TECHNICAL QUALIFICATION REQUIREMENT

Name of Project: MALEGAON ELECTRODE STATION

Name of Customer: M/s MSETCL

Name of Item: CLAMP & CONNECTORS

TECHNICAL QUALIFICATION REQUIREMENT
The Bidder should have supplied 33 KV clamp & connectors in last 5 years from date of Enquiry.

SUPPORTING DOCUMENTS TO BE SUBMITTED BY BIDDER ALONG WITH TECHNICAL BID		
Sr	**Required Criteria**	**Supporting Documents**
1	Supply	1. Purchase order 2. Dispatch clearance / LR / Material Receipt certificate at site / etc. establishing bidder as proven supplier of offered item

PREPARED BY

14/02/24

JINTU GOGOI

(MANAGER/ TBEM)

REVIEWED & APPROVED BY

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BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS ENGINEERING MANAGEMENT

DOCUMENT No.	TB-422-316-007	Rev. No.	00		Prepared	Checked	Approved
TYPE OF DOC.	**TECHNICAL SPECIFICATION**			SIGN			
TITLE	**CLAMP & CONNECTORS**			NAME	**JG**	**SS**	**SS**
				DATE	14.02.24	14.02.24	14.02.24
				GROUP	**TBEM**	W.O. No	

CUSTOMER	**MAHARASHTRA STATE ELECTRICITY TRANSMISSION COMPANY LIMITED (*MSETCL*)**
PROJECT	**SHALLOW TYPE GROUND ELECTRODE STATION AT MALEGAON (PADGHE TERMINAL) ASSOCIATED WITH ±500KV 1500MW CHANDRAPUR-PADGHE HVDC BIPOLE LINK**
STATION	**MALEGAON GROUND ELECTRODE STATION**

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Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS

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SECTION-1

Scope, Bill of Quantities and Specific Technical Requirement

1.1 SCOPE

This technical specification covers the requirements of design, engineering, manufacture, testing at works, documentation, packing and loading at works, transportation to site of Clamps and Connectors and Spacers etc. along with their accessories and fixing hardware to following project sites. The scope shall encompass and include all the activities listed above.

In case of variance in the requirements specified under Section-1 and other Sections of this specification, requirements of Section-1 shall prevail. In case of variance in the requirements specified in Section-2 & 3, Section-2 shall prevail.

1.2 The equipment is required for the following Projects.

Name of customer:	**Maharashtra State Electricity Transmission Company Limited**
Name of the project:	**SHALLOW TYPE GROUND ELECTRODE STATION AT MALEGAON (PADGHE TERMINAL) ASSOCIATED WITH ±500KV 1500MW CHANDRAPUR-PADGHE HVDC BIPOLE LINK**
Project Site:	**Malegaon Electrode site (Approx. 40 km from Padghe, Maharashtra)**

Refer Section - 3 for Project Details and General Specifications.

Note: The terms used in this specification namely,"Employer/Purchaser" refers to PowerGrid, "Contractor " refers to BHEL & "Sub-contractor" refers to successful bidder.

1.3 BILL OF QUANTITIES

Refer **ANNEXURE-BOQ.**

Note:

1. Quantity variation as per NIT terms & condition.
2. The Equipment terminal details will be furnished after placement of order.
3. Quantity Variation: +/- 25% on overall BOQ

1.4 SPECIFIC TECHNICAL REQUIREMENTS

All power clamps and connector/spacers and their accessories shall conform to IS 5561 and IS 10162 respectively and other relevant standards as mentioned in clause 2.2 of this specification, except to the extent explicitly modified in the Section -2 of this Specification.

1.4.1 Technical Particulars for Clamps & Connectors/Spacers

Sl. No.	Technical Particulars	Unit	System Ratings
			33 kV
1	Nominal system voltage	kV	33
2	Highest system voltage	kV	36
3	Current Rating	A	2000/1000
4	Short circuit current	kA	25 KA for 3 sec
5	**Material**		
a	For connecting ACSR Conductors	Aluminium alloy casting, conforming to designation A6 of IS:617 and shall be tested for all tests as per IS:617	
b	For connecting equipment terminals made of copper with ACSR Conduct`or	Bimetallic connectors made from aluminium alloy casting, conforming to designation A6 of IS 617 with 2mm thick Bimetallic liner and shall be tested as per IS:617.	
c	For connecting G.I. shield wire	Galvanised mild steel	
d	Bolts, nuts and plain washers	Electro galvanised for size below M12, for other hot dip galvanised	
e	Spring washers for items 'a' to 'c'	Electro - galvanised mild steel suitable for at least service conditions-3 as per IS:1573	

1.4.2 Technical Qualifying Requirement

As per Annexure-TQR.

