

1 X 500 MW FEROZE GANDHI UNCHAHAR THERMAL POWER PROJECT STAGE-IV

VOLUME -IIB

**TECHNICAL SPECIFICATION
FOR
MISCELLANEOUS PUMPS
(HORIZONTAL)**

Specification No. : PE-TS-401-100-N001 (REV. 0)



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI BUILDING, SECTOR 16 A
NOIDA - 201301**



PREAMBLE

SPECIFICATION NO.: PE-TS-401-100-N001

1X500 MW FG UNCHAHAR TPP STG-IV

REV. NO. 0

DATE: 09.10.14

1.0 The tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.

1.1 Volume I - CONDITIONS OF CONTRACT

This consists of four parts as below:

Volume - I A : This part contains instructions to bidders for making bids to BHEL.

Volume - I B : This part contains general commercial conditions of the tender and include provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

Volume - I C : This part contains special conditions of contract.

Volume - I D : This part contains commercial conditions for erection and commissioning site work, as applicable.

1.2 Volume II - TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume II which comprises of:

Volume - II A : General Technical Conditions

Volume - II B : Technical specification including drawings, if any

1.2.1 Volume - II B :

This volume is sub-divided into following sections:

Section - A : This section outlines the scope of enquiry.

Section - B : This section provides "Project Information"

Section - C : This section indicates technical requirements specific to the contract, not covered in Section-D.

Section - D : This section comprises of technical specifications of equipments complete with data sheet A, B & C.

Data sheet - A specifies data and other requirements pertaining to the equipment.

Data sheet - B specifies data to be filled by the bidder (Data Sheet B is contained in Volume - III)

Data sheet - C indicates data documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).

1.2.2 Volume - III TECHNICAL SCHEDULES

This volume contains technical schedules and Data Sheets - B, which are to be duly filled by the bidder and the same shall be furnished with the technical bid as per checklist, sec B7 in vol III.

2.0 The requirements mentioned in Section C/Data Sheets-A of Section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section -D.



TECHNICAL SPECIFICATIONS
MISCELLANEOUS PUMPS

SPECIFICATION
NO.:

PE-TS-401-100-N001

1X500 MW FG UNCHAHAR TPP STG-IV

REV. NO. 0

DATE: 09.10.14

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- DATA SHEETS-A FOR ABOVE PROJECT ALONGWITH LIST OF MANDATORY SPARES & WATER ANALYSIS.
- DATA SHEET - C
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- DATA SHEET-A
- STANDARD QUALITY PLAN FOR MOTORS



TECHNICAL SPECIFICATIONS
MISCELLANEOUS PUMPS

SPECIFICATION
NO.:

PE-TS-401-100-N001

VOLUME:

IIB

SECTION:

A

1X500 MW FG UNCHAHAR TPP STG-IV

REV. NO.


0

DATE:

09.10.14

SECTION A

SCOPE OF INQUIRY

	TECHNICAL SPECIFICATIONS MISCELLANEOUS PUMPS	SPECIFICATION NO.:	PE-TS-401-100-N001		
	1X500 MW FG UNCHAHAR TPP STG-IV	VOLUME:	IIB	SECTION:	A
	SCOPE OF ENQUIRY	REV. NO.	0	DATE:	09.10.14

1.0 SCOPE

- 1.1 This enquiry covers the design, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-contractors works, proper packing for delivery and installation checks and replacement of gland packing with Mechanical Seal arrangement (if applicable) at site, PG Testing of Pump (as specified in Sec-C) at site for Miscellaneous Pumps along with mandatory spares complete with all accessories as per the requirements specified in this specification for following project.

1 X 500 MW FEROCZE GANDHI UNCHAHAR THERMAL POWER PROJECT STAGE-IV

The bidder's scope shall also include any other services, etc. if called for in the succeeding sections of the specification.

- 1.2 The miscellaneous pumps covered under this specification shall be Horizontal pumps.

