

	TECHNICAL SPECIFICATION FOR CW PUMP HOUSE CRANE (70/18T CAPACITY) 2x660 MW SEZ ENNORE STPP	Tech. Spec. no. :- PE-TS-412-501-A002	
	ANNEXURE IV PAINTING SPECIFICATION	VOLUME II B	
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PAINTING

1.0 SCOPE

This section defines the technical requirements for surface preparation, selection and application of paints on cranes structures, its mechanical components , motors & panels etc. The bidder shall submit a detailed painting procedure for approval of owner/ owner's representative after the award of contract.

2.0 CODES AND STANDARDS

Painting of equipment shall be carried out as per the specifications indicated below and shall conform to the relevant IS specification for the material and workmanship.

The following Indian Standards may be referred to for carrying out the painting job :

IS:5 : Colours for ready mixed paints and enamels

IS:1303 : Glossary of terms relating to paints

IS:2379 : Colour code for identification of pipelines

IS:1477 : Code of practice for painting of ferrous metals in buildings (Parts I & II)

IS:2524 : Code of practice for painting of non-ferrous metals in buildings (Parts I & II)

IS:2395 : Code of practice for painting of concrete, masonry and plaster surfaces (Parts I & II)

IS:2338 : Code of practice for finishing of wood and wood based materials (Parts I & II)

IS:158 : Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali, water and heat resisting.

IS:2074 : Ready mixed paint, air drying, red Oxide Zinc Chrome, priming

IS:104 : Ready mixed paint, brushing, Zinc Chrome, priming

IS:2932 : Enamel Synthetic exterior

(a) Undercoating

(b) finishing

IS:4682 : Code of practice for lining of vessels & equipment

SIS 559000 : Swedish standard for blasting

ISO 8504-2 : Preparation of steel substrates before application of paints and related products. Surface preparation methods Part 2 Abrasive blast cleaning

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ISO 8501-1 : Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness. Part 1 : Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings.

SIS 05 5800 : Surface preparation by acid pickling

SSPC SP08 : Surface preparation by acid pickling

IS 2629 : Recommended practice for hot dip galvanizing of iron and steel

ASTM A780 : Standard practice for repair of damaged galvanized coatings

SSPC : Steel structures painting council

NACE : National association of Corrosion Engineers

DIN : Deutsehes Institute for Normung

BS : British Standard

ASTM : American Society for Testing material

AWWA : American Water works association

3.0 SURFACE PREPARATION

The surface shall be prepared in a manner suitable for coatings. Chemical derusters or rust converters shall not be applied. Acid cleaning is subject to approval of Purchaser/ Purchaser's representative.

3.1 BLASTING

The surface of the part/ component shall be blasted before the coating material is applied. Compressed air supply for blast cleaning shall be free of water and oil. Air compressors shall not be allowed to deliver air above 1100C. Blasting activity shall be performed at temperatures 30C above dew point and substrata temperature between 50C & 500C and relative humidity not exceeding 85% shall be maintained during painting. Necessary safety precautions for equipment and operator shall be adhered to and shall comply with applicable laws, regulations, ordinances etc., of the local authority, state or the nation pertains to the work. Abrasive used for blast cleaning carbon steel and alloy steel shall be as per ISO 8504-2 and SSPC painting manual. Suggested abrasives are chilled iron grit, shot steel, malleable iron grit and shots of non metallic abrasive (aluminum oxide, copper slag, garnet etc.).

The grade of blasting shall be performed in line with the approved painting scheme.

The nature, quality and grain size of abrasives and the parameter of their use are to be chosen to obtain the required surface profile depth and cleanliness.

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Surfaces prepared for coating shall be coated the same day and before any visible rusting occurs (the time elapsed between blast cleaning and commencement of painting shall under no circumstances exceed 4 hours, but in any case must commence before signs of degradation occur).

The grades of surface finish:-

Unless otherwise specified in the documents, the surface shall satisfy the following requirements after blasting (a) Blasting according to SIS 055900, Grade Sa 2½.

Primer paint shall be Zinc Silicate of approved brand. Dry film thickness of each primer coat shall be 60 µm.

3.2 Manual Rust Removal

Manual rust removal shall be allowed for welded zones and for touching up installed components.

3.3 Cleaning

Removal

- | | |
|----------------------------------|--|
| a) Dust, loose deposits | Vacuum-cleaning, brushing |
| c) Adhesive deposits | Power brushing |
| d) Oils, greasy impurities | Wet blasting, use of detergent additives by agreement |
| e) Salt deposits | Rinsing |
| f) Markings (e.g., felt tip pen) | Organic solvents to manufacturer's specifications eg
Trichloro trifluoro ethane and solvents containing acetone
(renew solvent and rag frequently) |

4.1 General

Application Conditions

The primer shall be applied to properly prepared surfaces only. The specifications of the coating material manufacturers shall be observed. The minimum temperature shall be + 5°C and the relative humidity shall not exceed 80%. The temperature of the work piece shall be at least 3°C above dew point.

4.2 Application Procedure

The primer shall be applied by means of brush or by spray. The top coats shall be applied by means of brush, roller or spray.

At points where coating application is interrupted, the individual layers shall be adequately stepped to ensure proper layer sequence when coating operations are resumed.

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4.3 Touching Up

Before each layer is applied, previous coating shall be touched up where necessary by way of rust removal and cleaning according coating manufacturers specification. The final top shall be reapplies completely.

4.4 Uncoated Surfaces

Moving parts of machines (e.g stems, shafts, sliding and locating bearings), nameplates, instruments and sealing surface shall not be coated. Welds shall be left free of coating upto a distance of 30 mm on each side of the weld edge until erection and weld examinations, if any, have been completed.

4.5 Bond Strength

The pill off stress determined using the pull off test method for adhesion shall not be less than 1.5 N/mm², according to ISO 4624.

