TECHNICAL SPECIFICATION

FOR

EOT CRANE FOR TG BUILDING

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

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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 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) 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.

1. INTENT OF SPECIFICATION:

This specification specifies the requirement of Design, Engineering, Manufacturing, Assembling, Inspection, Delivery, proper packing and painting of **Double Girder Electric Overhead Travelling Cranes [D/G EOT Crane]**, Erection & Commissioning and testing at site of EOT crane 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.

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	$75^0$51'10'' East/$21^0$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 1 No. of EOT Crane (35/5 T) in TG Building is required for handling of turbo generator and its auxiliaries during maintenance. Location of EOT Crane: Indoor

5. TECHNICAL DETAILS/REQUIREMENTS:

5.1 Design Parameters of EOT Crane for TG Building:

Description	EOT Crane for TG Building
Quantity (No.)	1
Area Classification	Safe area
Main Hoist Capacity (Ton)	35
Aux. Hoist Capacity (Ton)	5
Lift of Main Hoist(m)	16.0
Lift of Auxiliary Hoist(m)	16.5
Span (m)	13.0
Travel (m)	92.0 mtrs. [Existing building of 52 mtrs. and New Building of 40.0 mtrs.)]
Type	Double-girder, box type crane with the crab running on top

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.]	Following Design Standard duly taking care of Customer Specifications (Annexure-4) attached with this specification shall be following while designing EOT Cranes: a) IS-3177: Code of practice for Electric Overhead Travelling Cranes and Gantry Cranes other than Steel Work Cranes. b) IS-807: Design, Erection and Testing (Structural Portion) of Cranes and Hoists — Code of practice c) 1S- 15560: Point hooks with shank up to 160 Tonne-Specification d) IS-5749: Specification for Forged Ramshorn Hooks e) IS- 3443: Specification for Crane Rail Sections f) IS-2266: Steel Wire Ropes for General Engineering Purposes-Specification
2.	Crane Duty Class	M5,Indoor as per IS 3177,IS 807 & IS 800
3.	Method of Crane control	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.
4.	Main Hoisting speed	1 m/min
5.	Auxiliary hoisting speed	8 m/min
6.	Cross travel speed	15 m/min
7.	Long travel	30 m/min
8.	Creep speed for main hoist	10% of Normal Speed. All Hoists shall also have creep controller and VFD with encoders.
9.	Creep speed for auxiliary hoist	10% of Normal Speed. All Hoists shall also have creep controller and VFD with encoders.
10.	Speed control	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.
11.	Main Hoist Brake	Double Shoe DC Electromagnetic shunt brakes as per requirement, Fail Safe Type & self-aligning type.
12.	Auxiliary Hoist Brake	Double Shoe DC Electromagnetic shunt brakes as per requirement, Fail Safe Type & self-aligning type
13.	Cross Travel Brake	AC Electro hydraulic Thrustor Brakes as per requirement, Fail Safe Type & self-aligning type
14.	Long Travel Brake	AC Electro hydraulic Thrustor Brakes as per requirement, Fail Safe Type & self-aligning type

15.	Gear Box	As per IS 4460 or AGMA
16.	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
17.	Power Supply to Crane	Through Down Shop Lead(DSL) Conductor
18.	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.
19.	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.
20.	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.
21.	Anti-Collision Device	**To be provided by bidder at both ends of Crane in order to avoid collision with already existing crane.**
22.	Lifting Hooks	Main hoist hook: Standard single Trapezoidal shank hook with self-latching provision Auxiliary hoist hook : Standard single Trapezoidal shank hook with self-latching provision
23.	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%.
24.	Crane Wheels	LT Wheels: Forged steel. CT Wheels: Forged steel.

25.	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
26.	LT rails	**CR-80**. 40 mtrs. of LT Rail is required as per travel distance. However, the same shall be connected with already existing LT Rail. Required Fixtures, Plates, Nuts & Bolts etc. to install the same on New Building and Connecting with the already existing LT Rail.
27.	CT Rail	Flat Rails not acceptable. Rail shall be as per IS 3443.
28.	Hall dimensions	Refer enclosed drawings [Annexure-1]

Notes:

a) Above mentioned details shall be read in conjugation with Customer Specification for Crane & Hoist [Annexure-4, Doc. No. NALCO CGPP-3CA01-PWR-01(R1)].
b) All Equipment including electrical shall be designed for ambient temperature of 50 Deg. C.
c) Electric gong bell of reputed make, on bridge platform shall be provided.
d) Hook approach for Main and Auxiliary are indicated in the attached equipment layout drawing [Annexure-1]. Accordingly, the end carriage to be designed.
e) Power supply to trolley shall be through festoon type flexible cable.
f) LT Power supply to crane shall be through Shrouded DSL type conductor system.
g) Full-length platforms shall be provided on both side along the bridge girders with removable hand rails.

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:

6.1.1 1 No. 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 & CT 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 The Crane shall be installed in Extension of Existing Building (52.0 mtrs).As the present enquiry crane has to travel for a length of 92 mtrs. (Existing building of 52 mtrs. and New Building of 40.0 mtrs.), DSL System to be considered for a length of 92.0 mtrs.

6.1.6 Commissioning Spares:

1 Set 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.

6.1.7 Mandatory Spares: Not Applicable

6.1.8 2 Year Recommended spare(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.

6.1.9 Special tools & tackles:

The bidder shall furnish 1 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.

6.1.10 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 <u>SCOPE OF SERVICE:</u>

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.

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 (EQC):

Bidder to submit the Equipment Qualification Criteria for EOT Cranes as per Annexuer-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 and Quality related requirements. For details, refer Customer/Consultant 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 in conjugation with enclosed Customer/Consultant specification, IS 3177 & applicable standards.

8.3.1 Testing at Works:

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.

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:

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.	**Hoist Capacity**	
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.

9. <u>PAINTING:</u>

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. Final Color shall be intimated during detail engg.

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 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.

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.

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 bock 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.
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	WHEN TO SUBMIT

		BE SUBMITTED	
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. **Vendor to incorporate all BHEL comments so that further revisions can be minimized.*	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. Note: *Bidder to furnish final hard copy of O&M only after getting concurrence on soft copy.*	Soft copy	At least 2 months before the delivery date of equipment
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	35/5 T EOT crane-Main Supply	PY9751699010
03	35/5 T EOT crane-E&C	PY9851387035

	RECORD OF REVISIONS				
Rev. No.	**Date**	**Revision Details**	**Revised By**	**Reviewed By**	**Approved By**
00	27.01.2021	First Issue	----------	SBN	MSSN

Annexure-1

LAYOUT DRAWING

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

SHT.01 OF 05 | DRG. NO: PY-LE-1-M166-2006-01

PROPOSED NEW BOILER # 6

EXISTING ROAD

CABLE GALLERY

FFL 0.00M

MND TO CHECK AND CONFIRM THE LOCATION OF STAIR CASE AND LIFT LOCATION W.R.TO EXTENSION OF BUILDING.(TYP)

LIFT PROPOSED

EXISTING STAIRCASE

PIPE TRENCH DEEP COOLER

CL OF MONORAIL BEAM

BOILER FEED PUMP-2

BOILER FEED PUMP-1

MAKEUP WATER PUMP-2

MAKEUP WATER PUMP-1

LUBE OIL COOLER

WORKING OIL COOLER

HP DOSING

LP DOSING

GEN. AIR FILTER HANDLING AREA

MH

MAIN OIL TANK

DIRTY OIL TANK

OIL CENRIFUGE-1

OIL CENRIFUGE-2

AREA FOR DMCW COOLING WATER MODULE

SPACE FOR CO2 FIRE FIGHTING CYLINDERS AND CONTROL PANELS

AH

ATM FLASH TANK

CW PIPING PIT EL.-2.050

11/11.5 kV GENERATOR TRANSFORMER 10m X 10m BY BHEL

11/6.6 kV LCSS TRANSFORMER (BY NALCO)

11/6.6 kV LCSS TRANSFORMER (BY NALCO)

±0.00M

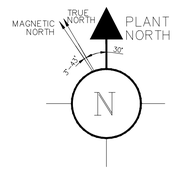
EXISTING PIPE RACK

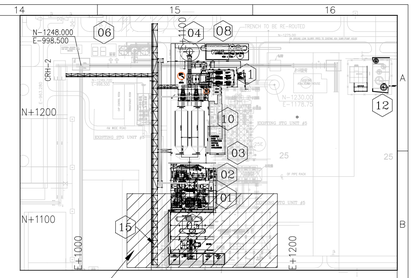
EXISTING TG # 5 BUILDING

NEW TG#6 EXISTING TG#5

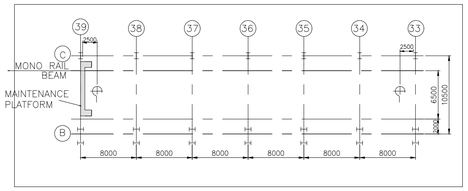
38 37 36 35 34 33

PLAN AT 0.00M LEVEL





KEY PLAN



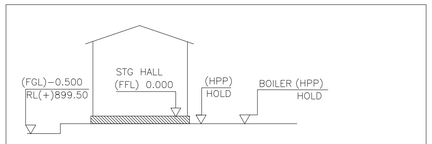
* KEY PLAN OF E.O.T CRANE FOR B.F.P (N.T.S)

EQUIPMENT TABLE

SL. No.	NAME OF EQUIPMENT	SIZE	ERECTION LOAD(Kg)	FLODDED LOAD(Kg)	RATING
1	MMP	LATER	LATER	LATER	LATER
2	BFP	10000x2380(EACH)	LATER	LATER	LATER
3	CEP	LATER	LATER	LATER	LATER
4	HP DOSING	LATER	LATER	LATER	LATER
5	LP DOSING	LATER	LATER	LATER	LATER
6	CONDENSOR	9900 X 2300	46000	95000	NA
7	DIRTY OIL TANK	3000 X 3000	LATER	LATER	NA
8	MAIN OIL TANK	3450 X 2750	5100	20000	NA
9	OIL CENTRIFUGE-1 & 2	1600 X 1500	1070	1470/(EACH)	NA
10	OIL FILTER	1700 X 900	670	1000	NA
11	LUBE OIL PUMPS(MOP, AOP)	2800 X 2615	1310(EACH)	2000(EACH)	LATER
12	LUBE OIL PUMP(EOP)	2400 X 1000	980	1100	LATER
13	OIL COOLER	2800 X 1200	4000	5300(EACH)	NA
14	JOP	1150 X 550	420	1000	LATER

LEGEND

- REMOVABLE CHEQUERED PLATE
- CHEQUERED PLATE
- REMOVABLE GRATING
- GRATING
- HAND RAILING
- OPENING



LEGEND:
FFL: FINISHED FLOOR LEVEL
HPP: HIGHEST PAVED POINT
FGL: FINISHED GROUND LEVEL

MND REQUESTED TO CONFIRM HPP LEVEL

PLANT LEVEL

NOTES:

1. ALL DIMENSIONS ARE IN mm
2. ALL FLOOR ELEVATIONS ARE IN METER
3. FFL EL (+) 0.00 of STG HALL corresponds to RL (+)899.500
4. ALL OTHER COMPONENTS REQUIRING MAINTENANCE SHALL BE TAKEN DIRECTLY FROM OPERATING FLOOR TO MAINTENANCE BAY AT GROUND LEVEL.

REFERENCE DRGS.:–

1. MACHINERY ARRANGEMENT & FOUNDATION : HY-DG-1-31301-24535-S01-R01
2. CONDENSER GA DRAWING : HY-DG-1-36010-70801-S00-R01
3. STEAM JET AIR EJECTOR GA: HY-DG-1-46101-08801-S00-R01 DRAWING
4. GLAND STEM COOLER GA DRAWING : HY-DG-2-56214-99601-S00-R00
6. PLOT PLAN :PY-LQ-0-M166-2001-01

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

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	RAVI		23.10.20	N.A.
CHD.	PARAMESH G		23.10.20	
APPD.	UDAY KUMAR V		23.10.20	

REV.	DATE	ALTERED MOQEET
01	22.01.21	CHD/APPD PARAMESH
ZONE		REVISED AS PER CUSTOMER COMMENTS

DEPT. PED | CODE 450 | UNTOL. DIMS. GR. 9/M/f | SCALE 1:125 | WEIGHT (KG) N.A. | REF. TO ASSY. DRG. N.A. | ITEM NO. N.A. | NO.OF ITEMS N.A.

TITLE: STG HALL & DEAERATOR EQUIPMENT LAYOUT

CARD CODE NA | DRG. NO. PY-LE-1-M166-2006-01 | REV. 01 | SHT. No 01 | NO. OF SHT. 05

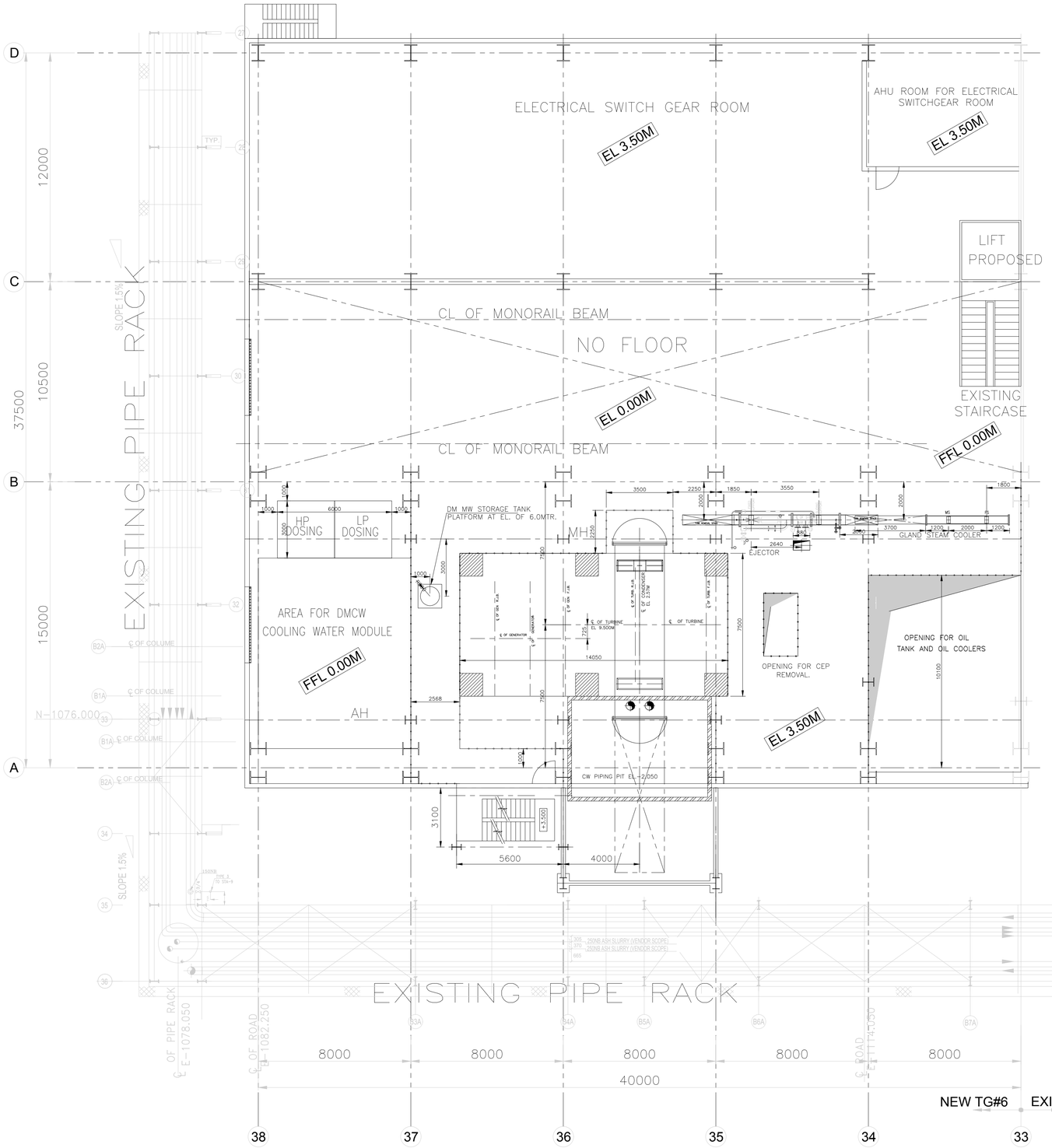
GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

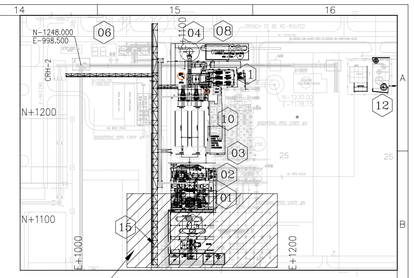
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

SHT.01 OF 02 | DRG. NO: PY-LE-1-M166-2006-01

PROPOSED NEW BOILER # 6





THIS AREA

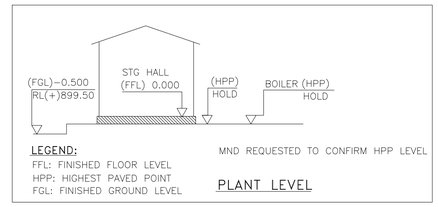
KEY PLAN

EQUIPMENT TABLE

SL. No.	NAME OF EQUIPMENT	SIZE	ERECTION LOAD(Kg)	FLODDED LOAD(Kg)	RATING
1	STEAM JET EJECTOR	5850 X 535	7100	9000	NA
2	GLAND STEAM CONDENSOR	4400 X 430	1600	2100	NA
3	DM WATER TANK	1250 X 1250	1000	1000	NA

LEGEND

- REMOVABLE CHEQURED PLATE
- CHEQURED PLATE
- REMOVABLE GRATING
- GRATING
- HAND RAILING
- OPENING



LEGEND:
FFL: FINISHED FLOOR LEVEL
HPP: HIGHEST PAVED POINT
FGL: FINISHED GROUND LEVEL

MND REQUESTED TO CONFIRM HPP LEVEL

PLANT LEVEL

NOTES

1. ALL DIMENSIONS ARE IN mm
2. ALL FLOOR ELEVATIONS ARE IN METER
3. FFL EL (+) 0.00 of STG HALL corresponds to RL (+)899.500
4. ALL OTHER COMPONENTS REQUIRING MAINTENANCE SHALL BE TAKEN DIRECTLY FROM OPERATING FLOOR TO MAINTENANCE BAY AT GROUND LEVEL.