1.4.3 Type Tests

Clamps and connectors should be type tested on minimum three samples as per IS:5561 and shall also be subjected to routine tests as per IS:5561. Following type test reports shall be submitted for approval. Type test once conducted shall hold good. The requirement of test conducted within last ten years, shall not be applicable.

i) Temperature rise test (maximum temperature rise allowed is 35°C over 50°C ambient)

ii) Short time current test

iii) Resistance test and Pull out strength test

iv) Cantilever Strength test on bus support clamps & connectors

1.4.4 Quality Plan

The contractor shall carry out contract works in accordance with sound quality management principles which shall include such as controls which are necessary to ensure full compliance to all requirements of the specification & applicable international standards. This quality management requirement shall apply to all activities during design, procurement, manufacturing, inspection, testing, packaging, shipping, inland transportation, storage, site erection & commissioning. Contractor shall submit detailed Quality Plan for BHEL / customer's approval.

1.4.5 Special Tools & Tackles

The bidder shall include in his proposal the deployment of all special tools and tackles required for erection, testing, commissioning and maintenance of the equipment. The Special tools and tackles shall only cover items which are specifically required for the equipment offered and are proprietary in nature. A list of all such devices shall be furnished.

1.4.6 Deviations

The bidder shall list all the deviation from the specification separately only in the deviation schedule provided with the NIT. Offers without specific deviation will be deemed to be totally in compliance with the specification and NO DEVIATION on any account will be entertained at a later date.

ANNEXURE-BOQ

BOQ OF CLAMP & CONNECTORS

SL NO	DESCRIPTION	QTY	UNIT	REMARKS
1	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 1000A, ISOLATOR (HDB) CONNECTOR SUITABLE FOR SINGLE BERSIMIS	10	NOS	
2	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 1000A, ISOLATOR (HDB) CONNECTOR SUITABLE FOR FIXING 11KV CABLE TERMINATION KIT	10	NOS	
3	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 1000A, TEE CONNECTOR SUITABLE FOR AL TUBE 3 INCH IPS TO SINGLE CONDUCTOR AS PER TS	12	NOS	CONDUCTOR IS ACSR BERSIMIS
4	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 2000A, TEE CONNECTOR SUITABLE FOR AL TUBE 3 INCH IPS TO TWIN CONDUCTOR AS PER TS	6	NOS	CONDUCTOR IS ACSR BERSIMIS
5	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 2000A, CAPACITOR CONNECTOR SUITABLE FOR TWIN BERSIMIS	2	NOS	
6	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 2000A, REACTOR CONNECTOR SUITABLE FOR TWIN BERSIMIS	2	NOS	
7	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 1000A, LA CONNECTOR SUITABLE FOR SINGLE BERSIMIS	2	NOS	
8	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 2000A, BPI CONNECTOR SUITABLE FOR AL TUBE 3 INCH IPS, RIGID/SLIDING THROUGH TYPE	5	NOS	
9	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 2000A, CORONA BELL SUITABLE FOR 3 INCH IPS AL TUBE	4	NOS	
10	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 1000A, TEE CONNECTOR SUITABLE FOR SINGLE BERSIMIS TO SINGLE CONDUCTOR AS PER TS	4	NOS	CONDUCTOR IS ACSR BERSIMIS
11	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 2000A, RIGID SPACER SUITABLE FOR TWIN BERSIMIS	20	NOS	
12	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 2000A, WELDING SLEEVE SUITABLE FOR 3 INCH IPS AL TUBE	4	NOS	
13	SUPPLY- CLAMPS & CONNECTORS : CLAMP SUITABLE FOR FIXING EARTHING CONDUCTOR ON GS STRUCTURE	18	NOS	EARTHING CONDUCTOR is GI FLAT 75X12 Sqmm or 120 Sqmm COPPER CONDUCTOR. SAME WILL BE CONFIRMED DURING DETAIL ENGINEERING
14	SUPPLY- CLAMPS & CONNECTORS : 33KV, 25KA FOR 3S, 1000A, TEE CONNECTOR SUITABLE FOR AL TUBE 3 INCH IPS TO 70SQMM CABLE	1	NO	

SECTION-2

Equipment Specification

2.1. General

This section covers the general technical requirements of Clamps & Connectors/Spacers. In case of any discrepancies between the requirements mentioned in this section and those specified in other sections of this specification, this shall prevail after section-1 and shall be treated as binding requirements.