5.0 Painting System :-

(a) Crane Steel Surfaces /structures

(i) All steel structures shall receive two primer coats and two sandwich coat of MIO Epoxy paint and one finish coat of painting. First coat of primer shall be given in shop after fabrication before dispatch to erection site after surface preparation as described below. The second coat of primer shall be applied after erection and final alignment of the erected structures. Two intermediate coats and one finished coat shall also be applied after erection.

(ii) Steel surface which is to be painted shall be cleaned of dust and grease and the heavier layers of rust shall be removed by chipping prior to actual surface preparation. The surface shall be abrasive blasted as explained in clause 3.1 to Sa 2½ finish as per SIS05-5900. Primer paint shall be Zinc Silicate of approved brand. Dry film thickness of each primer shall be 60 microns. Total primer thickness of two coats total thickness 120 microns.

(iii) Two intermediate MIO Epoxy paint, and one top polyurethane coating of approved brand shall be applied. Dry film thickness of each intermediate coat shall be 90 microns, total intermediate coatings thickness shall be 180 Microns. and top polyurethane coating/finish shall be 30 microns. The under coat and finish coat shall be of different tint to distinguish the same from finish paint. The total dry film thickness shall be 330 microns. All paints shall be of approved brand and shade as per owner's requirement.

(iv) Joints to be site welded shall have weldable primer applied within 100 mm of welding zone. Similarly where friction grip fasteners are to be used removable anti corrosive coating shall be provided. On completion of the joint the surfaces shall receive the paint as specified.

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(v) Surfaces inaccessible after assembly shall receive two coats of primer prior to assembly. Surfaces inaccessible after erection including top surfaces of floor beams, supporting gratings or chequered plate shall receive one additional coat of finish paint over the above number of coats specified before erection. Portion of steel member embedded/ to be encased in concrete shall not be painted.

b) Painting of Mechanical components, electrical items & motors etc.

Surface Preparation

Blasting according to SIS 055900 grade Sa 2½.. All the steel work shall be thoroughly cleaned of rust, scale, oil, grease, dirt and scarf by pickling, emulsion cleaning, etc. The sheet steel shall be phosphated / oven dried and then painted with two coats of zinc rich primer paint. After application of the primer, two coats of finishing synthetic enamel paint shall be applied.

Prime Coat

Two (2) layers of Zinc phosphate epoxy, total dry film thickness 75µm.

Finish Coat

Application of two (2) finishing coats of chlorinated rubber paint in approved shades at 30-40 microns DFT each coat in approved shades.

Total DFT -135-155 Microns

Remarks

Equipment coated with a standard application system can be accepted if the quality of this application system is corresponding with the quality of the above mentioned system.

C) Painting of Control Panel etc.

Surface preparation : Seven tank process

Primer : two coats of zinc rich primer paint, total dry film thickness 75µm.

Finish Coat : two coats of finishing epoxy paint shall be applied, 30-40 microns DFT each coat.

Total DFT : 135-155µm

Or powder coating – 75 micron (total DFT)

COLOR CODING PROCEDURE / SCHEME

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S.No	ITEM DESCRIPT ION	REGI ON	SURFA CE PREP.	PAINTING SCHEME							COLOUR SHADE	REMARKES
				PRI MER	M IN D FT μ	INTERMED IATE	M IN D FT μ	FINI SH	M IN D FT μ	TOT AL DFT		
		As per paint specification										
a	Crane structure	—	—	—	—	—	—	—	—	—	Golden Yellow Shade 356 as per IS-5	Color band black
b	Bottom block assembly	—	—	—	—	—	—	—	—	—	Crimson shade 540 as per IS- 5	
c	Hooks	—	—	—	—	—	—	—	—	—	Crimson shade 540 as per IS- 5	
d.	End carriage sweep	—	—	—	—	—	—	—	—	—	Golden Yellow Shade 356 as per IS-5	Color band black
e.	Panels	—	—	—	—	—	—	—	—	—	Light grey 631 as per IS 5/ 7032	

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f	motors											Light grey 631 as per IS 5	
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ANNEXURE-V

DRAWINGS/ DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT

The successful bidder shall submit the following drawings / documents during detail engineering for customer's approval /information:

S.N	BHEL drawing No.	Title	Approval category	Schedule date of submission from date of LOI.
1	PE-V0-412-501-A300	Manufacturing Quality Plans with sub vendor list for CWPH crane	A	3
2	PE-V0-412-501-A301	Data sheet of CWPH EOT cranes with painting details for CWPH crane	A	3
3	PE-V0-412-501-A302	Data sheet of motors for CWPH crane	I	6
4	PE-V0-412-501-A303	Mechanism Sizing Calculation for CWPH crane	A	3
5	PE-V0-412-501-A304	General arrangement drawings for CWPH EOT crane with CT DSL details	A	3
6	PE-V0-412-501-A305	Crab sub assembly for CWPH EOT crane with CT wheel assembly	I	4
7	PE-V0-412-501-A306	Gantry Rail installation for CWPH EOT crane	A	3
8	PE-V0-412-501-A307	General arrangement for PVC shrouded DSL for CWPH EOT crane	A	3
9	PE-V0-412-501-A308	Main hook block assembly and aux. hook block assembly with details of hook, nut and check plate	A	4
10	PE-V0-412-501-A309	Long travel Machinery Assembly for CWPH EOT crane with LT wheel assembly	I	4
11	PE-V0-412-501-A310	Structural calculations for CWPH EOT crane	A	4
12	PE-V0-412-501-A311	Cranes lubrication drawing for CWPH EOT crane	I	6
13	PE-V0-412-501-A312	Detailed BOM/BOQ for CWPH EOT crane	I	8
14	PE-V0-412-501-A402	Schematic circuit diagram for CWPH EOT crane a) Protective panel, Main and lighting circuit & BOM b) Main hoist panel & BOM c) Aux hoist panel & BOM d) Cross Traverse & BOM e) Long Traverse & BOM f) Earthing diagram.	A	5
15	PE-V0-412-501-A403	G.A. of all panels for double girder cranes a) Protective panel b) Main hoist panel c) Aux hoist panel	I	5