REFERENCE DRGS.:-

1. MACHINERY ARRANGEMENT & FOUNDATION : HY-DG-1-31301-24535-S01-R01
2. CONDENSER GA DRAWING : HY-DG-1-36010-70801-S00-R01
3. STEAM JET AIR EJECTOR GA DRAWING: HY-DG-1-46101-08801-S00-R01
4. GLAND STEM COOLER GA DRAWING : HY-DG-2-56214-99601-S00-R00
6. PLOT PLAN :PY-LQ-0-M166-2001-01

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

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	RAVI		23.10.20	
CHD.	PARAMESH G		23.10.20	N.A.
APPD.	UDAY KUMAR V		23.10.20	

REV.	DATE	ALTERED MOQEET
01	22.01.21	CHD/APPD PARAMESH
ZONE		REVISED AS PER CUSTOMER COMMENTS

DEPT. PED | CODE 450 | UNTOL. DIMS. GR. G/M/F | SCALE 1:125 | WEIGHT (KG) N.A. | REF. TO ASSY. DRG. N.A. | ITEM NO. N.A. | NO.OF ITEMS N.A.

TITLE: STG HALL & DEAERATOR EQUIPMENT LAYOUT

CARD CODE NA

DRG. NO. PY-LE-1-M166-2006-01 REV. 01

SHT. No 02 NO. OF SHT. 05

PLAN AT 3.50M

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

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

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

SHT.01 OF 03 | DRG. NO: PY-LE-1-M166-2006-01

PROPOSED NEW BOILER # 6

BOILER TG INTERCONNECTING PLATFORM

MCC ROOM 8.50M

AHU ROOM 8.50M

LIFT PROPOSED

CONTROL ROOM 8.50M

AHU ROOM 8.50M

EXISTING STAIRCASE

EXISTING TG # 5 BUILDING

EXISTING PIPE RACK

SLOPE 1.5%

12000

37500

10500

15000

GOV.OIL ACCUMULATOR

GOV.OIL CONSOLE

MH 8.50M

7500

REMOVAL SPACE FOR GENERATOR ROTOR

7000

2000

725

OPENING FOR CEP REMOVAL.

OPENING FOR OIL TANK AND OIL COOLERS

LUBE OIL ACCUMULATORS

AH 8.50M

AHU ROOM FOR TG HALL 8.50M

5600

8000

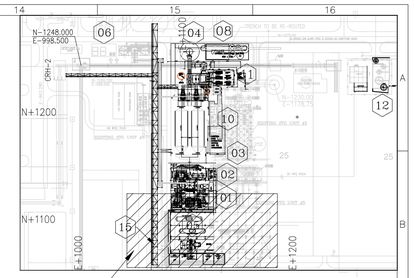
N-1076.000

NEW TG#6 EXISTING TG#5

250NB ASH SLURRY (VENDOR SCOPE)

EXISTING PIPE RACK

PLAN AT 8.500M LEVEL



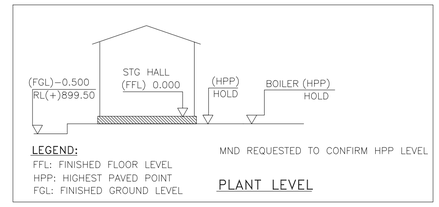
KEY PLAN

EQUIPMENT TABLE

SL. No.	NAME OF EQUIPMENT	SIZE	ERECTION LOAD(Kg)	FLODDED LOAD(Kg)	RATING
1	GOVERNING CONSOLE	1400 X 1400	1000	1600	NA
2	LOCAL GAUGE BOARD-1	2100 X 500	400/EACH	800	NA
3	LUBE OIL ACCUMULATORS	1370 X 490	800	1000	NA
4	GOV.OIL ACCUMULATORS	1370 X 490	800	1000	NA

LEGEND

- REMOVABLE CHEQURED PLATE
- CHEQURED PLATE
- REMOVABLE GRATING
- GRATING
- HAND RAILING
- OPENING



LEGEND:
FFL: FINISHED FLOOR LEVEL
HPP: HIGHEST PAVED POINT
FGL: FINISHED GROUND LEVEL

MND REQUESTED TO CONFIRM HPP LEVEL

PLANT LEVEL

NOTES

1. ALL DIMENSIONS ARE IN mm
2. ALL FLOOR ELEVATIONS ARE IN METER
3. FFL EL (+) 0.00 of STG HALL corresponds to RL (+)899.500
4. ALL OTHER COMPONENTS REQUIRING MAINTENANCE SHALL BE TAKEN DIRECTLY FROM OPERATING FLOOR TO MAINTENANCE BAY AT GROUND LEVEL.

REFERENCE DRGS.:-

1. MACHINERY ARRANGEMENT & FOUNDATION : HY-DG-1-31301-24535-S01-R01
2. CONDENSER GA DRAWING : HY-DG-1-36010-70801-S00-R01
3. STEAM JET AIR EJECTOR GA DRAWING : HY-DG-1-46101-08801-S00-R01
4. GLAND STEM COOLER GA DRAWING : HY-DG-2-56214-99601-S00-R00
6. PLOT PLAN : PY-LQ-0-M166-2001-01

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

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	RAVI		23.10.20	
CHD.	PARAMESH G		23.10.20	N.A.
APPD.	UDAY KUMAR V		23.10.20	

REV.	DATE	ALTERED MOQEET
01	22.01.21	CHD/APPD PARAMESH
ZONE		REVISED AS PER CUSTOMER COMMENTS

DEPT.	UNTOL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
PED	GR. ₹/M/₹	1:125	N.A.	N.A.	N.A.	N.A.
CODE 450						

TITLE: STG HALL & DEAERATOR EQUIPMENT LAYOUT

CARD CODE: N.A.

DRG. NO.: PY-LE-1-M166-2006-01 REV. 01

SHT. No 03 NO. OF SHT. 05

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 COMPAY

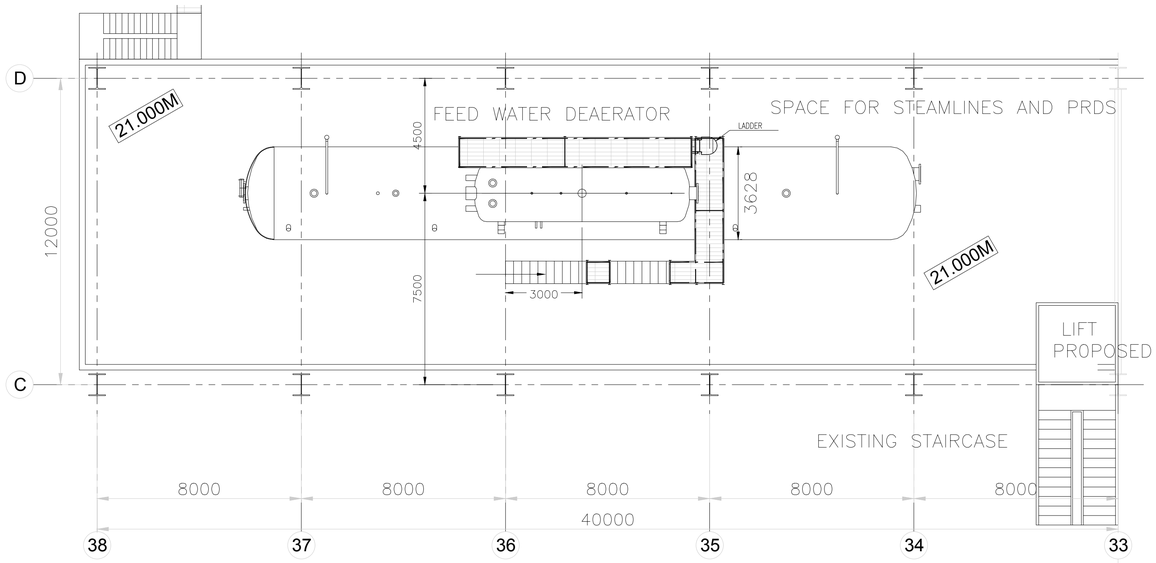
GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

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

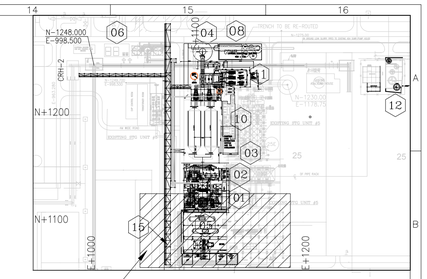
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

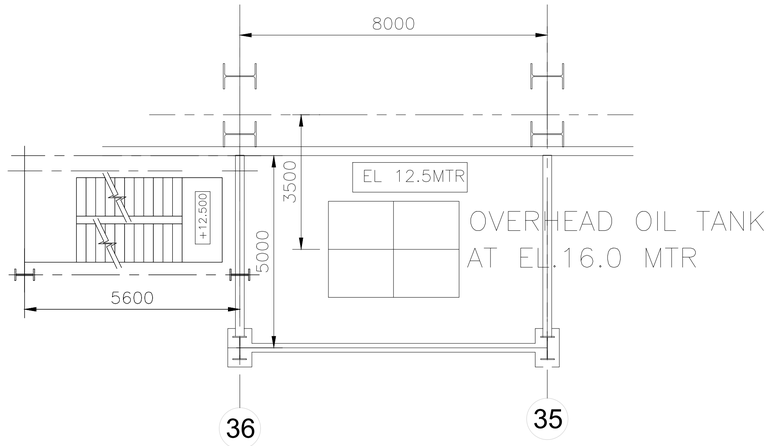
SHT.04 OF 05 | DRG. NO: PY-LE-1-M166-2006-01



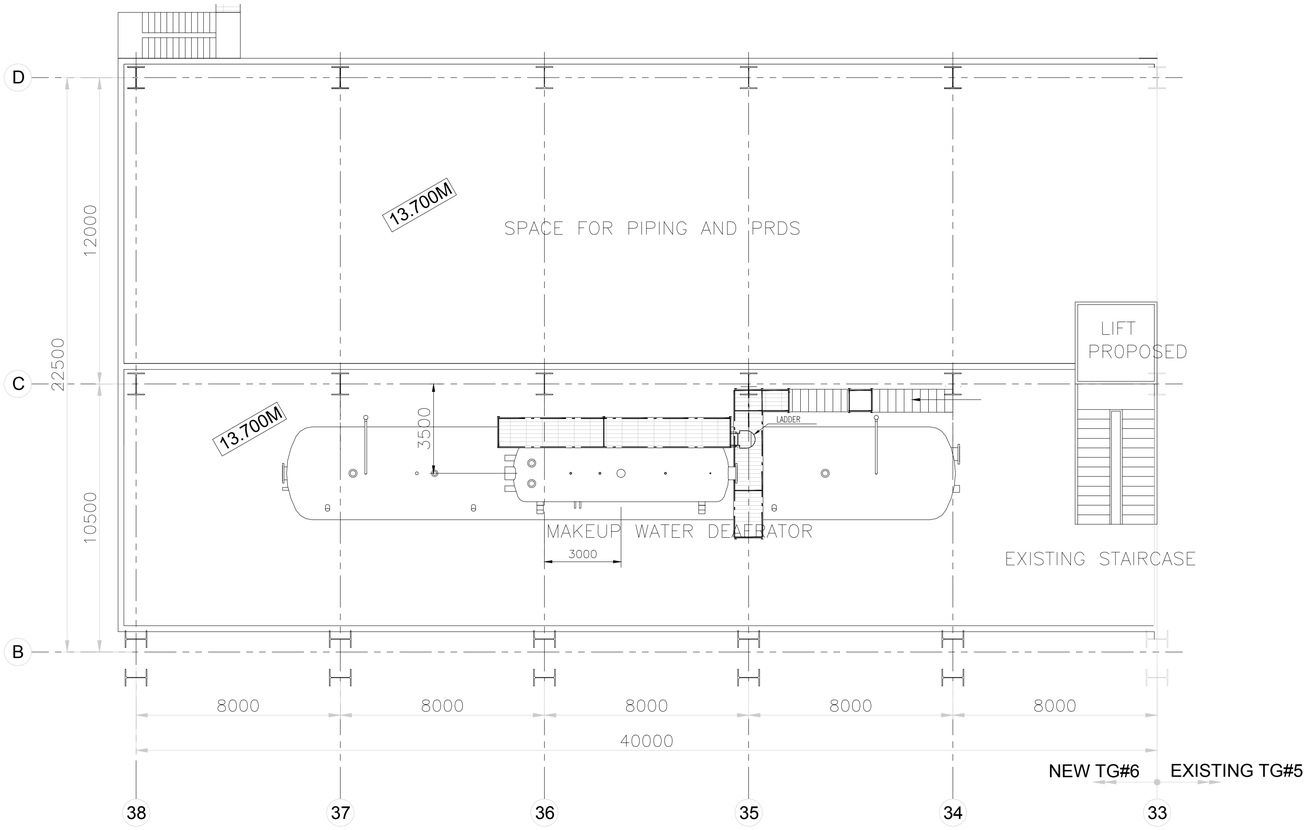
PLAN AT 21.000M LEVEL



KEY PLAN



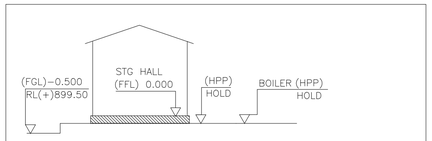
PLAN AT 12.500M LEVEL



PLAN AT 13.700M LEVEL

LEGEND

- REMOVABLE CHEQURED PLATE
- CHEQURED PLATE
- REMOVABLE GRATING
- GRATING
- HAND RAILING
- OPENING



LEGEND:
FFL: FINISHED FLOOR LEVEL
HPP: HIGHEST PAVED POINT
FGL: FINISHED GROUND LEVEL

MND REQUESTED TO CONFIRM HPP LEVEL

PLANT LEVEL

EQUIPMENT TABLE

SL. No.	NAME OF EQUIPMENT	SUPPORT TYPE	ERECTION LOAD(Kg)	FLODDED LOAD(Kg)	HORIZONTAL LOAD(Kg)
1	MAKE UP WATER DEAREATOR	FIXED SUPPORT	20790	110590	NA
		SLIDING SUPPORT	24750	125660	5026
2	FEED WATER DEARATOR	FIXED SUPPORT	20790	110590	NA
		SLIDING SUPPORT	24750	125660	5026
3	OVER HEAD TANK	–	2500	11550	–

NOTES

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4. ALL OTHER COMPONENTS REQUIRING MAINTENANCE SHALL BE TAKEN DIRECTLY FROM OPERATING FLOOR TO MAINTENANCE BAY AT GROUND LEVEL.