2.2 Applicable Standards

The spacers and clamps & connectors, unless otherwise specified, shall strictly conform to the latest revision of the following Indian and International standards as appropriate:

List of Standards:

Electric Power Connectors	IS-5561
Electric Power Connectors for substation	NEMA-CC1
Connectors for use between aluminium or aluminium-copper overhead conductors	NEMA-CC3
Spacers & spacer dampers for twin horizontal bundle conductors	IS 10162
Aluminium and aluminium alloy ingots and castings for general engineering purposes	IS 617
Hexagon head bolts, screws and nuts of product grade C	IS 1363
Hexagon head bolts, screws and nuts of product grades A and B	IS 1364
Technical supply conditions for threaded steel fasteners	IS 1367 Part (1, 2, 3 &13)
Conductors and earth wire accessories for overhead power lines	IS 2121
Methods for testing uniformity of coating of Zinc coated articles	IS 2633
Specification for Electroplated coatings of zinc on iron and steel	IS 1573
Hexagonal bolts & nuts (M42 to M150)	IS 3138
Metric screw threads	IS 4218(Parts 1 to 4 & 6)
Fasteners: hexagonal products width across flats	ISO 272
Fasteners, screws & studs	ISO 898
Hot dip zinc coatings on structural steel and other allied products	IS 4759
Recommended practice for hot dip galvanizing of iron and steel	IS 2629
Code of practice for use of metal arc welding for general construction in mild steel	IS 816

2.3 Clamps and Connectors

2.3.1 All power clamps and connectors shall conform to IS:5561 or other equivalent international standard and shall be made of materials listed below:

Sl. No.	Description	Materials
1	For connecting ACSR conductors/AAC conductors/ Aluminium tube	Aluminum alloy casting, conforming to designation 4600 of IS:617 and all test shall conform to IS:617
2	For connecting equipment terminals mad of copper with ACSR conductors/AAC conductors/ Aluminium tube	Bimetallic connectors made from aluminum alloy casting, conforming to designation 4600 of IS:617 with 2mm thick bimetallic liner/strip and all test shall conform to IS:617
3	For connecting G.I	Galvanised mild steel shield wire
4	Bolts, nuts & plain washers	Electro-galvanised for sizes below M12, for others hot dip galvanised.
5	Spring washers	Electro-galvanised mild steel suitable for atleast service condition-3 as per IS:1573

2.3.2 Necessary clamps and connectors shall be supplied for all equipment and connections. If corona rings are required to meet these requirements they shall be considered as part of that equipment and included in the scope of work.

2.3.3 Where copper to aluminum connections are required, bi-metallic clamps shall be used, which shall be properly designed to ensure that any deterioration of the connection is kept to a minimum and restricted to parts which are not current carrying or subjected to stress.

2.3.4 Low voltage connectors, grounding connectors and accessories for grounding all equipment as specified in each particular case, are also included in the scope of Work.

2.3.5 No current carrying part of any clamp shall be less than 10 mm thick. All ferrous parts shall be hot dip galvanised. Copper alloy liner/strip of minimum 2 mm thickness shall be cast integral with aluminum body or 2 mm thick bi-metallic liner/strips shall be provided for Bi-metallic clamps.

2.3.6 All casting shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges and corners shall be blurred and rounded off.

2.3.7 Flexible connectors, braids or laminated straps made for the terminal clamps for bus posts shall be suitable for both expansion or through (fixed/sliding) type connection of IPS AL tube as required. In both the cases the clamp height (top of the mounting pad to centre line of the tube) should be same.

2.3.8 Current carrying parts (500A and above) of the clamp/connector shall be provided with minimum four numbers of bolts preferably for 132kV and above.