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		d) Cross Traverse panel e) Long Traverse panel. f) Pendent		
16	PE-V0-412-501-A404	DSL,Cable size calculation, Voltage drop calculation & cable schedule for double girder cranes	A	6
17	PE-V0-412-501-A405	Cranes Operational write up	I	5
18	PE-V0-412-501-A406	Type test certificate (for motors), if applicable		
19	PE-V0-412-501-A407	Mandatory spare parts list	A	8
20	PE-V0-412-501-A408	O & M Manual	I	10
21	PE-V0-412-501-A409	Erection procedure	I	8
22	PE-V0-412-501-A410	MQP for motors above 50kW.	I	5
LEGENDS				
A= Approval category				
I= Information category				

Notes:

- The above drawing list is tentative and shall be finalized with the successful bidder after placement of order. While some of the drawings indicated above may not be applicable, some additional drawings may also be required based on scope of work.
- Drawings shall be prepared in Auto-Cad latest edition. Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified elsewhere in the specification.
- Only manual calculation with authentic supporting literature (e.g. extracts of hand Book/ standard/codes) shall be acceptable. All design calculations and drawings shall be in SI system only.
- Bidder to note that all values/dimensions/elevations etc. without supporting back up data adopted/assumed by the successful bidder (during contract stage) in the design calculation/drawings shall be taken by the customer/owner to be correct unless they are stipulated in the specification. Any problem arising later in this regard shall be made good by the successful bidder at his cost and no extension of time shall be granted for the same.
- All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.:
 - All drawings and documents shall indicate the list of all reference drawings including general arrangement.
 - All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view; all major self-manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.
 - Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names.
 - All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ /



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BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

- e) Drawings/ documents to be submitted for purchasers review/ approval shall be under Revision A, B, C... etc. while drawings /documents to be submitted thereafter for customer's approval after purchaser's approval shall be under R-0, 1, 2, 3etc.
- f) Drawings and documents not covered above but required to check safety of machines/ system, shall be submitted during detailed engineering stage without any commercial implication.
- g) All drawings shall include "B.O.M" and indicate quantity, material of construction, make along with IS/BS No., Technical parameters, dimensions, hardness, machining symbol and tolerance, requirement of radiography and hydraulic tests, painting details, elevation, side view, plan, skin section and blow-up view for clarity.
- h) All drawings shall be prepared as per BHEL's title block and shall bear BHEL's drawing No.
- i) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.
- j) Bidder to follow the following the drawing submission schedule:
 - i. 1st submission of drawings from date of LOI as per the submission schedule.
 - ii. Every revised submission incorporating comments – within 7 days.
- k) Bidder to submit revised drawings complete in all respects incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. For any clarification/ discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL for across the table discussions/ finalizations/ submissions of drawings.



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ANNEXURE VI – PACKING PROCEDURE

Packing and Marking

All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. The Contractor shall be responsible for all loss or damage during transportation, handling and storage due to improper packing.

The identification marking indicating the name and address of the consignee shall be clearly marked in indelible ink on two opposite sides and top of each of the packages. In addition the Contractor shall include in the marking gross and net weight, outer dimension and cubic measurement.

Each package shall be accompanied by a packing note (in weather proof paper) quoting specifically the name of the Contractor, the number and date of contract and names of the office placing the contract, nomenclature of contents and Bill of Material.

ANNEXURE-VII



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Procedure for Load & Overload testing of Double Girder EOT
Cranes at Manufacturer's Works

Objective: To demonstrate final NO load, Load, Overload, Deflection & Functional tests of assembled crane/s for the purpose of acceptance.

Basic Assumptions / Inputs for testing at Works:

- Actual job hook shall be used for load & overload tests for hoisting.
- Actual ropes shall be used for load & overload testing.
- Shop cables can be used for temporary connection for the purpose of showing various functional tests at shop.
- Interlock and limit switch operation check will be shown with load for hoisting and CT motion.

Procedure for Load / Overload testing:

The cranes shall be tested for no load, load test & overload test at works generally in conformance with the IS – 3177 (latest edition). Specifically with respect to the load / overload testing of crane, the following tests as per the outlined procedures shall be done at works.

- Deflection of the girder will be measured at SWL when the trolley with load is at the middle of the girder.
- No load and full load current of the motors will be measured to verify whether it is as per the approved data sheet of the motor. Resistors in the circuit will be checked for any overheating of the element.
- Overload relays will be checked for proper functioning.

Hoisting & Cross Travel motions:

The load will be gradually raised to 125 percent of the rated capacity (SWL) with actual hook. The load will be lifted upward to about 1 meter height above its support and stop again. Check for any undue drift in the load. If load drifts, check the adjustment of brakes and repeat the above procedure. Then lower the load to rest on support/ground.



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For checking the cross travel, raise the load up to one (1) meter height above supports and then move the trolley with load about one (1) meter in either direction of the bridge. Then lower the load to rest on support/ ground.

Creep speed motions shall be checked over a distance of about 500 mm.

Note: Complete No load, load & over load tests in line with IS-3177 (latest edition) shall also be done after erection of EOT crane at site.