REFERENCE DRGS.:–

1. MACHINERY ARRANGEMENT & FOUNDATION : HY-DG-1-31301-24535-S01-R01
2. CONDENSER GA DRAWING : HY-DG-1-36010-70801-S00-R01
3. STEAM JET AIR EJECTOR GA DRAWING: HY-DG-1-46101-08801-S00-R01
4. GLAND STEM COOLER GA DRAWING : HY-DG-2-56214-99601-S00-R00
6. PLOT PLAN :PY-LQ-0-M166-2001-01

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

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	RAVI		23.10.20	
CHD.	PARAMESH G		23.10.20	N.A.
APPD.	UDAY KUMAR V		23.10.20	

REV.	DATE	ALTERED MOQEET
01	22.01.21	CHD/APPD PARAMESH
ZONE	REVISED AS PER CUSTOMER COMMENTS	

DEPT. PED	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO. / NO.OF ITEMS
CODE 450	g/m/f		1:120	N.A.	N.A.	N.A. / N.A.

TITLE: STG HALL & DEAERATOR EQUIPMENT LAYOUT

CARD CODE: NA

DRG. NO.: PY-LE-1-M166-2006-01 REV. 01

SHT. No 04 NO. OF SHT. 05

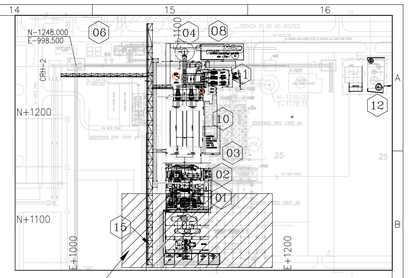
INVENTORY NO | SIGN. AND DATE | COMPUTER FILE NAME | REF. DRG. NO.

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

FIRST ANGLE PROJECTION

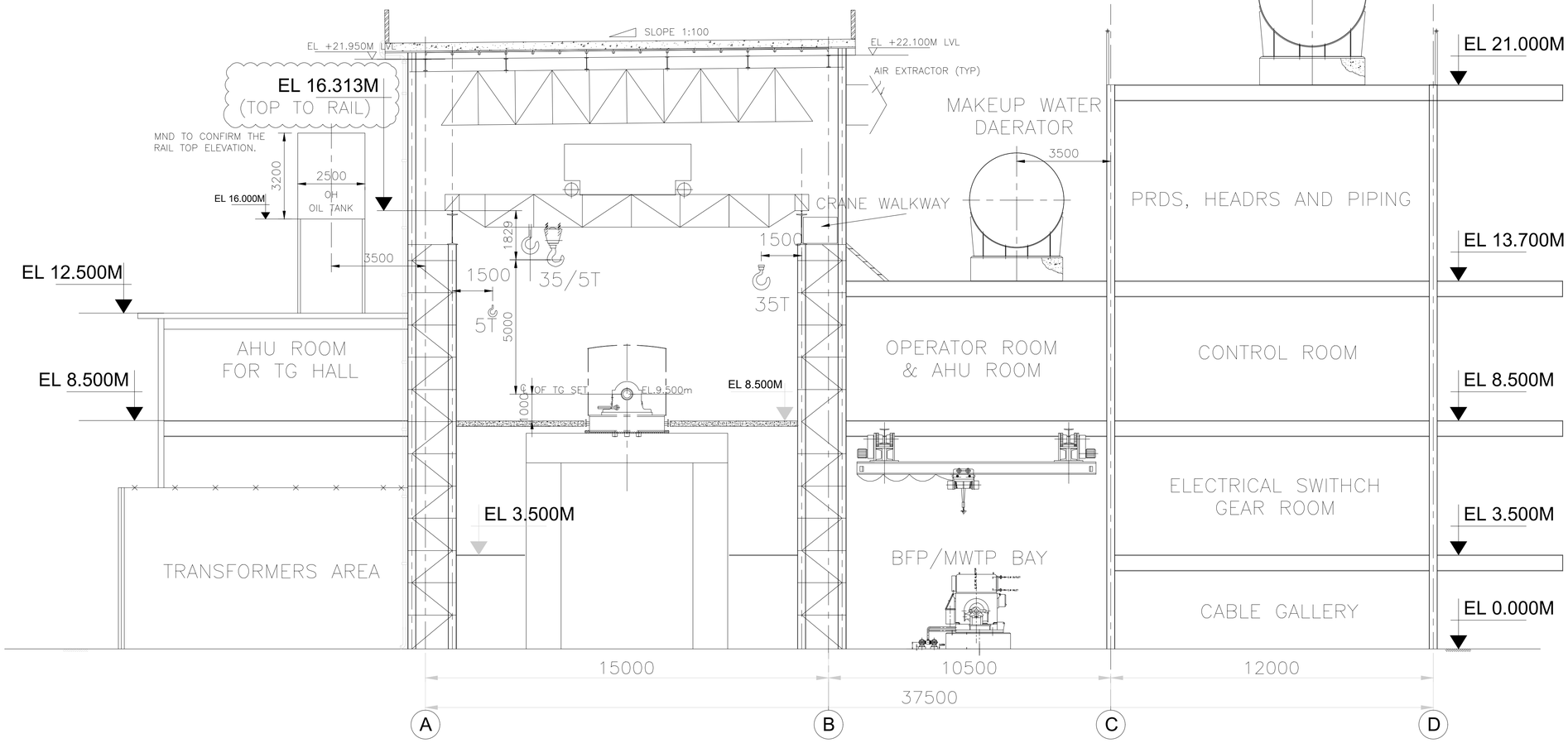
(ALL DIMENSIONS ARE IN mm)

SHT.05 OF 05 | DRG. NO: PY-LE-1-M166-2006-01



THIS AREA

KEY PLAN



SECTIONAL ELEVATION

GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

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

CLIENT	NATIONAL ALUMINIUM COMPANY LIMITED BHUBANESWAR, ODISHA		
CONSULTANT	M. N. DASTUR & COMPANY (P) LTD CONSULTING ENGINEERS, KOLKATA		
PROJECT	INSTALLATION OF STEAM AND POWER PLANT FOR 5th STREAM ALUMINA REFINERY EXPANSION AT DAMANJODI, ODISHA UNDER PHASE-3 EXPANSION OF M&R COMPLEX		
BHARAT HEAVY ELECTRICALS LTD. HYDERABAD		NAME / SIGN. / DATE / NO.OF VAR.	
	DRN.	RAVI / 23.10.20	
	CHD.	PARAMESH G / 23.10.20	N.A.
	APPD.	UDAY KUMAR V / 23.10.20	

REV.	DATE	ALTERED MOQEET
01	22.01.21	CHD/APPD PARAMESH
ZONE		REVISED AS PER CUSTOMER COMMENTS

DEPT. PED	UNTOL. DIMS. GR. g/M/f		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO. / NO.OF ITEMS
CODE 450			1:80	N.A.	N.A.	N.A. / N.A.

TITLE: STG HALL & DEAERATOR EQUIPMENT LAYOUT

CARD CODE: NA

DRG. NO.: PY-LE-1-M166-2006-01 REV. 01

SHT. No 05 | NO. OF SHT. 05

Annexure-2

Price bid Format

Annexure-3-I

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

PRICE FORMAT (R00) FOR 35/5 EOT CRANE FOR TG BUILDING
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.

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>						
I	**MAIN OFFER**						
A	**MATERIAL SUPPLY-EOT CRANE(35/5 T)[Material Code: PY9751699010]**						
A.1	**EOT Crane-Main Supply**						
	Design, manufacture, inspection, supply to site of EOT Crane Assembly along with Comissioing 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.	90			
A.2	**MATERIAL SUPPLY-DSL Conductor System**						
	DSL conductor system for LT (Refer note-14)	92	mtrs.				
A.3	**MATERIAL SUPPLY-LT Rails**						
	Crane LT rails (Refer note-14)	40	mtrs.				
B	**E&C of EOT CRANE[Material code:PY9851699039]**						
	Erection & Comissioing of EOT crane as per specification. [For Detail scope ,Please refer respective Clauses of Technical Specification]	1	No.	10			
	Grand total price for sl no A to B (Inclusive of Packing & Forwarding, Freight and Insurance)			100			
Packing & Forwarding, Frieght, Insurance and GST :							
(I) For Supply:							
(i) Packing & Forwarding :	In bidder scope			Included in basic price			
(ii) Frieght:	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			
(II) For supervision of E&C:							
(i) GST:	Extra at actuals			Extra at actuals			
(ii) Any other:	Included in basic price			Included in basic price			

Notes:

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) **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 offe**r and **Optional items** as per the prescribed format.
Offer will be evaluated based on total price for Supply and Erection & Commissioning (i.e. Sl. Nos. IA+IB 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 evalution 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) **For LT Rail for Long Travel of Crane assembly** : 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%.
For DSL required for Power supply to Crane assembly : 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 =92 m) .The variation in quantity can be from 0 to (+)10%.

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>						
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 commisioning spares, during commissioning shall be supplied free of cost by the equipment vendor.							
~~17)With respect to Mandatory Spares,~~ ~~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) 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.~~							
18) Reference document: **PY51699, R00 & annexures**.							
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) **In case the systems are being supplied from outside India,** reputed Third Party Inspection has to be considered and the charges should be included in the Main offer.The list of applciable thrid party shall be furnsihed 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.							

Annexure-3

CHEKCLIST

ANNEXURE-3 to BHEL TENDER SPECIFICATION (Doc. No. PY 51699)

CHECKLIST FOR EOT CRANE

Sl. No.	Description	Enclosed (Yes/ No)
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 CT & 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.	

SIGNATURE:
NAME:
DESIGNATION:
COMPANY: _____

DATE:_____

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	:

- 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 :

- 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 :

- 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. :

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 :

- 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 :

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	:

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) :

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%	:

- 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._____

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.

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

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

2.9 Supply of tools and tackles.

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

3.0 REQUIREMENT OF EOT CRANES

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

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

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

❖ **Note:**

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

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

Other Requirements

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

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

3. Crane shall be provided with Group lubrication system.

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

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

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

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

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

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

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

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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:

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

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

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

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

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^{0}C.

5.16 Electrical Equipment

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

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.

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.

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

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.

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

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

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

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

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

5.16.4 **Contactors**

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

5.16.5 **Brakes**

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

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

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

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

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

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

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

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

5.16.6 **Limit Switches**

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

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.

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

iii) One (1) 415/110V-control transformer shall be provided with ±5 per cent and ±10% taps on the primary side. The control transformer capacity shall

be so selected that voltage drop due to simultaneous closing of the magnetic contactors of multiple drives shall be maintained to the minimum. The anticipated voltage drop on the basis of which the control transformer is selected shall be indicated.

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

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

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

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

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

5.16.7.4 Individual control panels

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

i) Hoist Control

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

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

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.

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

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

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

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

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

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

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

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

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

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

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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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.

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:

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

11.0 TOLERANCES

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

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

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

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

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

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

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

PERFORMANCE GUARANTEE AND PRICE REDUCTION SCHEDULE

E) CRANES AND HOISTS

The following shall be demonstrated:

Sl. No.	Guaranteed parameters	Demonstrated Value	Acceptable tolerance limit	Remarks
1.	Lifting capacity (SWL) of cranes/hoists, t	**A) EOT Cranes:** 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) **B) Electrical Hoists**	NIL	Tenderer to rectify within reasonable time period.
2.	Total lifting height of cranes/hoists, m	**A) EOT Cranes:** i) 35/5T -16m/16.5m ii) 7.5T -10.5 m iii) 15 T – 6 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) Electrical Hoists		
3.	Operating speeds with and without SWL (in both directions) for various motions.	**A) EOT Cranes:** **i) 35/5T** - Main hoist, m/min-1 & 0.1 - Auxiliary hoist, m/min - 8 & 0.8 - Cross Travel, m/min - 15 & 1.5 - Long Travel, m/min- 30 & 3.0	± 10%	Tenderer to rectify within reasonable time period.
		ii) 7.5 T - 8 m/min (Hoisting) - 10 m/min (CT) - 30 m/min (LT)	± 10%	Tenderer to rectify within reasonable time period.
		iii) 15 T - 8 m/min (Hoisting) - 10 m/min (CT) - 30 m/min (LT)	± 10%	Tenderer to rectify within reasonable time period.
		iv) 5 T - 8 m/min (Hoisting)	± 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) Electrical Hoists 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
1.0	**General**	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	
2.0	**Applicable Standards**		
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.	
3.0	**Environment**		
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)

Sl. No.	Description	Requirement	Confirmation by Tenderer
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.	
4.0	**Execution Options**		
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)

Sl. No.	Description	Requirement	Confirmation by Tenderer
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	
5.0	**Construction details**		
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)

Sl. No.	Description	Requirement	Confirmation by Tenderer
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 aero-dynamic 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)

Sl. No.	Description	Requirement	Confirmation by Tenderer
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	*Temperature Detectors*	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	*Special Requirement for Inverter grade Motors for satisfactory working in conjunction with IGBT Transistor based Inverters.*		
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	**Painting**	As per IS 5, Finish coat shall confirm to shade 632 for outdoor equipment and shade 631 for indoor equipment	
6.0	**Safety features**		
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)

Sl. No.	Description	Requirement	Confirmation by Tenderer
7.0	**Documents**		
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^{0}C shall have a minimum of two primer coats prior to despatch to site. The paint system shall be PVC Copolymer based primer or alkyed 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.

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 60ºC 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:

Service	Colour	Shade as per IS:5
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)

Service	Colour	Shade as per IS:5
Demineralised water	Base- Sea Green Band- Light Orange	217 557
Condensate	Base - Sea Green Band - Light Brown	217 410
Cooling water	Base - Sea Green Band - French Blue	217 166
Plant air	Base - Sky Blue	101
Instrument air	Base - Sky Blue Band - Silver Grey	101 628
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:

Surface Preparations						
Required:						
Observed:						

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

Outside Painting :

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

_____ _____

Signature of Manufacturer **Signature of Contractor**

SEAWORTHY PACKING
(PACKING INSTRUCTIONS FOR GENERAL COMPONENTS / ASSEMBLIES / EQUIPMENT)

1 GENERAL

This standard lays down packing instructions for seaworthy packing of Components /Assemblies/ Equipment to be dispatched 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 for storage. For specific applications the concerned engineering department shall issue a product standard. Reference of this standard, must appear in the Shipping list/Packing List.

2 SCOPE

This procedure gives minimum guidelines for seaworthy packing to be complied with for packing of Components /Assemblies / Equipment. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage for periods more than one year.

3 CROSS REFERED SPECIFICATION

- Multi-layered cross laminated plastic film : AA51420
- Packing Wood : AA51401
- Silica gel : AA55619
- Thermocole : AA51416
- Packing slip holders : AA7240901
- Corrugated Fibre Board : AA51414
- Rubber sheet : AA59001
- VCI paper : AA51406
- High quality full glossy out door finishing paint : AA56126
- Polyethylene air bubble film : IS 12787
- Structural steel - standard quality (plates, sections, strips flats & bars) : AA10108
- International Standards For Phytosanitary Measures No. 15 : ISPM-15:2009

4 WOOD SPECIFICATION FOR PACKING

The wood shall conform to specification AA51401.

5 TYPE OF PACKING

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

- 'OP' - Open Type
- 'PP' - Partially Packed
- 'CP' - Crate Packing - Components/Equipment requiring physical protection

– 'CQ' - Case Packing - Small medium Components/ Assemblies/ Equipment which require corrosion & physical protection
– 'CR' - Case Packing - Electrical Components/Assemblies which require special packing viz. Water Proof, Shock Proof, etc.

6 DESCRIPTION OF TYPES OF PACKING

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

6.1 'OP' - Open Type

In case, of components which are not affected by water & dust & 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.

6.2 'PP' - Partially Packed

Components which need special protection, at selected portions only, shall be dispatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces after application of TRP should be protected with Multi-layered cross laminated plastic film to AA51420.

