.	NO. OF SHTS.	CAT	CRITICAL FOR MFG?	REQD.FOR CUSTOMER SUBMISSION?	STATUS	Rev-0			Rev-1			Rev-2			Final Rev-(R)	REMARKS		
			NO.	(A / I)	(Y/N)	(Y/N)	" "PV/PB /PC/AA	SD	AD	APP.CAT	SD	AD	APP.CAT	SD	AD	APP.CAT	Date			
25	List of Mandatory spares			A																
26	List of Commissioning spares			I																
27	List of Recommended spare parts for 2 year normal operation & maintenance			I																
28	List of special tools & tackles if any			I																
29	Utility consumption list			I																
30	List of sub vendors			A																
31	Bill of Materials			A																
32	Billing Breakup			A																
33	Packing List			I																
34	Painting Procedure			A																
35	Erection Procedure			I																
36	Commissioning procedure			I																
37	Performance guarantee test procedure			I																
38	Quality Assurance Plan			A																
39	Installation, opearation & maintenance manuals containing all certified drawings & documents			A																
40	Test certificates & reports as per approved QAP & ITP			I																
41	O& M Manuals(Hard Copies)** ** hard copy shall be furnished after getting concurrence on soft copy.			I																
								^APP.CAT												
	A-Approval Category	PV-Commented and pending with vendor					0	A1-'Approved					Approved By:							
	I-Information Category	PB- Pending with BHEL					0	A2-'Mfg. Clearance given subject incorporation of comments					Sign :							
		PC- Pending with Customer					0	A3-Commented.Revision & resubmission required.												
		AA- Approved					0	A4- Retained for info.					Date :							
		" " - Not yet Due.																		
		OD - Over Due.					0													
Vendor documentation status																				



MASTER DOCUMENT LIST -SINGLE GIDER UNDER SLUNG EOT CRANE FOR BFP AREA/CHILLER PLANT AREA/MILL BAY AREA																		
	Vendor Name:				PROJECT:									Supplier Doc- No:				
	Vendor Contact Person:				BHEL PO No.			PO Dly. Date:						Rev- No.				
	Vendor contact No.				Supplier's Job No.									Date:				
	SYSTEM/PACKAGE:	EOT Crane				TODAY-DATE		Sumission status to BHEL										
Sl.No	DRG/DOC. NAME	DRG/ DOC NO.	NO. OF SHTS.	CAT	CRITICAL FOR MFG?	REQD.FOR CUSTOMER SUBMISSION?	STATUS	Rev-0			Rev-1			Rev-2			Final Rev-(R)	REMARKS
			NO.	(A / I)	(Y/N)	(Y/N)	" "IPV/PB /PC/AA	SD	AD	APP.CAT	SD	AD	APP.CAT	SD	AD	APP.CAT	Date	
	Total No of Docs	Due as on Date	Submitte d by vendor as on Dt.	Approv ed by BHEL as on Dt.	Commented by BHEL as on Dt.	Pending with BHEL/CUSTOM ER as on date	Is Mfg. Clearance given?	Status/ Remarks										
	(Nos)	(Nos)	(Nos)	(Nos)	(Nos)	(Nos)	(Y/N).-/ (if Y ) put Dt.											
	0	0	0	0	0	0	Y											

Note: Above List is preliminarry in nature.The same shall be discussed and Mutually agreed post order stage.





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# Annexure-9

## Deviation Format



**ANNEXURE-9: DEVIATION FORMAT**

<b>Sl. No.</b>	<b>Section / Part/Subsection</b>	<b>Page No.</b>	<b>Clause No.</b>	<b>Bid Specification Requirement</b>	<b>Bidder's Deviation</b>

**Notes:**

1. Bidder to furnish duly filled format along with SEAL & SIGN along with their offer.
2. All the pre-bid queries (if any) shall be raised before submission of the offer as per pre-bid query format (Annexure- 10) .



3. Deviations, which are impractical, and the same were raised during pre-bid stage as per pre-bid query format (Annexure-10 ), but still purchaser's reply/clarifications could not be met shall only be raised in this format.
4. If there are no deviations, bidders shall indicate as "No deviation" and submit the same along with their offer.
5. Deviations indicated elsewhere in bidders offer except raised through this format shall not be considered and reviewed

SIGNATURE : \_\_\_\_\_  
NAME : \_\_\_\_\_  
DESIGNATION : \_\_\_\_\_  
COMPANY : \_\_\_\_\_  
DATE : \_\_\_\_\_

COMPANY SEAL





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# Annexure-10

## Pre-bid clarification format



### ANNEXURE-10: PRE -BID QUERIES FORMAT

Sl. No.	Section / Part/Subsection	Page No.	Clause No.	Bid Specification	Bidder's Query	Purchaser's Reply

**Note:** During Preparation of Pre-Bid Queries, Complete Tender Specification Doc. No. PY-51414 (along with all Annexures) shall also be referred.