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SUPPLY PRICE PERCENTAGE BREAKUP

S. N.	Details of Works or Equipment/System	Qty. (LOT / Nos.)	Percentage (%) Break up proposed for billing purpose during contract for Supply and Mandatory Spares
1.	Total lumpsum firm price for design, engineering, manufacturing, inspection and testing, painting, supply/delivery duly packed at project site including freight , unloading, storage and handling at site in line with drawings/ documents/ test procedures approved by BHEL / Customer for One (1) no. of 70/18 T capacity, Double girder EOT cranes with 16.3 M lift of main hook, 16.8 m lift of auxiliary hook, 12.75 M span, complete with all accessories, isolating switch and power cable from isolating switch to DSL, Erection and commissioning spares for the total scope defined as per technical specification PE-TS-412-501-A002.	1 set.	84%
2.	Total lumpsum firm price for design, engineering, manufacturing, inspection and testing, painting, supply/delivery duly packed at project site including freight, unloading, storage and handling at site in line with drawings/ documents/ test procedures approved by BHEL / Customer for MS angle type runaway conductor / PVC shrouded bus bar type DSL for 78.7 M bay length complete with all accessories for the total scope defined as per technical specification PE-TS-412-501-A002.	1 set	3%
3.	Total lumpsum firm price for design, engineering, manufacturing, inspection and testing, painting, supply/delivery duly packed at project site including freight , unloading, storage and handling at site in line with drawings/ documents/ test procedures approved by BHEL / Customer for 78.7 M bay length Gantry rail complete with all accessories for the total scope defined as per technical specification PE-TS-412-501-A002.	1 set	7.5%
4.	Lump sum price of temporary cable for operation of crane during erection stage of the plant (equal to half the baylength plus 25 M) for the total scope defined as per technical specification PE-TS-412-501-A002.	1 set	3.5%
5.	Lump sum price of MAIN HOOK AND AUXILLIARY HOOK ASSEMBLY as per technical specification PE-TS-412-501-A002.	1 set	1.5%
6.	Total lump sum firm price for design, engineering, manufacturing, inspection and testing, painting, supply/delivery duly packed at project site including freight, unloading, storage and handling at site in line with drawings/ documents/ test procedures approved by BHEL / Customer for Maintenance tools and Tackles as per technical specification no. PE-TS-412-501-A002.	1 lot	0.5%
7.	Mandatory Spares	1 lot	

NOTE: -These prices shall be used for billing purpose during contract stage.



TITLE
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FOR CW PUMP HOUSE **ABOVE 50T UPTO 150T**

SPECIFIC TECHNICAL REQUIREMENTS

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SECTION – IB
Specific Technical Requirement (Electrical)

**TAMIL NADU GENERATION & DISTRIBUTION
COROPORATION LTD.**

2X660 MW SEZ ENNORE STPP

**DOUBLE GIRDER/ EOT CRANES
TECHNICAL SPECIFICATION
(ELECTRICAL PORTION)**



**BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
NOIDA
INDIA**



TITLE:
ELECTRICAL EQUIPMENT SPECIFICATION
FOR DOUBLE GIRDER EOT CRANES
2X660 ENNORE TPS

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	TITLE: ELECTRICAL EQUIPMENT SPECIFICATION FOR EOT CRANES / ELEVATORS / ELECTRIC HOISTS SYSTEM (ELECTRICAL PORTION) 2X660 ENNORE TPS	SPECIFICATION NO.
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1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

The equipment and services to be provided by bidder under this specification shall be as detailed here below but shall not be limited to the following:

- a) Services and Equipment as per "Electrical Scope between BHEL and Vendor".
- b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The bidder without any extra charge shall provide the same.
- c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
- d) Erection and Commissioning spares.
- e) Erection & Maintenance tools & tackles.
- f) Electrical load requirement for EOT CRANES / ELEVATORS / ELECTRIC HOISTS System.
- g) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- h) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer / BHEL approval without any commercial and delivery implications to BHEL.
- i) Various drawings including GA drg, data sheet as per required format, quality plans, calculations, test reports, test certificates, operation and maintenance manuals, characteristic curves, wiring diagrams/schemes etc shall be furnished as specified at contract stage. All documents shall be subject to customer / BHEL approval without any commercial implications to BHEL.
- j) Motors shall meet minimum requirement of Electric motor specification.
- k) All routine tests and type tests reports as per applicable standards shall be furnished at contract stage.
- l) Purchaser will furnish data sheets to the vendor after award of contract. Vendor shall furnish filled in data sheets meeting the specification requirements.
- m) LV Power Cables and Control Cables shall be as per cable annexure.
- n) Cable trays shall be as per attached Cable Tray Annexure.
- o) Panel shall be as per attached Panel Annexure.
- p) Technical requirements shall be as per specifications listed in Clause 4.1 to 4.9. In case of any discrepancy between Basic technical Particulars for HT or LT motors and BHEL standard specification, Basic technical particulars for HT or LT motors shall prevail.

2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:
Refer "Electrical Scope between BHEL and Vendor".

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

3.1 The electrical specification without any deviation from the technical/quality assurance requirements stipulated shall be deemed to be complied by the bidder in case bidder furnishes the overall compliance of package technical specification in the form of compliance certificate/No deviation certificate.

3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.



TITLE:
ELECTRICAL EQUIPMENT SPECIFICATION
FOR EOT CRANES / ELEVATORS / ELECTRIC HOISTS
SYSTEM
(ELECTRICAL PORTION)
2X660 ENNORE TPS

SPECIFICATION NO.

VOLUME NO. : II-B

SECTION: C

REV NO. : 0 DATE:

SHEET: 1 OF 2

4 LIST OF ENCLOSURES

- Electrical scope between BHEL & vendor.
- Technical specification – Specification for Electric Motors/Actuators
- Basic Technical Particulars of HT/LT motors.
- Testing Requirements.
- Quality Plan for LV Motors.
- Cable Annexure.
- Cable Tray Annexure.