6.3 'CP' - Crate Packing – General

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

6.4 'CQ' - Case Packing - Machined Components/Assemblies/Equipment

a) Small & Medium sized components/assemblies/equipment due to size/weight & to avoid handling, and pilferage, problems shall be packed in Case/Containers.
b) Wherever required adequate quantity of silica gel to AA55619 or VCI Powder/ Tablets, packed in thin muslin cloth cotton bags shall be suitably placed.
c) Small machines/components of less weight shall be provided with suitable cushioning. Wood Wool/Expanded Polyethylene Foam Sheet, if used, shall be sandwiched between polyethylene sheets and sealed.
d) The components inside the case shall be entirely covered with Multi-layered cross laminated plastic film to AA51420, where-ever required.

6.5 '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.

a) Adequate quantity of Silica gel to AA55619 packed in cotton bags, of 100 grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with Multi-layered cross laminated plastic film to AA51420, before being packed in the cases.
b) VCI Powder/Tablets can be used as an alternative to Silica Gel to AA55619.
c) Empty space in the cartons shall be filled with small chips of Expanded Polystyrene (Thermocole), Wood Wool etc. Polyethylene air bubble film shall conform to IS 12787/AA51420 Expanded polystyrene (Thermocole) shall conform to AA51416.
d) The cartons shall be manufactured from corrugated Fibre Board, meeting requirements of AA51414.

6.6 Volatile Corrosion Inhibitor (VCI) Paper

a) Un-protected surfaces of steel and cast iron components, tools bearing, shaft seals etc. are covered with VCI paper. VCI paper has been impregnated with corrosion inhibitors which by evaporation and chemical conversion protect metals in an enclosed area against corrosion.
b) 7 m^3 VCI paper is necessary for 1 m^3 of packed item approximately as per AA51406.

Application Limitation:

VCI paper shall not be used for components made of aluminium, aluminium alloys as well as Zinc, copper, brass, cadmium and silver.

VCI powder is sprinkled inside the piping components ends shall be protected with end cover as specified in plant standards, drawings.

6.7 Moisture Absorber

Silica gel is used for this purpose to protect the contents over sufficiently long time from corrosion. At the time of use, silica gel should be so dried that its colour becomes dark blue. These shall be filled in small cotton bags. Before sealing the equipment, the silica gel bags should be kept inside the polyethylene film cover at different locations. The quantity of silica gel should not be less than 1.0 kg per cubic metre volume of the packing box

7 TYPE OF CASES

For specific requirement of packing the cases are to be provided with Tongue and Groove joints.

8 PREPARATION OF PACKING CASE

1) The base of the case shall be made of wooden batons for planks giving necessary reinforcement, such that the bottom of the equipment is at a height of 100 to 200 mm from the ground level depending upon size, ft weight of equipment. However for packing cases of smaller size equipment can be at a height of 40 mm from the ground level.
2) In case of 'CR1 - Packing Viz. Electrical ft Electronic components for instruments/assemblies, a rubber sheet, Self-expanded polyethene foam sheet, preferably 10 mm thick, shall be fixed on to the base to act as cushioning to the equipment.
3) The four sides, shall be lined, from inside with multi-layered cross-laminated polyethylene sheet of 90GSM as per AA51420 and tacked at suitable places.

   Whenever specified the top cover will have a layer of multi-layered cross laminated polyethylene sheet of 90 GSM over the cover. This should project about 100 - 250mm on all sides.

   It is preferable to have a single piece of the above Multi-layered cross laminated polyethylene sheet fixed on the four sides. In case jointing is unavoidable, it should be done by overlapping of approximately 100mm.
4) Place the Components/cartons with corrosion inhibitors duly applied wherever necessary for place suitably, thin muslin cloths bags containing 100 grams (approx.) of activated Blue Silica Gel to AA55619, wherever necessary. Alternatively VCI Powder or Tablet may be used.
5) In case, depression is formed, at the top, after the equipment is lowered, provide ply board/wooden batons.
6) Cover the whole equipment with polyethylene sheet of at least 100 micron thickness, on all sides preferably by a single piece.
7) For indoor panels/equipment, provide suitable packing batons with covering of Thermocole/expanded soft polyethylene foam/polyethylene air bubble film wrapped with suitable cords, to avoid cutting of the polyethylene sheet so that finished surface is not damaged.
8) Empty space in the box shall be filled with adequate cushioning material e.g. Thermocole Chips, Wood Wool etc. to avoid movement for shocks. Alternatively put wooden blocks/batons wherever necessary.
9) The inner side of the top cover shall be lined with polyethylene sheet, of at least
10) 100 micron thickness, which shall project approximately 25 to 150 mm depending upon the size of the case on all sides of the top cover shall be provided below the top cover. This projection, after nailing the top cover, shall be folded over, on the sides of the crates ft tacked, to, prevent ingress of water from the top.

9 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 Components/Assemblies/Equipment in the steel container properly. Cover the Components/Assemblies/Equipment with polythene.

– To arrest the movement in the steel container necessary wooden Blocks/Batons may be put.

– Put cover on steel, container and Bolt Properly.

10 SEALED PACKING

Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture.

The components sub-assemblies and assemblies are completely covered with 2 layers of polyethylene sheet. All sharp corners and edges are to be protected by rubber mats to prevent the polyethylene sheet from damage. Top surface of the case shall be free from dents to prevent rain water pockets.

11 SLING PLATE

Sling plate shall be provided to prevent damage to the packing box during lifting. Size of the sling plate shall be selected depending upon the net weight of the consignment.

12 PACKING SLIP HOLDERS

Two nos. steel packing slip holders, specification no. AA7240901 containing the packing list, sealed in thick polyethylene film, shall be fixed one inside and the other outside the packing box.

13 GENERAL PRECAUTIONS

a) While fixing nails during packing, necessary care shall be taken to ensure that materials used for protection inside the case e.g. paper, polyethylene sheet, coir etc. do not get damaged.

b) Sling protection brackets to be provided on cases wherever required.

c) It shall be ensured that all stencil marks external, front & rear sides of the casing shall be of water proof Material to prevent obliteration in transit.

d) The various caution signs shall be marked with stencil on both sides of the packing box.

e) Do not pack any other Mechanical items with this case.

THE FOLLOWING DETAILS ARE TO BE MARKED ON THE PACKING CASES.

a) Address of consignee.

b) Purchase Order No./ SO No/WO No.

c) Description of item or title of packing list.

d) Case identification Number/ Packing List No.

e) Net Weight.

f) Gross Weight.

g) Dimensions of box

h) Marking showing upright position.

i) Marking showing sling position.

j) Marking showing umbrella (i.e. for machines/components to be stored under covered storage.

k) Loading and unloading precautions

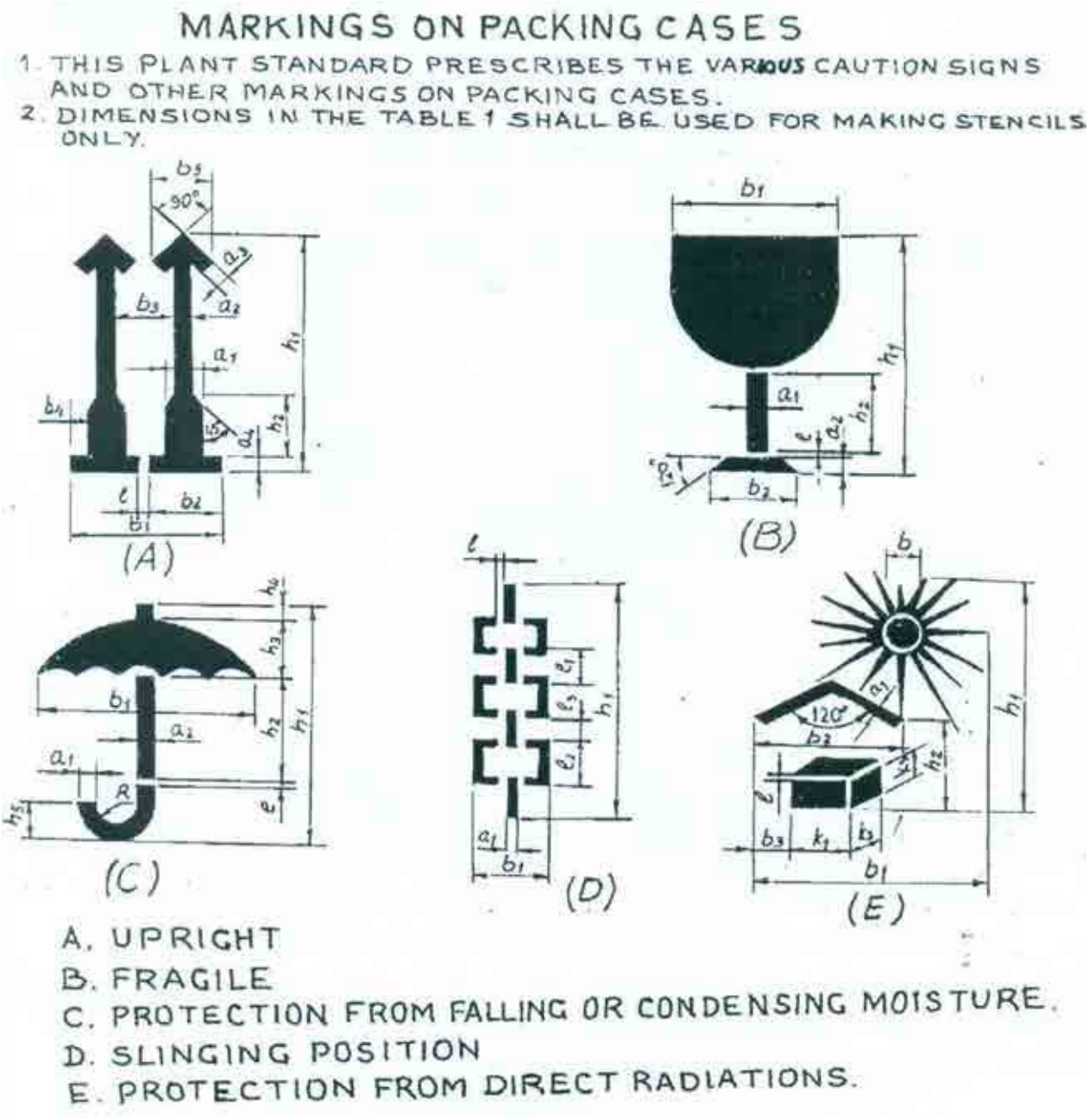


Figure 1

CENTER OF GRAVITY

Figure 2

CORPORATE STANDARD

Table 1

DESIGN-ATION		DIMENSIONS IN mm.																						
		a_1	a_2	a_3	a_4	b_1	b_2	b_3	b_4	b_5	b	ℓ	h_1	h_2	h_3	h_4	h_5	K_1	K_2	K_3	ℓ_1	ℓ_2	ℓ_3	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	187	62	–	–	–	34	16	22	–	–	–	–

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

14 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.

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

14.2 Appropriate material handling equipment like fork lifters, cranes etc. Shall be used where needed.

14.3 Lifting by crane and transportation by trolley of critical items and large components like rotors castings etc. Shall be done carefully.

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

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

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

14.7 Precision machined components like blades, catches, rollers etc. Shall be lifted using suitable wooden pallets.

14.8 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 Clause No. 13

14.8.1 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 15º.

14.8.2 Handling and lifting should be done without jerks or impacts.

14.8.3 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.

14.8.4 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.

14.8.5 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.

14.8.6 Silica gel and such other chemicals kept in the box as desiccants and indicators should also be left in the box itself.

15 GI SHEET

The packing cases are covered with GI sheet on outside for sides and top; inside for bottom as per the Figure-3.

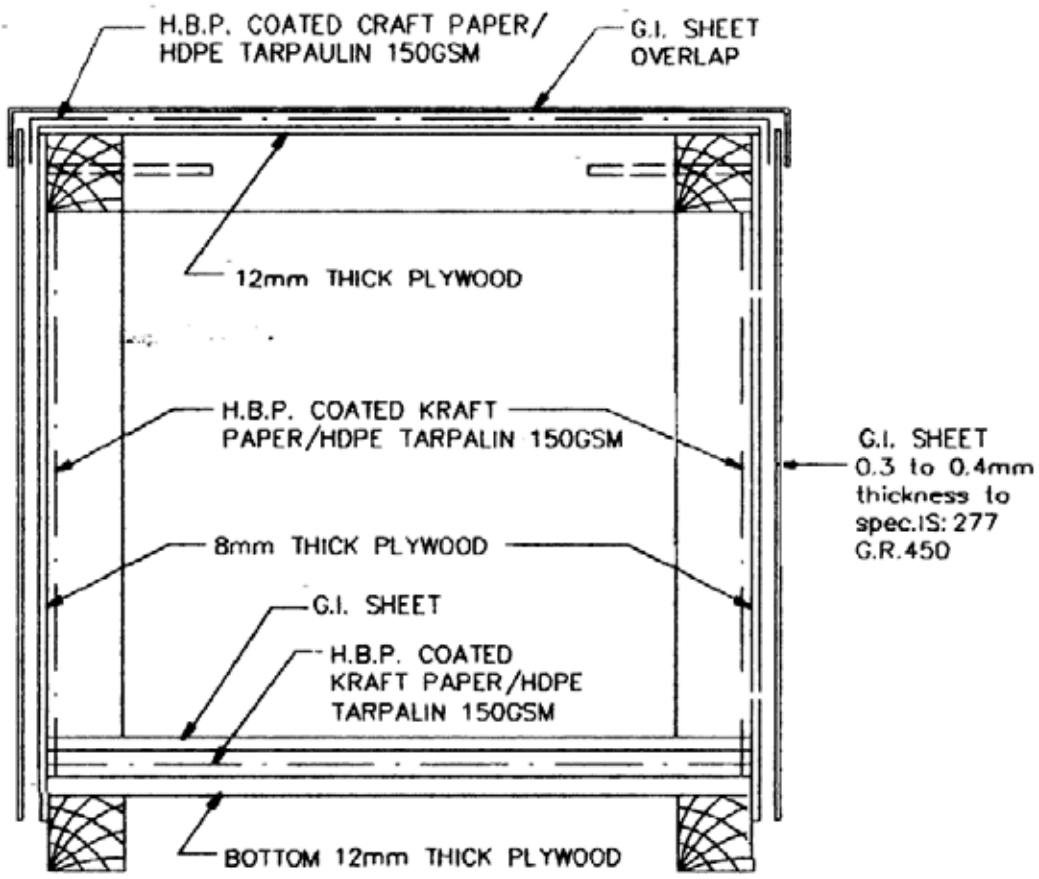
16 TREATMENT of Wood

Treatment of wood is as per ISPM 15: 2009

17 PROVISION FOR INSPECTION

This clause is applicable only where contractual requirement of customer is there. For other packings this is not applicable.

Each transportable packing's shall have provision for inspection by customer authority etc. during transport from origin of dispatched till destination. This inspection may require opening of the package and subsequently closing it again. For this purpose suitable designed opening with bolted cover shall be provided. Such an opening shall be clearly marked as "OPENING" with clear instruction for opening & closing written on this cover. For large consignment the size of the opening shall be suitable to facilitate entry of personnel.



CLOSED PACKING CASE WITH G.I.SHEET SHOWING LAYERS OF PACKING MATERIALS

Figure 3

VACUUM PACKING FOR STAMPINGS

1 GENERAL

This standard lays down the packing instructions for packing of Stamping to be dispatched against Customer contracts.

2 SCOPE

This procedure covers method of packing stamping in a wooden packing boxes with vacuum packing.

3 OBJECTIVE

To establish a rust proof safe packing procedure and where the components required to protect against temperature and humidity. In general minimum temperature +5 deg C and maximum temperature 45 deg C, and relative humidity between 10% to 40%.

4 PACKING BOX

Wooden Box shall be made as per BHEL Standard AA0490010 for Domestic/ AA0490009 for Export/ AA0490004 for Seaworthy packing. Size of the box as per the contract requirement which has to be checked by QC.

5 PACKING PROCEDURE

a) Only QC cleared packing wooden Boxes shall be used for Packing of stampings.

b) Stampings marked by QC with “OK” stickers only need to be packed. Varnished stampings are to be brought down to room temperature before labelling them “OK” for packing. Do not pack hot/warm stampings that have just received after varnishing.

c) Stampings are to be stacked in proper alignment and to be kept in packing wooden boxes of specific size.