2.3.9 All current carrying parts shall be designed and manufactured to have minimum contact resistance.

2.3.10 Power Clamps and connectors shall be designed to control corona as per requirement.

2.4 Spacers

Spacer shall conform to IS - 10162.

No magnetic material shall be used in the fabrication of spacers except for GI bolts and Nuts.

Spacer design shall be made to take care of fixing and removing during installation and maintenance

The design of the spacers shall be such that the conductor does not come in contact with any sharp edge.

2.5 Type Tests

All type tests should have been conducted not earlier than 10 year from 23.09.2022. If any type tests report is found to be technically unacceptable, such type test(s) shall be conducted by the vendor without cost and delivery implication to BHEL. In case the test reports are of the test conducted earlier than 10 (ten) from 23.09.2022, the bidder shall repeat these test(s) at no extra cost to BHEL.

2.5.1 Tests for Clamps and Connectors

Clamps and connectors should be type tested on minimum three samples as per IS:5561 and shall also be subjected to routine tests as per IS:5561. Following type test reports shall be submitted for approval. Type test once conducted shall hold good. The requirement of test conducted within last ten years, shall not be applicable.

i) Temperature rise test (maximum temperature rise allowed is 35°C over 50°C ambient)
ii) Short time current test
iii) Corona (dry) and RIV (dry) test [for 132kV and above voltage level clamps]
iv) Resistance test and Pullout strength test
v) Cantilever Strength test on bus support clamps & connectors

2.5.2 Tests for Spacers

The spacers shall be subjected to the type tests, acceptance tests and routine tests in accordance with IS : 10162.

SECTION - 3

PROJECT DETAILS AND GENERAL SPECIFICATIONS

1.0 GENERAL

This section stipulates the General Technical Requirements under the contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipment and services covered under other sections and is not exclusive. However, in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall hold good.

1.1 SITE INFORMATION

SL.NO.	DESCRIPTION	
3.1	**PROJECT INFORMATION**	
	a) Customer	MSETCL (MAHATRANSCO)
	b) Project	SHALLOW TYPE GROUND ELECTRODE STATION AT MALEGAON (PADGHE TERMINAL) ASSOCIATED WITH ±500KV 1500MW CHANDRAPUR-PADGHE HVDC BIPOLE LINK
	c) Project location	The Malegaon Earth electrode terminal is located about 40km from Padghe HVDC terminal in Maharashtra. The nearest railway station is Padghe (approx. 40kM) and nearest airport is Mumbai (approx. 100kM). The coordinates of the site location is 19.08.34.53N, 73.24.01.47E. The size of the land is 400 m X 400m.
	d) Transport facilities • Nearest Railway Station • Nearest Airport	 PADGHE (approx. 40km) BADLAPUR (approx. 20km) MUMBAI (approx. 100km)
3.2	**SITE CONDITIONS**	
3.2.1	Ambient Temp.	
	a) Maximum Design Ambient air temp. (Max.) ˚C	50 deg.
	b) Minimum Design Ambient air temp. (Max.) ˚C	0 deg.
3.2.2	Height above mean sea level	155 mtr
3.2.3	Coastal area consideration	yes
3.2.4	Earth quake data	
	a) Seismic zone	As per IS 1893
3.2.5	Wind data	
	a) Wind zone	As per IS 875 part-3

1.2 STANDARDS

The Works covered by the Specification shall be designed, manufactured, built, tested and commissioned in accordance with the Acts, Rules, Laws and Regulations of India. The Equipment(s) shall also conform to the general requirements detailed in the following standards, which shall form an integral part of the Specification, in addition to meeting the specific requirements called for elsewhere in the Specification.

The Bidder shall note that the standards mentioned herein are not mutually exclusive or complete in themselves, but are intended to complement each other, with minimum repetition, to define the requirements of the Specification.

When specific requirements stipulated in the Specification exceed or change those required by the applicable standards, the stipulations of the Specification shall take precedence.

Unless specifically agreed to by the Employer prior to Award of Contract, the Work shall be in accordance with the standards indicated and the requirements of the Specification. The Bidder shall be held responsible for any deviation.

In case of conflict between the various standards, the decision of Employer shall be binding & final.