REV: 00 DATE:

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR
PACKAGE: DOUBLE GRIDER EOT CRANES
SCOPE OF VENDOR: SUPPLY , ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT
PROJECT : 2 X660 MW ENNORE

<u>S.NO</u>	<u>DETAILS</u>	<u>SCOPE SUPPLY</u>	<u>SCOPE E&C</u>	<u>REMARKS</u>
1	Isolating Switch	Vendor	Vendor	BHEL will provide one number 415 V(3ph, 4W) supply feeder only up to change over type switch for cranes at middle of the bay. Any other voltage level (AC/DC) required will be derived by the vendor. Motor starter shall be part of crane control panel.
2	Power cables, control cables, screened control cables and any special cables (if required) between equipment supplied by vendor.	Vendor	Vendor	Cable from supply feeder to isolating switch shall be in BHEL scope.
3	Cabling material (cable trays, accessories, cable tray supporting system, conduits etc).	Vendor	Vendor	
4	Equipment Earthing	Vendor	Vendor	All equipment metallic enclosures / frames, metal structure etc. shall be grounded at two points each to the nearest grounding points / risers provided by BHEL.
5	Motors	Vendor	Vendor	
6	Cable glands and lugs for equipment supplied by vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power & control cables.
7	a) Input cable schedules (C & I) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
8	Equipment layout drawings	Vendor	-	
9	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

CHAPTER – 12

MOTORS

1.00.00 DESIGN CRITERIA

1.00.01 For the purpose of design of equipments /systems, an ambient temperature of 50 °C and relative humidity of 85% shall be considered. The equipment shall operate in a highly polluted environment.

1.00.02 Transient voltage dip on starting of the largest motor with DOL shall be limited to 20% of the nominal system voltage at the voltage terminals.

1.00.03 Rating

All motors shall be continuously rated (S1 duty). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor.

Whenever the basis for motor ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.

1.00.04 Starting Voltage requirement for all motors (except mill motors):

1. 85 % of rated voltage for motors up to 1000 kW
2. 80 % of rated voltage for above 1000 kW and up to 4000 kW
3. 75 % of rated voltage for above 4000 kW

For Mill Motors:

1. 85 % of rated voltage for motors above 1000 kW
2. 90 % of rated voltage for motors up to 1000 kW

1.00.05 Canopy shall be provided for outdoor motors.

1.01.00 Contractor shall provide fully compatible electrical system, equipments, accessories and services.



1.02.00 All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.

1.03.00 Voltage and frequency variations:

Frequency: (+) 3% and (-) 5%

Voltage : **i. AC**

a. $\pm 6\%$ for 11 kV/3.3 kV

b. $\pm 10\%$ for 415 V

Combined 10 % (absolute sum)

ii. DC- +10% to -15% for 220 V DC

1.04.00 All LV motors above 10 kW with S1 duty shall be compulsorily of Energy efficient level IE 2 as per IS 12615: 2011.

1.05.00 The responsibility of coordination with electrical agencies and obtaining all necessary clearances shall be of the contractor.

1.06.00 Type

AC Motors:

(a.) Squirrel cage induction motor suitable for direct-on-line starting.

(b.) Crane duty motors shall be slip ring type induction motor

DC Motors

(a.) Shunt wound.

1.07.00 Temperature Rise

Air cooled motors

70°C by resistance method

Water cooled

80° C over inlet cooling water temperature mentioned elsewhere, by resistance method.

1.08.00 Degree of Protection

Degree of protection for various enclosures shall be as follows :

i) Indoor motors – IP 54



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- | | | | |
|------|---|---|-------|
| ii) | Outdoor motors | – | IP 55 |
| iii) | CW motors (in case of screen
prot. Drip proof) | – | IP 23 |
| iv) | Cable box – indoor area | – | IP 54 |
| v) | Cable box – outdoor area | – | IP 55 |

2.00.00 CODES AND STANDARDS

2.01.00 All motors shall confirm to the latest editions including all applicable amendment of relevant IS, IEC and CBIP standards/Publications. In case any other standard is followed that ensures equal or better quality, may be accepted. However the English version of the Standard adopted shall be submitted.

2.02.00 Major Standards, which shall be followed, are listed below. Any other applicable Indian standards for any component part even if not covered in the list shall also be followed

- | | | | |
|-----|---|---|--|
| 1.) | Three phase induction motors | : | IS:325, IEC:60034 |
| 2.) | Single phase AC motors | : | IS:996, IEC:60034 |
| 3.) | Crane duty motors | : | IS:3177, IEC:60034 |
| 4.) | DC motors/generators | : | IS:4722 |
| 5.) | Degree of protection by
enclosures for rotating electrical
machines | : | IS: 4691
IS: 4728
IS: 6362
IS: 2253 |
| 6.) | Noise levels for rotating
electrical machines
Mechanical Vibrations for
rotating electrical machines | : | IS: 12065
IS: 12075 |

3.00.00 OPERATIONAL REQUIREMENTS

3.01.00 Starting Time

3.01.01 For motors with starting time up to 20 secs at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs more than starting time .



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- 3.01.02 For motors with starting time more than 20 secs and up to 45 secs at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs more than starting time.
- 3.01.03 For motors with starting time more than 45 secs at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.
- 3.01.04 Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.
- 3.01.05 Motors shall be capable of restarting under full load after a momentary loss of voltage with the possibility of 150 % nominal voltage during fast bus transfer.
- 3.02.00 Torque Requirements
- 3.02.01 Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.
- 3.02.02 Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.

4.00.00 DESIGN AND CONSTRUCTIONAL FEATURES

- 4.00.01 Suitable single phase space heaters shall be provided on motors rated 30 kW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided.
- 4.00.02 All motors shall be suitable for direct on line starting through any type of breaker.
- L All motors shall be either totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). CW motors can be screen protected drip proof (SPDP) type. Motors located in hazardous areas shall have flame proof enclosures conforming to IS: 2148 as detailed below

- (a) Fuel oil area : Group - IIB
- (b) Hydrogen generation plant Group - IIC
area :