6 Vacuum Packing

a) Turbo generator stamping of HEEP-Haridwar and Hydro stator and Hydro rims stamping of HEP-Bhopal will be packed in Vacuum Bag.

b) The stack of stampings shall be placed over porous plastic sheets (for Cushioning) with total thickness of at least 5mm and shall be wrapped with first layer of aluminium barrier bag (vacuum bag), second layer of VCI Paper (Vacuum Corrosion Inhibitor as per BHEL Standard AA51406). The VCI paper must contact stacked stampings. (Refer Figure-1).

c) Silica gel packets are to be placed inside the vacuum bag (between stamping and VCI paper) uniformly distributed around the stampings to remove/ prevent moisture. Total quantity per box should be a minimum 1.5 kg for packing box with a single stack and minimum of 2 kg for a double stack box. In order to cover the maximum space inside the box, small quantity packets 25 gm, 50 gm and 100 gm uniformly distributed all-round the box.

d) After final clearance from QC by putting green stickers on stack stampings, Vacuum bag should be secured in position and properly sealed using heat sealing machine and air to be drained using vacuum pump. At the time of the evacuation the vacuum inside the pack should be less than 0.5 ata.

e) The top covers of boxes shall be sealed only after final clearance from QC for confirmation of above.

f) All boxes should be covered by water proof tarpaulin over top and on all sides.

g) The packing boxes shall be covered with GI sheets (0.25-0.40mm thick) on all the sides for Export/ Seaworthy packing.

h) Vacuum packing room temperature and Relative Humidity should be maintained as mentioned below:

Min. +5 deg. C and Max. 45 deg. C, Relative humidity between 10% to 40%.

7 Aluminium Barrier Laminated Bags

Material must be a first ply of a relatively tough, bi-axially oriented film of organic polymer adhered to second ply of metallic foil/coating and a third ply of a tough polymer such as polyethylene with proper flexibility.

Bags are to be supplied with five sides' sealed and top cover in loose form. Sealing width should be 8 mm minimum.

Properties	Units	Value
Weight	g/m^2	150+ 5 GSM
Tensile Strength	N/mm^2 MD	40 (min)
	N/mm^2 TD	41 (min)
Water vapour Transmission	g/m^2	0.01 in 24 hrs. at 38 degree C & 90% RH (max)
Oxygen Transmission	cm^3/m^2	0.02 in 24 hrs at 38 degree C & 90 % RH (max)
Sealing Temp.	Degree C	180 - 220 degree C

8 MARKING OF PACKING BOX

a) Box No.

b) P.O. No.

c) Product Name

d) Project / Customer Name

e) Consignee

f) Water proofing (Umbrella Stencilling)

g) Upside direction

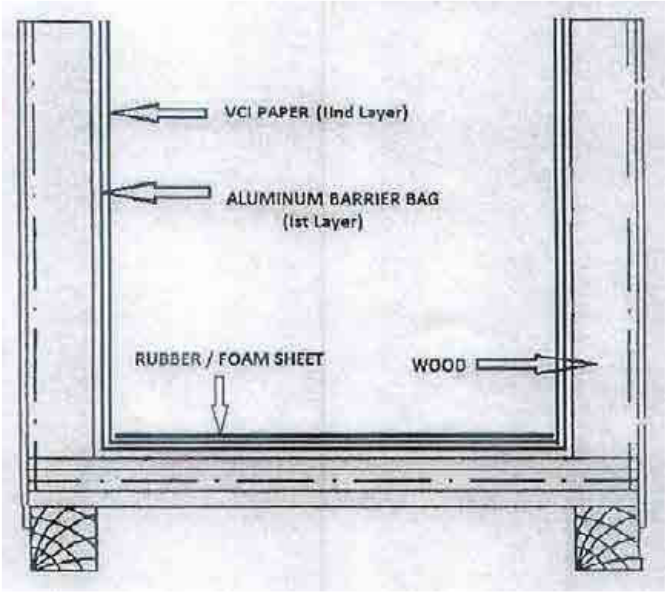


Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12

VACUUM PACKING FOR ELECTRONIC COMPONENTS

1 GENERAL

This standard lays down the packing instructions for packing of components / Electronic module / Assemblies to be dispatched against Customer contracts.

2 SCOPE

This procedure covers method of packing electronic components using vacuum packing in a wooden packing boxes.

3 OBJECTIVE

To establish a rust proof safe packing procedure and where the components required to protect against temperature and humidity. In general minimum temperature +5 deg C and maximum temperature 45 deg C, and relative humidity between 10% to 40%.

4 PACKING BOX

Wooden Box shall be made as per BHEL Standard AA0490010 for Domestic/ AA0490009 for Export/ AA0490004 for Seaworthy packing. Size of the box as per the contract requirement which has to be checked by QC.

5 PACKING PROCEDURE

a) Cleaning parts shall be thoroughly cleaned just before VCI (Volatile Corrosion Inhibitor) Vacuum packing. Finger prints on cleaned items are to be avoided as the same are very corrosive.

b) VCI Rust preventive oil (Ferrous grade oil base) shall be applied to all the components to withstand any corrosion.

6 VCI VACUUM PACKING

a) Bubble wrapping the items VCI vacuum packing.

b) Appropriate vapour corrosive packets one pouch (1 gm. /pouch) of VCI Anticorrosive Powder and one pouch (10gm./ pouch) of VCI Desiccant per 1000 cub. meter packing space shall be placed inside the VCI vacuum packing.

c) All the components shall be separately packed using VCI laminated Aluminium foils from which air/moisture are removed by the air vacuum device and sealed thoroughly using heat sealing machine. At the time of the evacuation the vacuum inside the pack should be less than 0.5 ata.

d) One identification slip containing component information such as description of item, Material No. Customer PO, Item No. Quantity etc. shall be put inside the VCI vacuum packing.

e) Top cover of the wooden box shall be sealed only after final clearance from QC for confirmation of above.

f) All boxes should be covered by water proof tarpaulin over top and on all sides.

g) The packing boxes shall be covered with GI sheets (0.25 -0.4mm thick) on all the sides for Export / Seaworthy packing.

h) Vacuum packing room temperature and Relative Humidity should be maintained as mentioned below:

Min. +5 deg. C and Max. 45 deg. C, Relative humidity between 10% to 40%.

7 COMPONENTS REQUIRED

7.1 VCI laminated Aluminium foil

Volatile Corrosion Inhibitor (VCI) safe foil shall be with aluminium barrier laminated which is flexible, heat sealable, water vapour and anticorrosion resistant barrier laminate of polyester, Aluminium foil and VCI Polyethylene. It is used as a primary packaging material for packing metal components and sealed with the help of a heat sealer after vacuuming with vacuum machine maintaining the humidity level below 40 RH inside the package.

7.2 Composition construction of VCI laminated Aluminium foil

a) PET Film : 12 Microns
b) Bonding layer : 2 Microns
c) Aluminium Foil : 9 Microns
d) Bonding layer : 2 Microns
e) VCI Poly film : 100 Microns
f) Total thickness : 125 Microns + or – 5%

7.3 Properties of VC Laminated Aluminium foil

a) Basic Weight : 138 gsm +/- 8%
b) Sealing condition : 180 C/ 2 sec
c) Tensile strength
   MD: 20 kgf
   CD: 18 kgf
d) Tear Strength
   MD 4.8 kg
   CD:3.4 kg
e) Heat Seal Strength : 30.380 N/cm
f) WVTR Value : 0.05gms/m /24 hrs.
g) OTR Value : 0.1 cc/m/24 hrs

8 MARKING OF PACKING BOX

Mark the following information on the two adjacent sides of the each package

a) Material No.
b) Customer PO
c) Item No.
d) Quantity
e) Storage Requirement : Indoor
f) Content Description : Electronic Module
g) Net weight (in kg)
h) Dimension (L x W x H in centimetres)
i) Project Name
j) Consignee
k) Water proofing (Umbrella Stencilling)
l) Upside direction

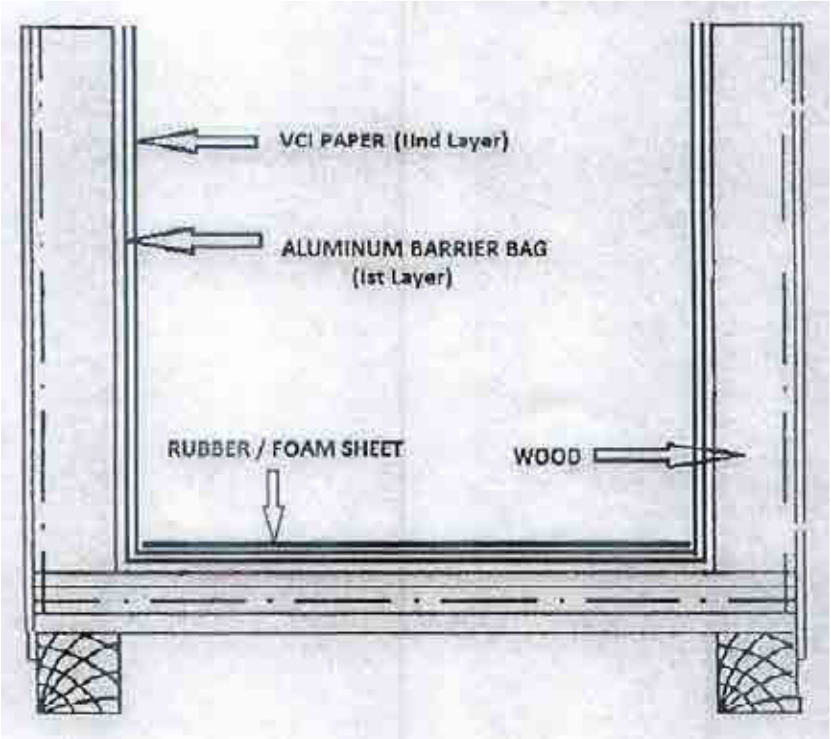

VCI PAPER (IInd Layer)
ALUMINUM BARRIER BAG
(Ist Layer)
RUBBER / FOAM SHEET
WOOD

Figure 1

VACUUM PACKING FOR ELECTRICAL COMPONENT

1 GENERAL

This standard lays down the packing instructions for packing of components / Electrical components Stator/ Rim punching, Wound Pole/ Field Coils and Stator coils / bars to be dispatched against Customer contracts.

2 SCOPE

This procedure covers method of packing component in a wooden packing boxes.

3 OBJECTIVE

To establish a rust proof safe packing procedure and where the components required to protect against temperature and humidity. In general minimum temperature +5 deg C and maximum temperature 45 deg C, and relative humidity between 10% to 40%.

4 PACKING BOX

Wooden Box shall be made as per BHEL Standard AA0490010 for Domestic/AA0490009 for Export/ AA0490004 for Seaworthy packing. Size of the box as per the contract requirement, which has to be checked by QC.

5 PACKING PROCEDURE

a) All items packed are to be marked by QC with “OK” stickers. Varnished stator punchings are to be brought down to room temperature before labelling them “OK” for packing. Do not pack hot/warm stator punchings that have is just received from the varnishing.

b) Packing of stator punchings, wound pole/ field coils and stator coils / bars should be done in a covered shed.

c) Packed materials are to be stacked in proper alignment and to be kept in wooden packing.

6 Additional Packing Methodology for Stator / Rim Punchings (Double stacking) only

In order to eliminate the use of studs avoid double stack packaging per box. Where double stacked packing boxes are unavoidable, the stator /rim punchings are to be securely tightened using GI studs, nuts and soft material washers (rubber/plastic). GI studs, nuts and soft material only to be used in case of double stacking of rim / stator punchings (with holes). Use soft rubber washers to seal the punctured opening at the bottom from where the studs pass in each layer of VCI (Volatile Corrosion Inhibitor) paper, polythene and tarpaulin sheet in case of rim /stator punchings (with holes).

a) GI studs with rubber washer to be placed initially inside the wooden packing box.

b) Over the wooden base, place water proof tarpaulin sheet.

c) Rubber washer shall be placed after the layer of tarpaulin sheet.

d) Then place a layer of porous plastic sheet with total thickness of at least 5mm (for cushioning and reduces the chances of damage to punchings).

e) Place the Aluminium Barrier laminated Bags over this porous sheet, place the rubber washer over it.

f) Place VCI papers on the Aluminium barrier bag and fix with rubber washer.

g) PVC Pipes shall be inserted over the GI studs. These pipes are to be used to cover each stud, to protect its direct contact and hence rubbing with punchings.

h) Now place the stack of punchings over the VCI paper and securely tighten the punchings using nuts and soft material, washers.

i) Each layer should be secured in position. Wrap the punchings with VCI paper and properly sealed separately using an adhesive tape.

j) Silica Gel packets are to be placed over the VCI paper and uniformly distributed inside the boxes on the VCI paper to remove/prevent moisture.

k) Aluminium barrier laminated bag has secured in position and properly sealed by using heat sealing machine and air to be drained out by using vacuum pump. At the time of the evacuation the vacuum inside the pack should be less than 0.5ata.

Use two separate VCI papers for doubled stacked boxes independently covering each stack. Similarly two Aluminium barrier laminated bag are to be used to wrap the two stacks independently, as explained above.

7 Additional Packing Methodology for Wound Pole/ Field Coils and Stator Coils/Bars only

a) Over the wooden base, place the waterproof tarpaulin sheet.

b) Then place a layer of porous plastic sheet with total thickness of at least 5mm (for cushioning and reduces the chances of damage to Wound pole/field coils and stator coils/ bars.

c) Place the Aluminium barrier laminated bag over this porous sheet.

d) Place the VCI paper (Volatile Corrosion Inhibitor as per BHEL Standard AA51406) on the Aluminium barrier laminated bag along with rubber washer.

e) Bare copper portion of field coils and stator coils / bars to be covered by VCI paper pouch and fasten with VCI tape.

f) Now place the wound pole, stack of field coil and stator coil / bars over the VCI paper.

g) Each layer should be secured in position. Wrap wound pole / field coils and stator coils / bars with VCI paper and properly sealed separately using an adhesive tape.

h) Silica Gel packets are to be placed and uniformly distributed inside the boxes on the VCI paper to remove/prevent moisture.

i) Then Aluminium barrier laminated bag has secured in position and properly sealed by using heat sealing machine and air to be drained out by using vacuum pump. At the time of evacuation the vacuum inside the pack should be less than 0.5ata.

j) The VCI paper must contact the stator / rim punchings, wound pole / field coils and stator coils/bars. It has to ensure that the VCI paper, Aluminium barrier bag should not get damage / puncture during the packing process.

k) Top cover of the wooden box shall be sealed only after final clearance from QC for confirmation of above.

l) All boxes should be covered by water proof tarpaulin over top and on all sides.

m) The packing boxes shall be covered with GI sheets (0.25 -0.4mm thick) on all the sides for Export / Seaworthy packing.

n) Vacuum packing room temperature and Relative Humidity should be maintained as mentioned below:

Min. +5 deg. C and Max. 45 deg. C, Relative humidity between 10% to 40%.

8 COMPONENT REQUIRED

8.1 VCI laminated Aluminium foil

Volatile Corrosion Inhibitor (VCI) safe foil shall be with aluminium barrier laminated which is flexible, heat sealable, water vapour and anticorrosion resistant barrier laminate of polyester, Aluminium foil & VCI Polyethylene. It is used as a primary packaging material for packing metal components and sealed with the help of a heat sealer after vacuuming with vacuum machine maintaining the humidity level below 40 RH inside the package.