All equipment and materials, unless otherwise specifically required in the Specification, shall conform to latest revisions of the standards listed in the Specification, in force 15 days before the originally scheduled deadline for submission of bid at the time of signing of the contract for this project.

IEC/TS 62344	Design of earth electrode stations for high-voltage direct current (HVDC) links.
IS-1893	Criteria for Earthquake Resistant Design of Structures
IEC 60076-6	Air core reactors
IEC-60871	Shunt capacitors
IEC 62271-102	High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches
IEC-60099-9	Metal-oxide surge arresters without gaps for HVDC converter stations
IEC-60270	Partial Discharge measurements
IS-7098-Part 1,2,3	XLPE insulated cables
IS-8130	Conductors for Insulated cables
IS-1554(1)	PVC Insulated cables
IS-15910	Geotextiles
IS-5561	Clamp and connectors
IS-1892	Code of practice for subsurface investigation for foundations
IS-1080	Code of Practice For Design And Construction Of Shallow Foundations In Soils (Other Than Raft, Ring And Shell)
IS-9451	Guidelines for lining of canals in expansive soils
IS: 456	Plain and Reinforced Concrete
IS: 10262	Concrete Mix Proportioning — Guidelines
IS: 1786	High Strength Deformed Steel Bars and Wires for Concrete reinforcement
IS:875	Code of practice for design loads (Other than earthquake) For buildings and structures
IS: 1893	Criteria for Earthquake Resistant Design of structures
IS: 3370	Concrete structures for storage of liquids
IS: 1200	Methods of measurement of building and civil engineering works
IS:1489 or IS: 4926 or IS: 4925	IS: 269 or IS:8112 or IS: 12269 or IS: 455 Cement Concrete mix
IS: 3812	Pulverized fuel ash
IS: 800	General construction in steel
IS: 2911	Design and construction of pile foundations
IS: 2720	Soil testing

1.3 SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED

All equipment shall also perform satisfactorily under various other electrical, electromechanical and meteorological conditions of the site of installation. All equipment shall be able to withstand all external and internal mechanical, thermal and electromechanical forces due to various factors like wind load, temperature variation, ice, snow & sea, (wherever applicable) short circuit etc for the equipment.

1.4 ENGINEERING DATA

The contactor shall necessarily submit all the drawings/ documents unless anything is waived. The contactor shall submit drawings/ design documents/ data/ test reports as may be required for the approval of the BHEL/MSETCL. All drawings submitted by the Manufacturer including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, the external connections, fixing arrangement required. the dimensions required for installation and interconnections with other equipment and materials, clearances and spaces required for installation and interconnections between various portions of equipment and any other information specifically requested in the specifications.

Each drawing submitted by the Manufacturer shall be clearly marked with the name of the BHEL/MSETCL, the unit designation, the specifications title, the specification number and the name of the Project. If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

Further work by the Manufacturer shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the BHEL/MSETCL, if so required.

The review of these data by the Owner will cover only general conformance of the data to the specifications and documents, interfaces with the equipment provided under the specifications, external connections and of the dimensions which might affect substation layout. Owner may not indicate a thorough review of all dimensions, quantities and details of the equipment, material, any devices or items indicated or the accuracy of the information submitted. This review and /or approval by the Owner shall not be considered by the Manufacturer, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at the Manufacturer's risk. The Manufacturer may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the BHEL/MSETCL. Approval of Manufacturer’s drawing or work by the BHEL/MSETCL shall not relieve the manufacturer of any of his responsibilities and liabilities under the Contract

All engineering data submitted by the Manufacturer after final process including review and approval by the Owner shall form part of the Contract Document and the entire works performed under these specifications shall be performed in strict conformity, unless otherwise expressly requested by the Owner in Writing.

The title block of drawings shall contain the following information incorporated in all contract drawings

Title block for _____ project:

Customer	**MAHARASTRA STATE ELECTRICITY TRANSMISSION Co. Ltd. (MSETCL)**
Project	**SHALLOW TYPE GROUND ELECTRODE STATION AT MALEGAON (PADGHE TERMINAL) ASSOCIATED WITH ±500KV 1500MW CHANDRAPUR-PADGHE HVDC BIPOLE LINK**
Contract No./LOA No.	
Contractor	**Bharat Heavy Electricals Limited**

1.5 Quality Inspection and testing

All equipment being supplied shall conform to type tests as per technical specification/ relevant IEC/IS and shall be subject to routine tests in accordance with requirements stipulated under respective sections.