4.00.03 Winding and Insulation

- (a) Type : Non-hygroscopic, oil resistant, flame resistant



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- (b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature
- (c) 11 kV / 3.3 kV AC motors : Class F: with winding temperature rise limited to class B. They shall withstand 1.2/50 micro sec switching surges of $4U+5$ KV (U=Line voltage in KV). The coil inter-turn insulation shall be suitable for 0.3/3 micro sec. surge of 32 KVp and 12 KVp for 11 kV and 3.3 kV system respectively followed by 1 min power frequency high voltage test of appropriate voltage on inter turn insulation.
- (d) 415V AC & 220V DC motors : Class 'F' with temperature rise limited to class 'B'
- 4.00.04 Motors rated above 1000 kW shall have insulated bearings to prevent flow of shaft currents.
- 4.00.05 Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.
- 4.00.06 Noise level and vibration shall be limited within the limits prescribed in IS: 12065 & IS: 12075 respectively. Motors shall withstand vibrations produced by driven equipment.
- 4.00.07 In MV/HV motors, 12 nos. simplex or 6 nos. duplex RTDs (two per phase), each having D.C. resistance of 100 ohms at 0°C, embedded in the stator winding at locations where highest temperatures may be expected, shall be provided. The material of the ETD's shall be platinum. Each bearing shall be provided with dial type thermometer with adjustable alarm contact and resistance type temperature detector. All HV motors shall be provided with shaft grounding rings for bearing protection and earthing shaft current.
- 4.00.08 MV/HV motors shall also be capable of satisfactory operation at full load at a supply voltage of 80% of the rated voltage and shall be capable of either two starts in quick succession with third start after 5 minutes in cold condition or two starts at 15 minutes intervals in hot condition, both cases with voltage and frequency variation within specified limits.
- 4.00.09 Locked rotor current of the MV motors shall be limited to 600% (subject to IS tolerance) of the full load current of the motors and for HV motor shall be limited to 450% (inclusive of IS tolerance) of full load current of the motor.



Locked rotor current of the LV motor shall not exceed 600% of full load current inclusive of IS tolerance.

- 4.00.10 MV Motors shall be provided with differential protection. These motors shall be provided with star connected stator windings. The 3 nos. current transformers, one for each phase shall be mounted in a separate compartment in the neutral side terminal box. The three phases shall be connected to form the star point after they pass through the CTs. These differential protection CTs shall be supplied loose by 11/ 3.3 kV switchgear manufacturer.
- 4.00.11 Motor body shall be grounded at two earthing points on opposite sides with two separate and distinct grounding pads complete with tapped holes, GI bolts and washers.
- 4.00.12 HV motors can be offered with either elastimould termination or dust tight phase separated double walled (metallic as well as insulated barrier) cable boxes. In case elastimould terminations are offered, then protective cover and trifurcating sleeves shall also be provided. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided in case of cable boxes.
- 4.00.13 All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.
- 4.00.14 The motors shall be suitable for bus transfer schemes provided on the 11 kV, 3.3 kV/415V systems without any injurious effect on its life.
- 4.00.15 All motors below 15 kW shall be provided with sealed ZZ bearings.
- 4.00.16 For motors rated 1000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.
- 4.00.17 All motors shall be provided with an emergency stop push button near the motor as per the Indian Statutory regulations.
- 4.00.18 The motor terminal box shall be suitable for withstanding the maximum system fault current for a duration of at least 0.25 seconds.
- 4.00.19 Neutral in case of HV motors shall be kept accessible.



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- 4.00.20 Motors shall be designed to easy access for drilling holes through motor feed of mounting flange for installation of dowel pins after assembly of the motor and driven equipment.
- 4.00.21 Well spacious working platforms shall be provided around the motor area for carrying out maintenance & testing works. Platform shall be minimum of 300 mm below the level of motor base plate.
- 4.00.22 Flow switches shall be provided for monitoring oil flow of forced lubrication bearings, if used. Alarm switch contact rating shall be minimum 0.5 A at 220 V DC and 10 A at 230 V AC.
- 4.00.23 For bearing temperature measurement, duplex RTDs shall be provided for each bearing and shall be wired up to the terminal box..
- 4.00.24 Lube oil pressure transmitters shall be provided to DCS for remote monitoring. Lube oil pressure very low trip to HV equipment shall be 2 out of 3 logic.
- 4.00.25 Capillary type temperature gauge cum switch shall be provided for DE / NDE of HV Motors
- 4.00.26 Motors with CACA/CACW heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate the following:

-Hot and cold air temperatures of the closed air circuit for CACA motors.

-Hot and cold, air and water temperatures for CACW motors.

The Alarm switch contact rating shall be minimum 0.5 A at 220 V DC and 10 A at 230 V AC.

4.00.27 Lifting Provisions

Motor weighing 25 kg or more shall be provided with eye bolt or other adequate provision for shifting. Electrical hoists shall be provided for motors above 1000 kgs for maintenance of the same.

4.00.28 DC MOTORS

DC motors shall be provided where specified/required. DC Motors shall be sized for operation with fixed resistance starting for reliability. DC motors shall be shunt wound type. Motors shall be capable of delivering the rated output at 220 V DC with (+) 10% and (-) 15% variations without exceeding its guaranteed temperature limits. 220 V DC



system shall be unearthed. Starting current of the DC motors shall be limited to 200% of the full load current of the motor, and is subject to IS tolerance. DC Motors shall be similar to AC Motors with respect to other features like enclosure type, cooling and class of insulation

4.00.30 Painting

Motor including fan shall be painted with corrosion proof paints of colour shade Siemens grey (RAL 7032).

4.00.31 Local Push Button Stations

The LPBS shall be installed near the motors to be controlled. Individual channel supports shall be used for each LPBS. These shall be installed as per approved erection detail drawing. LPBS for hazardous areas shall be CMRS certified and CCE approved.

All LPBS shall have necessary canopies. Wiring of LPBS shall be checked before giving control supply.

5.00.00 LIST OF TESTS TO BE CONDUCTED FOR HV, MV and LV MOTORS**5.01.00 TYPE TESTS**

- (a) No load saturation and loss curves up to approximately 115% of rated voltage
- (b) Momentary overload test
- (c) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., core temp., coolant flow and its temperature shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.
- (d) Surge withstand test on the sample coil after placing it in stator core at (4U + 5 KV) and with at least five impulse of 1.2/50 micro sec. wave, for HV motors only, where U is the line to line voltage in kV.
- (e) Surge-withstand test with 0.3/3 micro sec. wave on each type of 3.3/11 kV motor coils with at least five such impulses, followed by one minute power frequency high voltage test on turn to turn insulation, after cutting the coil and bringing out



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the turns suitably. The power frequency test voltage shall be decided during detailed engineering.