8.2 Composition construction of VCI laminated Aluminium foil

a) PET Film : 12 Microns
b) Bonding layer : 2 Microns
c) Aluminium Foil : 9 Microns
d) Bonding layer : 2 Microns
e) VCI Poly film : 100 Microns
f) Total thickness : 125 Microns + or – 5%

8.3 Properties of Aluminium Barrier laminated Bag

a) Basic Weight : Unit: g/sq. m 150 +/- 5
b) Tensile strength : Unit: N/sq. mm MD: 40 (min.)
Unit: N/sq. mm TD: 41 (min.)
c) Water Vapour Transmission : Unit: g/m^2 0.01 in 24 hrs. at 38 deg C & 90% RH(max)
d) Oxygen Transmission : Unit: cm^3/m^2 0.02 in 24 hrs. at 38 deg C & 90% RH (max)
e) Sealing Temp. : Unit : Degree C 180-220 deg C

9 MARKING ON PACKING BOX

Mark the following information on the two adjacent sides of the each package.

a) Box No.
b) Customer PO
c) Product Name.
d) Project Name
e) Quantity
f) Storage Requirement : Indoor
g) Net weight (in kg)
h) Dimension (L x W x H in centimetres)
i) Consignee
j) Water proofing (Umbrella Stencilling)
k) Upside direction
l) Sling position indicator

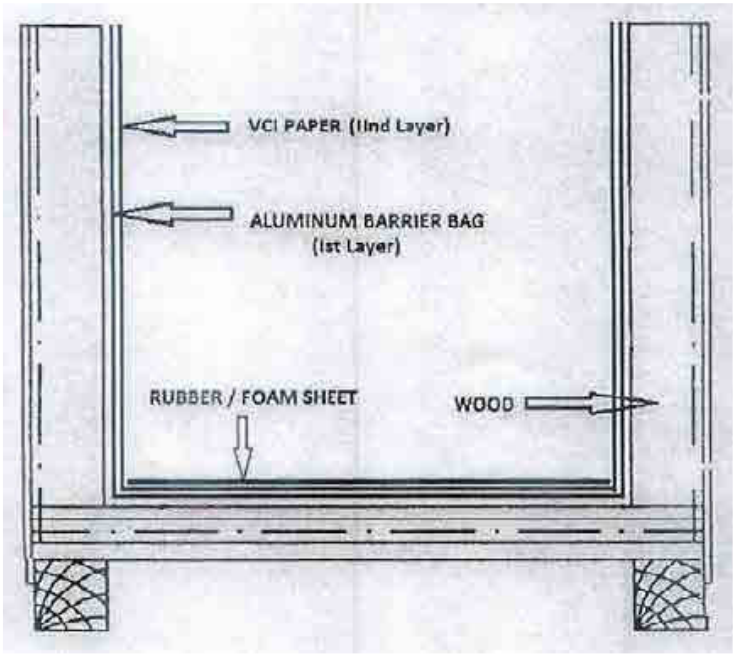


Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

EXPORT PACKING

(PACKING INSTRUCTIONS FOR GENERAL COMPONENTS / ASSEMBLIES / EQUIPMENT)

1 GENERAL

This standard lays down packing instructions for export packing of components/assemblies/equipment to be dispatched 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 for storage. For specific applications, the concerned engineering department shall issue a product standard. Reference of this standard, must appear in the Shipping list/Packing List.

2 SCOPE

This procedure gives minimum guidelines for export packing to be complied with for packing of components/assemblies/equipment. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage for periods more than one year.

3 WOOD SPECIFICATION FOR PACKING:

a) The wood shall conform to specification AA51401.

b) Ply Wood planks as per specification IS:303 Gr. “MR” Type A,B are used for the sides, top & bottom of the packing cases.

c) Ply Wood of marine grade as per IS:710 for packing of control equipment and for support batten pinewood to be used as per specification AA51401.

4 TYPE OF PACKING:

The following types of packings have been standardized for packing of general components/assemblies.

4.1 Open Type:

Packing subjected to BHEL approval.

4.2 Closed packing cases:

a) Export packing of the specific items requiring additional protection shall be covered with G.I. sheet covering as per customer/contractual/engineering requirements. G.I. shall conform to specification AA10166.

b) Any other special or export seaworthy packing (improvement or equivalent to the above) shall be subjected to BHEL Engg & QC approval).

4.3 Special Packing

Components requiring special packing (as per customer/contractual/ engineering requirements) not included in this specification shall be covered by product standards.

5 TREATMENT OF WOOD AS PER ISPM-15

As per customer requirement for export packing, wood to be treated as per International Standards for Phytosanitary Measures ISPM:15.

6 PREPARATION OF PACKING CASE:

1) Export items are to be packed in sea worthy wooden/Ply board cases.
2) The base of the case shall be made of wooden battens for planks giving necessary reinforcement, such that the bottom of the equipment is at a height of 100 to 200mm from the ground level depending upon size & weight of equipment. However for packing cases of smaller size equipment can be at a height of 40mm from the ground level.
3) The four sides & top cover shall be lined, from inside with multi-layered cross-laminated polyethylene sheet of 90GSM as per AA51420 and tacked at suitable places.

   Whenever specified the top cover will have a layer of multi-layered cross laminated polyethylene sheet of 90 GSM over the cover. This should project about 100 - 250mm on all sides.

   It is preferable to have a single piece of the above Multi-layered cross laminated polyethylene sheet fixed on the four sides. In case jointing is unavoidable, it should be done by overlapping of approximately 100mm.
4) Put the job on the base and wherever necessary may be screwed / fastened.
5) In case of delicate component Packing Viz. Electrical & Electronic components for instruments/ assemblies, a rubber sheet, Self-expanded polyethene foam sheet as per AA51423, preferably 10mm thick, shall be fixed on to the base to act as cushioning to the equipment.
6) Place the Components/cartons with corrosion inhibitors duly applied wherever necessary for place suitably, thin muslin cloths bags containing 100grams (approx.) of activated Blue Silica Gel to AA55619, wherever necessary. Alternatively VCI Powder or Tablet may be used.
7) In case, depression is formed, at the top, after the equipment is lowered, provide ply board/wooden batons.
8) Whole Equipment shall be covered and sealed with Multi-layered cross-laminated Polyethylene sheet to AA51420.
9) For indoor panels/equipment, provide suitable packing batons with covering of Thermocole/ expanded soft polyethylene foam/polyethylene air bubble film wrapped with suitable cords, to avoid cutting of the polyethylene sheet so that finished surface is not damaged.
10) Empty space in the box shall be filled with adequate cushioning material e.g. Thermocole Chips, Wood Wool etc. to avoid movement for shocks. Alternatively put wooden blocks/batons wherever necessary.
11) The inner side of the top cover shall be lined with M.L.C. laminated polyethylene sheet of at least 90GSM, which shall project approximately 25 to 150mm depending upon the size of the case on all sides of the top cover shall be provided below the top cover. This projection, after nailing the top cover, shall be folded over, on the sides of the crates & tacked, to, prevent ingress of water from the top.
12) For specific applications requiring additional protection the packing cases are covered with GI sheet on outside for sides and top; inside for bottom as per specification AA10166, thickness of G.I. sheet shall be 0.25mm.
13) For specific applications requiring inspection, additional inspection window has to be provided for custom clearance for export jobs.

7 SEALED PACKING:

Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture.

The components sub-assemblies and assemblies are completely covered with 2 layers of M.L.C. laminated poly film. All sharp corners and edges are to be protected by rubber mats to prevent the polyethylene sheet from damage. Top surface of the case shall be free from dents to prevent rain water pockets.

Certain special precautions are required for seal tight packing of specific item have to be covered by product standard.

8 OTHER PACKING MATERIAL

8.1 Volatile Corrosion Inhibitor (VCI) Paper as per AA51406:

a) Un-protected surfaces of steel and cast iron components, tools bearing, shaft seals etc. are covered with VCI paper. VCI paper has been impregnated with corrosion inhibitors which by evaporation and chemical conversion protect metals in an enclosed area against corrosion.

b) 7m3 VCI paper is necessary for 1 m3 of packed item approximately as per AA51406.

Application Limitation:

VCI paper shall not be used for components made of aluminium, aluminium alloys as well as Zinc, copper, brass, cadmium and silver.VCI powder is sprinkled inside the piping components ends shall be protected with end cover as specified in plant standards, drawings.

8.2 Moisture Absorber:

Silica gel is used for this purpose to protect the contents over sufficiently long time from corrosion. At the time of use, silica gel should be so dried that its colour becomes dark blue. These shall be filled in small cotton bags. Before sealing the equipment, the silica gel bags should be kept inside the polyethylene film cover at different locations. The quantity of silica gel depends on the dimension of the polyethylene sheet as well as transit and storage time.

8.3 Sling Plate:

Sling plate shall be provided to prevent damage to the packing box during lifting. Size of the sling plate shall be selected depending upon the net weight of the consignment.

8.4 Packing Slip Holders:

Two nos. of packing list with suitable protecting cover shall be fixed one inside and the other outside of the packing box as per specification AA7240901.

8.5 Nails

The length and diameter of the nails depends upon the size of planks

8.6 Strapping Strips:

These are used for strapping the boxes. Suitable size of box strapping strip can be used as per size and weight of consignment. The material shall be free from rust.

8.7 Brackets:

These brackets are used for nailing to the corners of cubicle boxes.The brackets shall be of “L" shape, suitable holes shall be provided towards the end of each side for screwing /nailing.

8.8 Fasteners:

Bolts, double nuts, spring washers of suitable size 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.

8.9 Polyethylene Sheet:

The polyethylene sheets are used to make covers to the jobs individually.multi-layered cross laminated polyethylene sheet as per AA 51420 can be used for packing of jobs.

8.10 Expanded Poly Foam Sheet and Air Bubble Film:

This item is used for covering the delicate items, Expanded Polyethylene Foam Sheet as per specification AA51423 and air bubble film as per specification AA51426

8.11 Thermocol (Expanded Polystyerene) Sheets:

This is used for covering delicate items. This material shall be as per spec. no AA51416

8.12 Cotton Bags:

These are used for holding silica gel.

8.13 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

8.14 Polyethylene Bags:

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

8.15 Mechanical Latching Clamps:

For specific items self locking clamps can also be used on need basis in conjunction with or apart from regular bolt and nut fixing arrangement, if needed.

9 DESIGN OF PACKING BOXES

Design/drawing of packing boxes shall be prepared based on actual weight and size of the equipment and shall be covered by concern product standards.

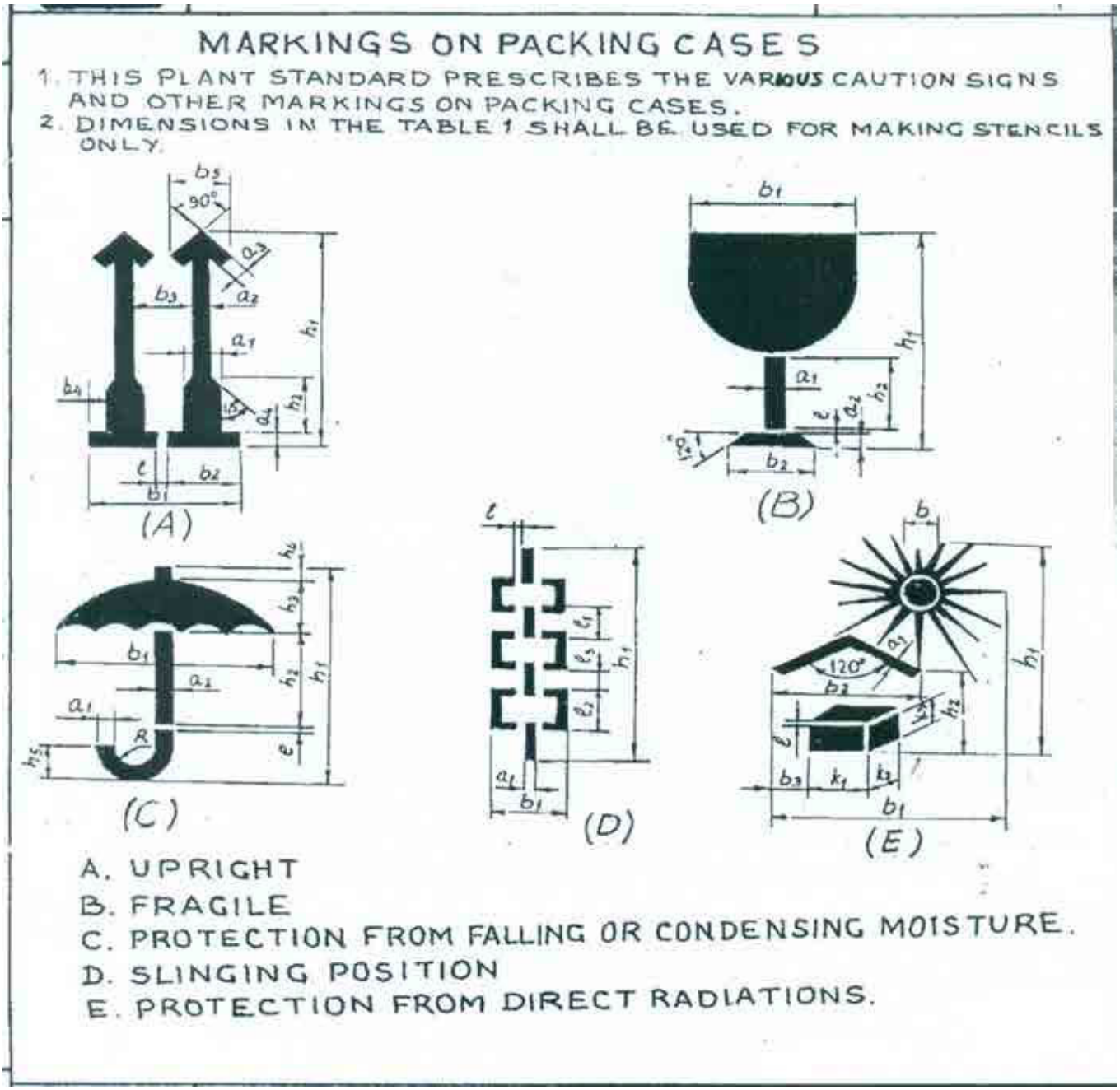
10 GENERAL PRECAUTIONS:

1) While fixing nails during packing, necessary care shall be taken to ensure that materials used for protection inside the case e.g. paper, polyethylene sheet, coir etc. do not get damaged.
2) Sling protection brackets to be provided on cases wherever required.
3) It shall be ensured that all stencil marks external, front & rear sides of the casing shall be of water proof Material to prevent obliteration in transit.
4) For packing of small/delicate items - Item may be wrapped properly with M.L.C. laminated polyethylene and wrapped item may be further wrapped with air bubble film as per spec. AA51426, these curtains will be subsequently packed in wooden/ply boxes as at clause 8.0.
5) The various caution signs shall be marked with stencil on both sides of the packing box.
6) Instructions on handling,storage, preservation, represervation and transport of export order components at works and site shall be covered by product standards.

11 MARKING

The following details are to be marked on the packing cases.

a) Address of consignee.
b) Purchase Order No.
c) Description of item or title of packing list.
d) Case identification Number.
e) Net Weight.
f) Gross Weight.
g) Dimensions of box
h) Marking showing upright position.
i) Marking showing sling position.
j) Marking showing umbrella (i.e. for machines/components to be stored under covered storage.



CENTER OF GRAVITY

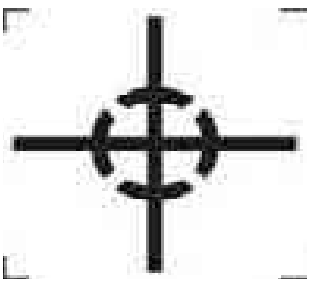


Figure 1 – Markings

CORPORATE STANDARD

DESIGNATION		DIMENSIONS IN mm.																						
		a_1	a_2	a_3	a_4	b_1	b_2	b_3	b_4	b_5	b	l	h_1	h_2	h_3	h_4	h_5	K_1	K_2	K_3	l_1	l_2	l_3	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	–	–	–	–

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.

Incase 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 higher 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, and then hand written letters/figures shall be allowed.

12 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.

1) Adequate care shall be taken in handling the material, and components to avoid damage during receipts, storage issue manufacture & despatch operations.
2) Appropriate material handling equipment like fork lifters, cranes etc. Shall be used where needed.
3) Lifting by crane and transportation by trolley of critical items and large components like rotors castings etc. Shall be done carefully.

4) For critical items, where specified, special handling fixtures shall be used for lifting.

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

6) Slings used on machined surfaces shall be suitably padded. No slings shall be used on journal surfaces.

7) Precision machined components like blades, catches, rollers etc. Shall be lifted using suitable wooden pallets.

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 Cl.No:11

a) 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 15º.

b) Handling and lifting should be done without jerks or impacts.

c) 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.

d) 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.

e) 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.

f) Silica gel and such other chemicals kept in the box as desiccants and indicators should also be left in the box itself.

13 PROVISION FOR INSPECTION:

This clause is applicable only where contractual requirement of customer is there. For other packings this is not applicable.

Each transportable packing's shall have provision for inspection by customer authority etc. during transport from origin of dispatched until destination. This inspection may require opening of the package and subsequently closing it again. For this purpose, suitable designed opening with bolted cover shall be provided. Such an opening shall be clearly marked as "OPENING" with clear instruction for opening & closing written on this cover. For large consignment, the size of the opening shall be suitable to facilitate entry of personnel.