The reports for all type tests as per technical specification shall be furnished by the Bidder along with equipment / material drawings. However, type test reports of similar equipment/ material already accepted by Employer shall be applicable for all projects with similar requirement. The type tests conducted earlier should have either been conducted in accredited laboratory (accredited based on ISO / IEC Guide 25 / 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) /representative of Utility /representative of accredited test lab/ representative of The National Accreditation Board for Certification Bodies (NABCB) certified agency shall also be acceptable. Unless otherwise specified elsewhere, the type test reports submitted shall be of the tests conducted within 10 years from the date of Award. In case the test reports are of the test conducted earlier than the years specified below from the date of Award, the Bidder shall repeat these test(s) at no extra cost to the Employer. Further, in the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes or due to noncompliance with the requirement stipulated in the Technical Specification or any/all type tests not carried out, same shall be carried out without any additional cost implication to the Employer.

The Bidder shall intimate the Employer the detailed program about the type tests atleast two (2) weeks in advance in case of domestic supplies & six (6) weeks in advance in case of foreign supplies.

The Employer reserves the right to witness any or all the type tests. The Employer shall bear all expenses for deputation of Employer's representative(s) for witnessing
the type tests except in the case of re-deputation if any, necessitated due to no fault of the Employer.

Routine tests shall however be done freshly on sample basis. The Type test and Routine test report clearance procedure shall be as per the Employer's prevailing Quality management practice. However, the Type and Routine test reports clearance shall be subject to Employer's approval.

1.6 MATERIAL/ WORKMANSHIP

General Requirement

Where the specification does not contain references to workmanship, equipment, materials and components of the covered equipment, it is essential that the same must be new, of highest grade of the best quality of their kind, conforming to best engineering practice and suitable for the purpose for which they are intended.

Incase where the equipment, materials or components are indicated in the specification as 'similar' to any special standard, the BHEL/MSETCL shall decide upon the question of

similarity. When required by the specification or when required by the BHEL/MSETCL the Bidder shall submit, for approval, all the information concerning the materials or components to be used in manufacture. Machinery, equipment, materials and components supplied, installed or used without such approval shall run the risk of subsequent rejection, it being understood that the cost as well as the time delay associated with the rejection shall be borne by the Bidder.

The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general, screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from the BHEL/MSETCL.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall also be interchangeable and shall be made of the same materials and workmanship as the corresponding parts of the equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be considered as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, levelling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances, instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacturer's limits suitable guards shall be provided for the protection of personnel on all exposed rotating and/ or moving machine parts and shall be designed for easy installation and removal for maintenance purposes. The spare equipment(s) shall be installed at designated locations and tested for healthiness.

The Bidder shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Bidder shall apply all operational lubricants to the equipment installed by him.

All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Bidder has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease is available. He shall help BHEL/MSETCL in establishing equivalent Indian make and Indian Bidder. The same shall be applicable to other consumables too.

A cast iron or welded steel base plate shall be provided for all rotating equipment which are to be installed on a concrete base unless otherwise agreed to by the BHEL/MSETCL. Each base plate shall support the unit and its drive assembly, shall be of design with pads for anchoring the units, shall have a raised up all around and shall have threaded in air connections, if so required.

Provisions for Exposure to Hot and Humid climate & costal area

Outdoor equipment supplied under the specification shall be suitable for service storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favorable to the growth of fungi and mildew. The indoor equipments located in non-air-conditioned areas shall also be of same type.

1.7 PACKING AND STORAGE

All the equipments shall be suitably protected (bubble-wrap for fragile items as needed), coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. On request of the BHEL/MSETCL, the manufacturer shall also submit packing details/ associated drawing for any equipment/ material at a later date, in case the need arises.

All coated surfaces shall be protected against abrasions, impact, discolouration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device.

Supplier shall ensure that equipment shall be properly packed, blocked, padded, coated and protected so that it is not damaged due to possible mishandling. Storage requirements shall be clearly defined by the supplier. Packing shall be such that if required, long time storage at site should not deteriorate the performance of the equipment.