- f) Dimensions (for motors covered by IS 1231:1974 and IS 2223:1983 only)
- g) Measurement of resistance of windings of stator and wound rotor.
- h) Reduced voltage running up test at no load (for squirrel cage motors up to 37kw only)
- i) Full load test to determine efficiency, power factor and slip.
- j) Insulation resistance test
- k) Test for vibration severity of motor
- l) Test for noise levels of motor
- m) Test for degree of protection by enclosure
- n) Temperature rise test at limiting values of voltage and frequency variations
- o) Over speed test

5.02.00**ROUTINE TESTS**

The following shall constitute the routine tests.

- a) Insulation resistance test
- b) Measurement of resistance of windings of stator and wound rotor.
- c) No load test
- d) Locked rotor readings of voltage, current and power input at a suitable reduced voltage
- e) Reduced voltage running up test (for squirrel cage motor)
- f) Open circuit voltage ratio of stator and rotor windings (for slip ring motors); rotor;
- g) High voltage test

6.00.00**INSPECTION AND TESTING AT SITE****6.01.01**

Insulation resistance of 415V motors shall be measured between the winding of the machine and its frame by means of a 500/1000V megger. A minimum value of 1 mega ohm for 415V motors shall be considered a safe value. In case of lower I.R. Value, the insulation value shall be brought up by any of the following methods as desired by the Site Engineer:

- (a.) Blowing hot air in case of big motors.
- (b.) Putting the motor in electric oven in case of smaller motors.
- (c.) Placing heaters or lamps around and inside in case of small motors after making suitable guarding and covering arrangements so as to conserve the heat.



6.01.02 Site Test

- (a.) Measurement of vibration.
- (b.) Measurement of insulation resistance and polarization index.
- (c.) Measurement of full load current.
- (d.) Test running of the motors, checking the temperature rise and identifying the hot spot etc.

6.01.03 3.3 kV motors shall be tested for insulation by 500/1000V megger and its value should not be less than the safe minimum insulation of $\geq 20 \text{ M}\Omega$ resistance at 60 deg. C. In case the insulation is low, the following method of drying has to be adopted:

- a. By locking the motor so that it cannot rotate and then applying such a low voltage to the stator terminals that full load current flows in the stator, keeping the stator winding temperature below 90 deg. C. In this a close watch shall be kept for any possible overheating and I.R. Values vs. temperature shall be plotted and heating continued till I.R. Value becomes steady.
- b. By blasting hot air from external source, Maximum temperature of winding while drying should be 70 deg. C to 80 deg. C. (Thermometer) or 90 deg. C. to 95 deg. C. by resistance method. Heating should be done slowly till steady temperature of winding is reached after 4 to 5 hours and for large machines after 10 hours. A record has to be kept for drying process, with half an hour readings and, after steady temperature is reached, at an interval of 2 hours. In case it is essential, the drying process can be supplemented by blower.



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MOTOR DATA SHEET-A

SL.NO.	PARAMETERS	UNIT	ENNORE	
	MOTOR			
1	DESIGN AMBIENT TEMP	DEG. C	50	
2	VOLTAGE SUPPLY AND VARIATION	VOLT	415V, $\pm 10\%$	
3	FREQUENCY WITH VARIATION	Hz	50 (+) 3% to (-) 5%	
4	COMBINED VOLTAGE & FREQUENCY VARIATION		10%	
5	MAX ACCEPTABLE RATING OF MOTOR AT 415 V	KW	160 kW	
6	SYSTEM FAULT LEVEL AND ITS DURATION	KA	50 KA, 1 Sec	
7	SUTABILITY OF TERMINAL BOX FOR FAULT LEVEL AND DURATION		50 KA, 0.25 sec	
8	CLASS OF INSULATION & TEMP RISE LIMITED TO		Class-F and temp rise limited to Class-B	
9	MIN. STARTING VOLTAGE		85%	
10	MOTOR RATING FOR SINGLE PHASE SUPPLY		Upto 200W	
11	MAXIMUM LOCKED ROTOR CURRENT	% OF FLC	For LT motors (except energy efficient motors) locked rotor current shall not exceed 700% of full load current inclusive of tolerance as per IS: 325. For LT energy efficient motors above 10kW with S1 duty, locked rotor current shall be as per IS: 12615-2011.	
12	ACCEPTABLE NOISE LEVEL	DB	85dB at 1.0m in line with IS 12065	
13	TYPE OF STARTER PROVIDED IN MCC		N.A.	
14	DOP OF ENCLOSURE		Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. The degree of protection for terminal boxes shall be IP 55 for outdoor area & IP 54 for indoor area as per IS 4691.	
15	SPACE HEATER REQUIREMENT		30KW & ABOVE	
16	PAINT SHADE		Shall be confirmed during detailed engineering.	
17	SPECIAL REQUIREMENT		Type test to be conducted on the identical motor in the last 5 years or after the last design change, which ever is earlier. Otherwise, the equipment shall have to be type tested, free of charge, to prove the design. All motors shall be subjected to routine tests as per IS: 325. The motors shall generally conform to IS 325/IEC-60034.	