14 REFERRED STANDARDS (Latest publications including amendments):

1) AA51401	2) IS:303	3)IS:710	4)AA10166
5)ISPM:15	6)AA51420	7)AA51423	8)55619
9)AA51406	10)AA51416	11)AA51426	12)AA56126

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

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:

a) Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25 +2/-3 mm.

b) Width of all planks including the tongue shall be more than 125mm and after plaining it shall be minimum 100mm.

c) Minimum number of planks shall be used for a shook.

d) Horizontal, vertical, diagonal planks shall be given for binding (number of such planks depend on the dimension of panel.

e) External sides of front and rear planks to be plained to facilitate writing of address and other markings.

f) Width of binding planks shall be minimum 100mm.

g) Distance between any 2 binding planks shall be less than 750mm.

h) diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm

i) Distance of the outer edges of these planks from the edge of case shall be less than 250mm.

j) 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.

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	AS2O52H2O	12.5
– Copper Sulphate	CuSO45H2O	37.5
– Sodium Dichromate	Na2Cr2O75H2O	50.0
– Or Potassium Dichromate	K2Cr2O7	

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).

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 shook'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 x2500
2. Two suite cubicle - 1650 x 950 x 2500
3. Three suite cubicle - 2400 x 950 x2500
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.

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

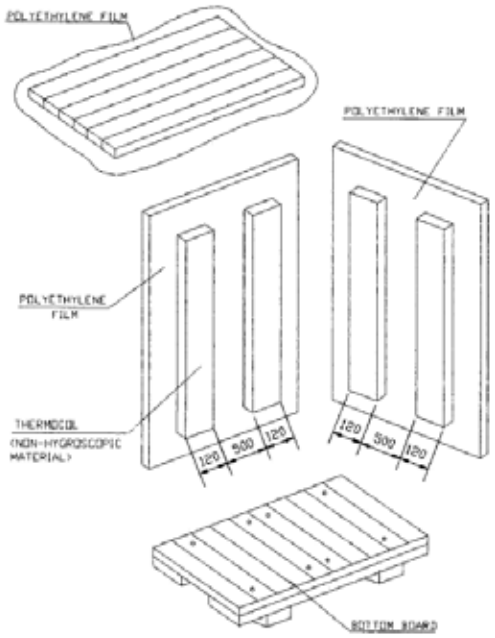


Figure 1

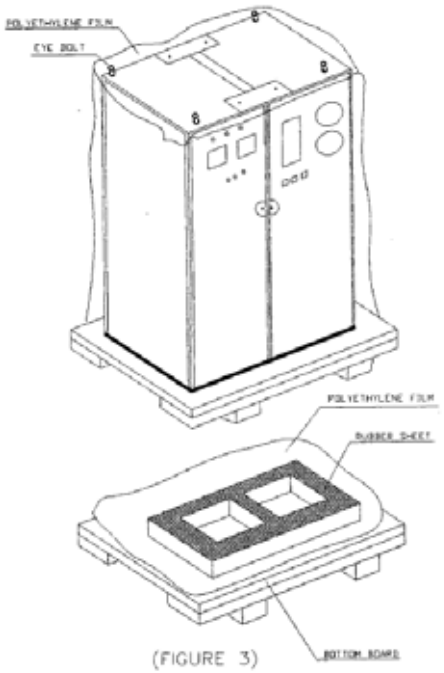


Figure 2

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.

a) Following precautions are to be taken during packing: -

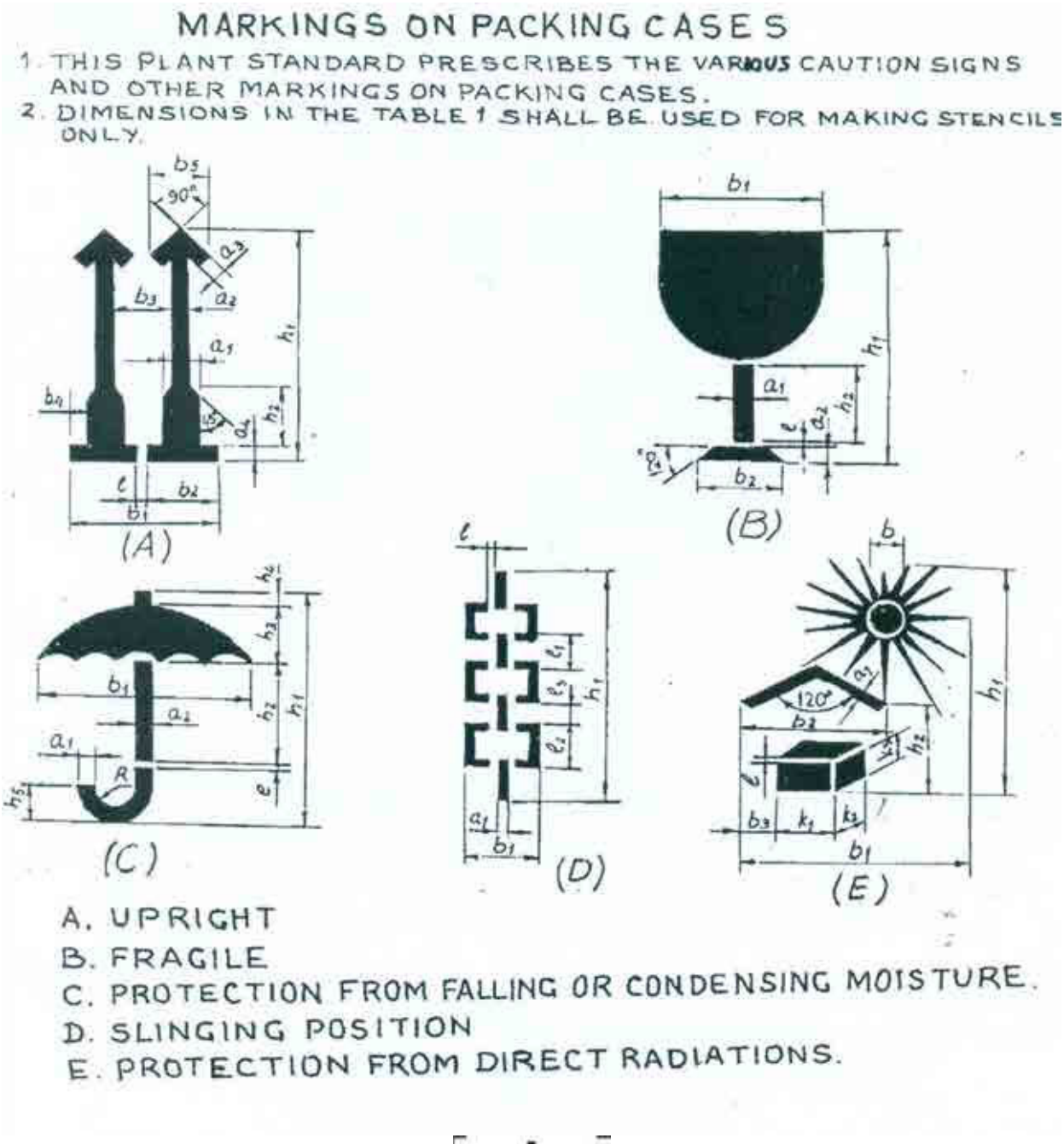
b) Put the machine in the steel container properly,

c) Cover the machine with polythene.

d) To arrest the movement in the steel container necessary wooden Blocks/Battons may be put.

e) Put cover on steel, container and Bolt Properly

8 MARKINGS/STENCILINGS



Center of Gravity

Figure 3

CORPORATE STANDARD

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.

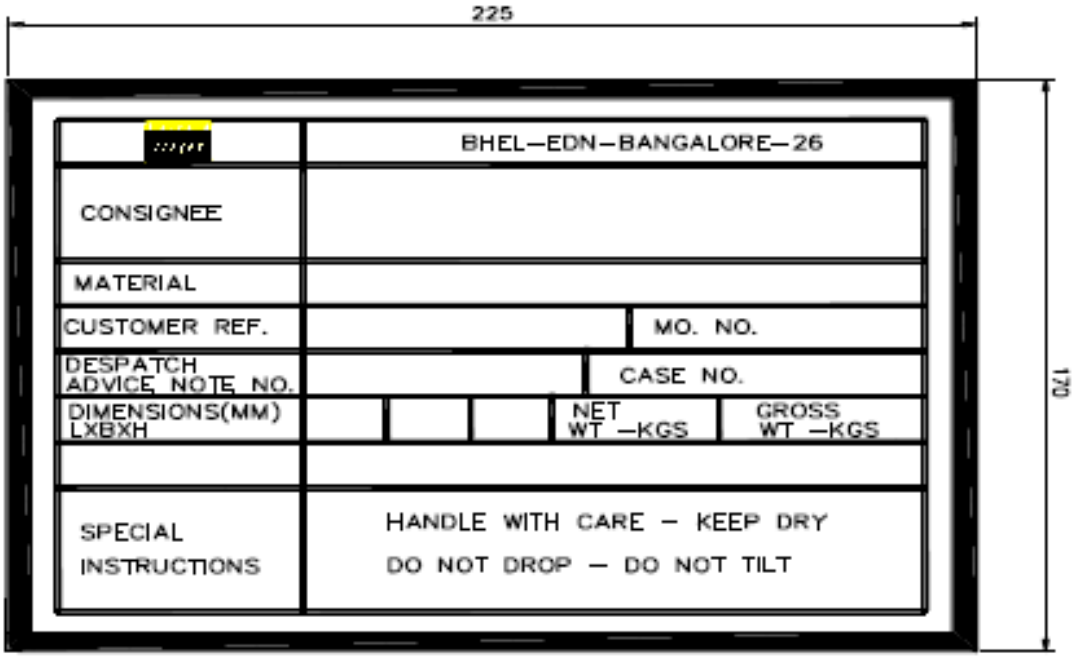


Figure 4 – TYPICAL MARKING PLATE

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 thecarrier 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 berecorded on the same “Weighment Slip”.
7) Weight of empty packing cases / scrap wood taken will be calculated on thebasis 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-nailingof wooden packing cases, under supervision of carpentry.
11) Carpentry contractor will identify packing cases / scrap wood for denailing, which will behanded 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
PRESSUE VESSELS								
TOWERS					O			
TANKS					O			
VESSELS					O			
GASKETS	O							
FASTENERS	O							

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								

CORPORATE STANDARD

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	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	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	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM

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

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.

a) The markings showing the upright position.

b) The markings showing the sling position

c) Markings showing the fragile contents.

d) Other required markings as per Cl.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 15º.

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 3Double 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

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

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:

a) Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25 +2/-3 mm.

b) Width of all planks including the tongue shall be more than 125mm and after plaining it shall be minimum 100mm.

c) Minimum number of planks shall be used for a shook.

d) Horizontal, vertical, diagonal planks shall be given for binding (number of such planks depend on the dimension of panel.

e) External sides of front and rear planks to be plained to facilitate writing of address and other markings.

f) Width of binding planks shall be minimum 100mm.

g) Distance between any 2 binding planks shall be less than 750mm.

h) diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm

i) Distance of the outer edges of these planks from the edge of case shall be less than 250mm.

j) 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.

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	AS2O52H2O	12.5
– Copper Sulphate	CuSO45H2O	37.5
– Sodium Dichromate	Na2Cr2O75H2O	50.0
– Or Potassium Dichromate	K2Cr2O7	

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).

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 shook'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 x2500
2. Two suite cubicle - 1650 x 950 x 2500
3. Three suite cubicle - 2400 x 950 x2500
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.

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

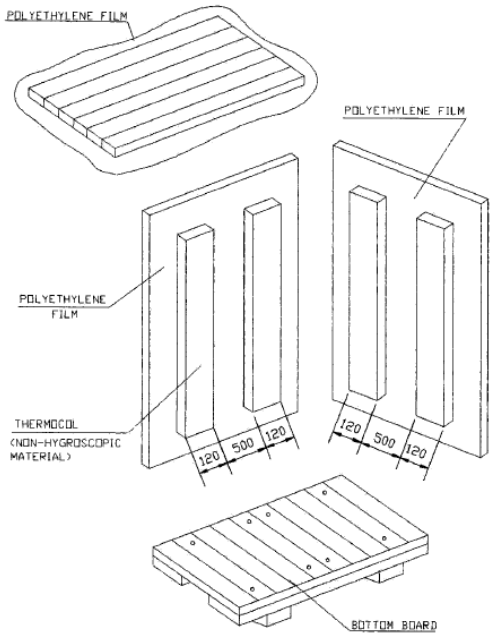


Figure 1

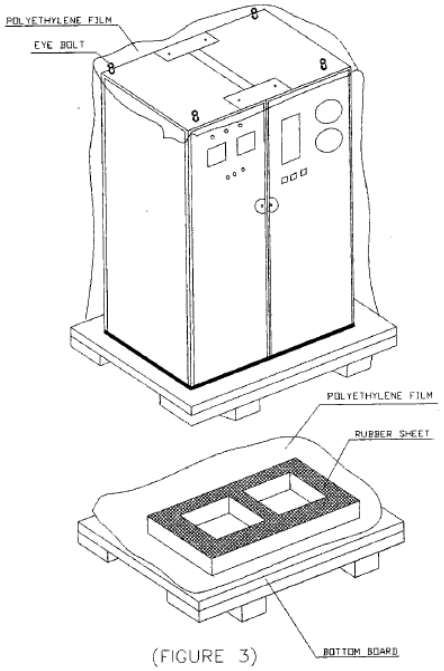


Figure 2

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.

a) Following precautions are to be taken during packing: -

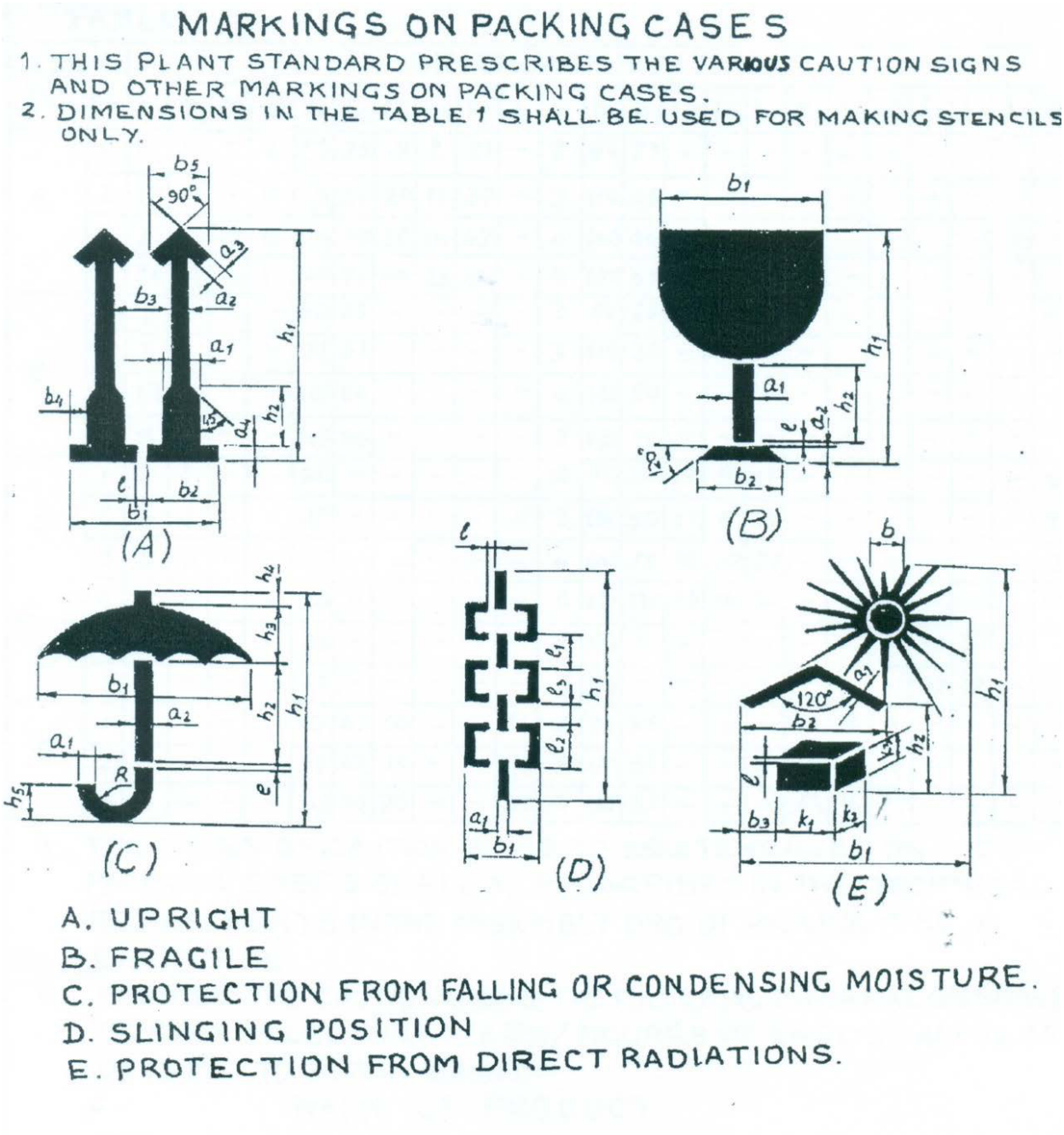
b) Put the machine in the steel container properly,

c) Cover the machine with polythene.

d) To arrest the movement in the steel container necessary wooden Blocks/Battons may be put.

e) Put cover on steel, container and Bolt Properly

8 MARKINGS/STENCILINGS



Center of Gravity

Figure 3

CORPORATE STANDARD

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.