	TITLE	SPECIFICATION NO.
	MOTOR	VOLUME II B
	DATA SHEET - C	SECTION D
		REV NO. 00 DATE
		SHEET 1 OF 2

S. No.	Description	Data to be filled by successful bidder
A.	General	
1	Manufacturer & country of origin	
2	Motor type	
3	Type of starting	
4	Name of the equipment driven by motor & Quantity	
5	Maximum Power requirement of driven equipment	
6	Rated speed of Driven Equipment	
7	Design ambient temperature	
B.	Design and Performance Data	
1	Frame size & type designation	
2	Type of duty	
3	Rated Voltage	
4	Permissible variation for	
5	a) Voltage	
6	b) Frequency	
7	c) Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)	
9	Synchronous speed & Rated slip	
10	Minimum permissible starting voltage	
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	
13	b) At min starting voltage	
14	Locked rotor current as percentage of FLC (including IS tolerance)	
15	Torque	
	a) Starting	
	b) Maximum	
16	Permissible temp rise at rated output over ambient temp & method	
17	Noise level at 1.0 m (dB)	
18	Amplitude of vibration	
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	
	c) At 75% load	

NAME OF VENDOR			SEAL	REV.
NAME	SIGNATURE	DATE		

	TITLE MOTOR DATA SHEET - C	SPECIFICATION NO.
		VOLUME II B
		SECTION D
		REV NO. 00 DATE
		SHEET 2 OF 2

S. No.	Description	Data to be filled by successful bidder
	c) At starting	
C.	Constructional Features	
1	Method of connection of motor driven equipment	
2	Applicable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Main terminal box	
	a) Type	
	b) Power Cable details (Conductor, size, armour/unarmour)	
	c) Cable Gland & lugs details (Size, type & material)	
	d) Permissible Fault level (kArms & duration in sec)	
7	Space heater details (Voltage & watts)	
8	Flame proof motor details (if applicable)	
	a) Enclosure	
	b) suitability for hazardous area	
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
D.	Characteristic curves/ drawings (To be enclosed for motors of rating $\geq 55KW$)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

CUSTOMER :		PROJECT TITLE		SPECIFICATION : NUMBER :		
BIDDER/ VENDOR SYSTEM		QUALITY PLAN		SPECIFICATION :		
CAT.		ITEM AC ELECT MOTORS 55 KW & ABOVE (LV & MV)		VOLUME III		
SHEET 1 OF 9		REFERENCE DOCUMENT		REMARKS		
CHARACTERISTIC CHECK		EXTENT OF CHECK		SECTION AGENCY		
TYPE/ METHOD OF CHECK		NORM		P W V		
3		4		5		
2		3		6		
1		2		7		
1		3		8		
1.0		4		9		
1.1		5		10		
1.2		6		11		
1.3		7		12		
1.4		8		13		
1.0	RAW MATERIAL & BOUGHT OUT CONTROL					
1.1	SHEET STEEL, PLATES, SECTION, EYEBOLTS	MA	100%	FREE FROM BLINKS, CRACKS, WAVERNESS ETC	LOG BOOK	3 - -
	2.DIMENSIONS	MA	SAMPLE	MANFR'S DRG./SPEC	-DO-	3 - -
	3.PROOF LOAD TEST (EYE BOLT)	MA	-DO-	INSPEC. REPORT		3 - 2
1.2	HARDWARES	MA	100%	FREE FROM CRACKS, UN-EVENNESS ETC.	-DO-	3 - -
	2.PROPERTY CLASS	MA	SAMPLES	RELEVANT IS/SPEC.	SUPPLIERS TC & LOG	3 - 2
1.3	CASTING	MA	100%	FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK	3 - 2
	2.CHEM. & PHY. PROP.	MA	1/HEAT NO. TEST	RELEVANT IS/	SUPPLIER'S TC	3 - 2
	3.DIMENSIONS	MA	100%	MANUF'R'S DRG.	LOG BOOK	3 - 2
1.4	PAINT & VARNISH	MA	100% CONTINUOUS	MANFR'S DRG./SPEC	LOG BOOK	3 - 2
	1.MAKE, SHADE, SHELF LIFE & TYPE					
BHEL		PARTICULARS		BIDDER/VENDOR		
		NAME		SIGNATURE		
		DATE		BIDDER'S/VENDORS COMPANY SEAL		

[illegible]

CUSTOMER :		PROJECT :		SPECIFICATION :							
BIDDER/ VENDOR		TITLE		NUMBER :							
SYSTEM		QUALITY PLAN		TITLE							
CAT.		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)		SECTION							
TYPE/ METHOD OF CHECK		REFERENCE DOCUMENT		AGENCY							
EXTENT OF CHECK		ACCEPTANCE		VOLUME III							
SHEET 3 OF 9		NORM		REMARKS							
CHARACTERISTIC CHECK		FORMAT OF RECORD		P W V							
COMPONENT/OPERATION		INSPT. REPORT		10 11							
SL. NO.	1	2	3	4	5	6	7	8	9	10	11
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND. ETC. 2. OTHER CHARACTERISTICS	MA	VISUAL	100%	-	MANUF'S SPEC.	NO VISUAL DEFECTS	LOG BOOK AND OR SUPPLIER'S TC	3 - 2	
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND. 2. DIMENSIONS INCLUDING BURS HEIGHT 3. ACCEPTANCE TESTS	MA	TEST	SAMPLE	MANUF'S SPEC.	LOG BOOK	NO VISUAL DEFECTS (FREE FROM BURS)	LOG BOOK	3 - 2	FOR MV MOTOR INSULATION VARNISH THICKNESS SHALL BE MORE THAN THE BURS HEIGHT
1.9	CONDUCTORS	1. SURFACE FINISH 2. ELECT. PROP. & MECH. PROP	MA	VISUAL	100%	MANUF'S DRG.	MANUF'S DRG.	RELEVANT IS	SUPPLIER'S TC	3 - 2	* MOTOR MANUFACTURER TO CONDUCT VISUAL CHECK FOR SURFACE FINISH ON RANDOM BASIS (10% SAMPLE) AT HIS WORKS AND MAINTAIN RECORD FOR VERIFICATION BY BHEL/CUSTOMER.
BHEL		PARTICULARS		BIDDER/VENDOR		RELEVANT IS/ BS OR OTHER STANDARDS		RELEVANT IS/ BS OR OTHER STANDARDS	SUPPLIERS TC & VENDOR'S INSPN. REPORTS	3 - 2	
		NAME									
		SIGNATURE									
		DATE									