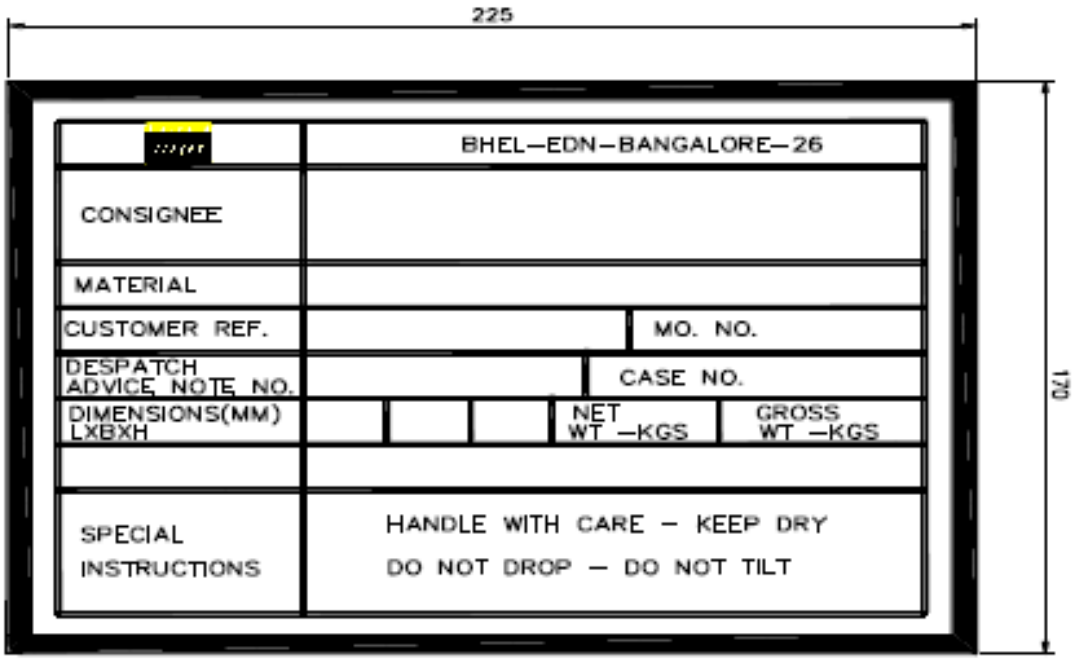


Figure 4 – TYPICAL MARKING PLATE

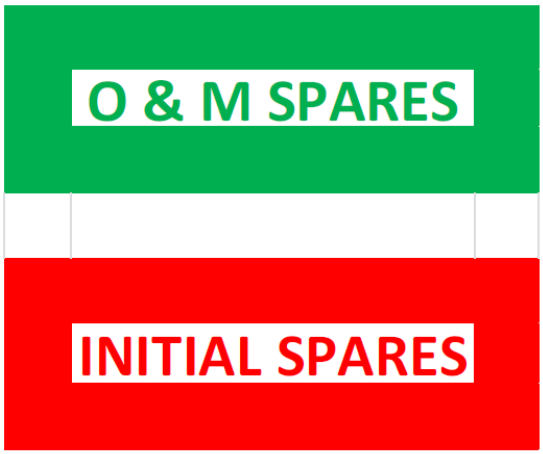


Figure 5

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 thecarrier 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 berecorded on the same “Weighment Slip”.
7) Weight of empty packing cases / scrap wood taken will be calculated on thebasis 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-nailingof wooden packing cases, under supervision of carpentry.
11) Carpentry contractor will identify packing cases / scrap wood for denailing, which will behanded 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
PRESSUE VESSELS								
TOWERS					O			
TANKS					O			
VESSELS					O			
GASKETS	O							
FASTENERS	O							

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								

CORPORATE STANDARD

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	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	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	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM

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

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.

a) The markings showing the upright position.

b) The markings showing the sling position

c) Markings showing the fragile contents.

d) Other required markings as per Cl.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 15º.

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 3Double 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

Annexure-5

QUALITY GUIDLINES & QAP FORMATS

QAP GUIDELINES & FORMAT

(ANNEXURE-5)

The QAP format and guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement.

Note:

1. Typical /Indicative /Standard QAP(s) for equipment /package attached is reference document and to use by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval.

2. No deviation to reference document is acceptable.

GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN

1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.

2. Each page of QAP shall contain the following information.
   a) Vendor's name & address.
   b) Customer: BHEL, Hyderabad.
   c) Project.
   d) BHEL Product Standard Number/revision number as referred in P.O.
   e) BHEL Purchase Order Number & Date.
   f) Product as per P.O. description.
   g) QAP Number (unique and shall not repeat)/revision number/date.
   h) Page number and number of pages

3. QAP shall contain four parts / stages as follows.
   a) Raw materials and bought out items.
   b) In process Control / Inspection.
   c) Final assembly, Inspection & Testing.
   d) Painting, preservation & packing.

4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc.).

5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT, DP etc.), hydrostatic test, calibration check etc.)

6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic.

7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)

8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)

9. Under 'Reference document' and 'Acceptance norms', appropriate National & 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 & approval by our Engineering dept.

10. Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc.

11. 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)

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 code1.

12. Under ‘D’ please put (□ Tick) against each characteristic where vendor proposes to submit test certificate/report etc. OR as required as per BHEL Specification.

13. Vendor’s signature & stamp should be available on each page of QAP.

14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification & Approved Drawings.

15. The following operations/characteristics/check points may be included (AS APPROPRIATE)
   a) Visual check
   b) Dimensional check
   c) Mechanical and Chemical properties.
   d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc. as the case may be.)
   e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc.
   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.
   g) Verification of test certificate for protection class for the enclosures.
   h) Mechanical functioning of switches.
   i) Continuity of earthing and provision of earth points.
   j) Colour coding of wiring, size, tightness & dressing of wiring.
   k) Review of test certificates of assembled items, raw materials, internal test reports etc.
   l) Witness of functional checks, which may include mechanical run & electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc.
   m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc.
   n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.)
   o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non-Destructive Tests.
   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)
   q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole.
   r) Packing and Preservation.

16. **QAP Format enclosed.**

17. Typical Manufacturing QAP(s) is /are attached.

INSPECTION PROCEDURE (IP) FOR MECHANICAL EQUIPMENT & STRUCTURES 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-M-00 Rev. 0**

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

General Note :-

1) Three sets of test certificates (2 sets hard & 1 set soft) duly verified and signed by the main Contractor shall be furnished.
2) IP number and revision status to be indicated by M.N.Dastur & Co. (P) Ltd.
3) Drawing approval authority shall be as per contract.
4) If quantity is in lot, substantial quantity shall be offered for economy of inspection.
5) For Structural items average quantity shall be offered in 100 MT lot.
6) Attempt shall be exercised to furnishIP for all the items if the package in single lot.
7) Painting to be done after inspection as per approved Painting Specification. Shop Painting Certificate as per format FM VIA shall be submitted.
8) Vendor approved detail drawing shall be made available during inspection as required corelated with Dasturco approved GA drawing
9) All measuring instruments used for our inspection and testing shall have valid calibration certificate from NABL laboratory with traceability to national/international standards.
10) Pumps, Fans, Blowers and Compressors Performance test shall be conducted for one per type/model/capacity and remaining quantities shall be Mechanical Run Tested.
11) All manual, pneumatic, electrical operated valves upto and 100 NB size shall be cleared based on review of documents and valve size 150 NB and above shall be witnessed.

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)	Test Certificates & Documents to be submitted by Contractor (Select from List A&B)	Remarks/Sampling Plan, if any
				M	C	D	M	C	D			
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

Abbreviation:-

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

Signature of Contractor & Seal
Name:

Signature of Client & Seal
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	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
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.

बीएचईएल BHEL	**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	COMPONENTS	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	

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-502032			PROJECT: PACKAGE: **EOT CRANE**				REV NO:	DATE:				
								PAGE 4 OF 4					

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
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	
2.0	**INPROCESS INS PECTION**												
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	

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.

बी एच ई एल BHEL	**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	COMPONENTS	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		
3.0	**FINAL INSPECTION & TESTING**													
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	Measurement 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	–		

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-502032	PROJECT: PACKAGE:**EOT CRANE**	REV NO: / DATE: PAGE 4 OF 4

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
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	WPS	-	Welding Procedure Specification
IBR	–	Indian Boiler Regulations	PQR	-	Procedure Qualification Record
DFT	–	Dry Film Thickness	WPQ	-	Welder Performance Qualification
TC	–	Test Certificate	NDE	-	Non Destructive Examination
EL.	-	Elongation	ID	-	Internal Diameter
PMI	-	Positive Material Identification	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.

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.

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS

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.

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.

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 : inspection.kol@dastur.com & Arun.Dt@dastur.com
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 : inspection.mum@dastur.com kulkarni.gs@dastur. com
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 : inspection.chn@dastur.com subramanian.vm@dastur.com
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 Inspection.Del@dastur.com E-Mail : Kanwaljeet.D @dastur.com

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.

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

JOINT INSPECTION REPORT

JIR No. Page No.: 1 of

Name of Project: **Contractor-**

I	Place of Inspection & Insp. date			
II	Cont. No./P.O/LOI/LOA & Date on M/s.			
III	Contractor's Call Ref. No. & Date			
IV	Insp. File ref. no. for call & date			

V		VI	VII		VIII
Eqpt/ Item No.	B.Sch. No.	Description of Items	Relevant approved/Cleared Drawings No.		Quantity Inspected

IX	Test & Measuring Instruments used & its calibration details			*(In Case of more than two instruments, use form FM-VIB)*	
X	Sampling Plan (if any) * ✓ Tick			XI	Documents collected during visit, if any
	A	B	100%		
XII	Observations :				

* A: Sampling as agreed in IP is followed.
B: IS:2500 (Part I) – latest revision, General Inspection Level - II of Table I and Single Sampling Plan as well as AQL (0.1%) as per Table - II-A was followed

Manufacturer
Name

Main Contractor
Name:

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

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

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

JOINT INSPECTION REPORT
(Continuation Sheet)

JIR No. & date :

XII	Observations (Contd.):	

Manufacturer
Name

Main Contractor
Name:

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

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:

Surface Preparations						
Required:						
Observed:						

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

Outside Painting :

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

Signature of Manufacturer **Signature of Contractor**

	JIR No. and Dt.	

TEST INSTRUMENT CALIBRATION DETAILS

Sl. No.	INSTRUMENT	SL.NO/ ID NO.	MAKE	RANGE	NABL Accredited Lab Y/N	VALIDITY

MANUFACTURER CONTRACTOR DASTURCO

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

INSPECTION CERTIFICATE

Inspection category: Physical Inspection/ Document review

Certificate No.

Date:
Issuing Office :

Client:	Project:
Package No, & Description:	Order No.& dt. on Contractor:
Contractor:	Date(s) of Inspection:
Ref. Inspection Call No. and date	JIR Ref. for Physical Inspection:
Manufacturer & Place of 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
2. Contractor- 2 copies
3. Site Office – 1 copy
4. Project Manager – 1 copy
5. Insp Kol – 1 copy
6.
7.

Reviewed/Inspected by:
Name & Designation

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

(Signature)
Name& Designation:
(put stamp)

Note:
1. 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.
2. Quantity indicated above may defer from billing schedule quantity due to engineering requirements.
3. 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

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)

PROJECT ENGINEERING & SYSTEMS DIVISION
RC PURAM, HYDERABAD.
QUALITY & BUSINESS EXELLENCE

INSPECTION / TC REVIEW FORMAT

1	Vendor's Name:		5	Applicable BHEL Spec No:	
2	Project:		6	Approved Drawing No:	
3	PO No:		7	Approved Data Sheet No:	
4	Item Description:		8	Approved QAP No:	

OFFER LIST

S.No	BBU/ PO Sr. No.	Item Description	Total Qty as per PO/BBU	Qty. already accepted	Qty offered for TC review	Cumulative Qty	Balance Qty
A							
B							
C							
D							

TC REVIEW REQUISITION

BBU / PO Sr. No.	QAP Clause No.	Format of Record	Certificate No. & Date	Page No.	REMARKS
A. Item Description:					
B. Item Description:					
C. Item Description:					
D. Item Description:					
E. Item Description:					

SUPPLIER / VENDOR SIGNATURE WITH SEAL	BHEL/ BHEL's TPIA SIGNATURE WITH SEAL
Dt:	Dt:

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 5th 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 Double-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/ Double Girder)	Purchase Order Ref.No. & Date (copy to be enclosed)	Datasheet / Drawings / Performance certificate etc (Enclosed / Not enclosed)	Remarks

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-BRADLLEY/GO-SWITCH (EMERSON)/ SCHINDER

Junction Boxes	:	BALIGA/PYROTECH/HENSEL/EXPROTECTA/FLEXPRO/FLAMEPACK/SUDHIR SWITCHGEAR/ RITTAL/ABB

Annexure-8

Master DOC List

MASTER DOCUMENT LIST -EOT CRANES

	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)	" "/PV/PB /PC/AA	SD	AD	APP.CAT	SD	AD	APP.CAT	SD	AD	APP.CAT	Date	
1	GA Drawing of entire assembly showing major dimensions and MOC with individual equipment weight, wheel load & rail fixingdetails			A	Y	Y												
2	GA Drawing of individual parts showing major dimensions and MOC with equipment weight			A	Y	N												
3	Cross section drawing of individual parts			A	Y	N												
4	Data sheet of individual items			A	Y	N												
5	Data sheet of EOT Crane			A	Y	Y												
6	Crane clearance diagram			I														
7	Mechanical design & sizing calculation for Motor			I	Y	N												
8	Mechanical design & sizing calculation for Wire rope			I	Y	N												
9	Mechanical design & sizing calculation for Wheel			I	Y	N												
10	Mechanical design & sizing calculation for Brake			I	Y	N												
11	Mechanical design & sizing calculation for Rope Drum			I	Y	N												
12	Mechanical design & sizing calculation for Rope sheave			I	Y	N												
13	Mechanical design & sizing calculation for Strutctural calculation of girder			I	Y	N												
14	Trolley Arrangement			I														
15	Motor Documents [GA Drawing, Datasheet & Curves]			A	Y	N												
16	Electrical Load List			I														
17	SLD for Crane system			A														
18	DSL System Diagram			A														
19	Power Control System for Control Panel			A	Y	N												
20	Power Control System for Main Hoist			A	Y	N												
21	Power Control System for Auxiliary Hoist			A	Y	N												
22	Power Control System for Long Travel			A	Y	N												
23	Power Control System for Cross Travel			A	Y	N												
24	Instrument datasheets: Limit Switch			A														

MASTER DOCUMENT LIST -EOT CRANES

	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)	" "/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 Recemmended 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, opeartion & 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 -EOT CRANES

	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)	" "/PV/PB /PC/AA	SD	AD	APP.CAT	SD	AD	APP.CAT	SD	AD	APP.CAT	Date	

Total No of Docs	Due as on Date	Submitted by vendor as on Dt.	Approved by BHEL as on Dt.	Commented by BHEL as on Dt.	Pending with BHEL/CUSTOMER 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	

Annexure-9

Deviation Format

ANNEXURE-9: DEVIATION FORMAT

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

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-11), 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 during technical evaluation of their offer.

SIGNATURE : _____
NAME : _____
DESIGNATION : _____
COMPANY : _____
DATE : _____

COMPANY SEAL

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 (alongwith all Annexures) shall also be referred.**