NOTE:-

- a) **The bidder shall include complete supplies for the Project/Group as above in his scope. Part supplies offered for the Project/Group shall disqualify the bidder's offer for that Project/Group.**

- 1.3 The pumps erected by the purchaser shall be checked by the bidder for correctness of their installation, alignment, etc. at site prior to their commissioning. Replacement of gland packing with Mechanical Seal (If applicable) as per Cl. No. 2.1 of Section C1 & Cl. No. 9.08.04 of section D of this volume. PG Testing of Pumps at site as specified as per Cl. No. 2.2 of Section-C of this Volume. The charges for these shall be included by bidder in his base price, itself.

- 1.4 The miscellaneous pumps and drives covered under this specification for various projects are as per Annexure-I. HT drives, wherever applicable and irrespective of motor ratings, shall be issued free of cost by BHEL. The details of pumps with HT drives shall be as per Annexure II.

The Capacity, Head, Materials of construction, Mandatory spares and other particulars of these pumps, are detailed in Data Sheet-A annexed with Section-D of the specification.

- 1.5 For detailed scope of supply & services refer clause 3.00.00 of Standard technical Specification for Horizontal Centrifugal pumps specified under Section-D of this volume.
- 1.6 Electrical scope between BHEL and Vendor for Miscellaneous pumps and drives of this specification shall be as per annexure I of section C-2 of this volume.

2.0 GENERAL TECHNICAL INSTRUCTIONS:

- 2.1 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship, and shall be capable of performing the required duties in a manner acceptable to Engineer/Owner who will interpret the meaning of drawings and specifications and shall be entitled to reject any component or material, which in his judgement is not in full accordance herewith.
- 2.2 The omission of specific reference to any component/accessory necessary for the proper performance of Miscellaneous Pumps and drives shall not relieve the bidder of the responsibility of providing such facilities to complete the supply of equipment at quoted prices.
- 2.3 BHEL's / Customer's representative shall be given full access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.
- 2.4 The equipments covered under this specification shall not be despatched unless the same have been finally inspected, accepted and shipping release issued by BHEL/Customer.
- 2.5 ***In case of any deviation from this technical specification (Vol.IIB) and General Technical Conditions (Vol.II A), the same shall be indicated in the schedule of deviations enclosed in Vol.III. In the absence of duly filled schedules it will be assumed that the bid strictly conforms to the specification.***
- 2.6 Unpriced copy of the price bid shall be furnished alongwith the technical bid.



TECHNICAL SPECIFICATIONS
MISCELLANEOUS PUMPS

SPECIFICATION NO.: PE-TS-401-100-N001

1X500 MW FG UNCHAHAR TPP STG-IV

VOLUME:

IIB

SECTION: A

SCOPE OF ENQUIRY

REV. NO.

0


DATE: 09.10.14

Annexure I

List of Miscellaneous Pumps and drives for :

1 X 500 MW FEROCZE GANDHI UNCHAHAR THERMAL POWER PROJECT STAGE-IV

Sl. No.	Pump Description	Total Qty.	Type of Pumps
1	ACW PUMPS	3 nos.	Horizontal
2	ECW (TG AUX.) PUMPS	3 nos.	Horizontal
3	ECW (SG AUX.) PUMPS	2 nos.	Horizontal
4	DM MAKE-UP PUMPS	2 nos.	Horizontal
5	BOILER FILL PUMPS	2 nos.	Horizontal
6	CONDENSATE TRANSFER PUMPS	1 nos.	Horizontal

	TECHNICAL SPECIFICATIONS MISCELLANEOUS PUMPS	SPECIFICATION NO.:	PE-TS-401-100-N001		
	1X500 MW FG UNCHA HAR TPP STG-IV	VOLUME:	IIB	SECTION:	A
	SCOPE OF ENQUIRY	REV. NO.	0	DATE:	09.10.14

Annexure II

Following HT drives, irrespective of Motor ratings shall be issue free, by BHEL:

1 X 500 MW FEROUZE GANDHI UNCHA HAR THERMAL POWER PROJECT STAGE-IV

- 1 ACW PUMPS
- 2 ECW (TG AUX.) PUMPS
- 3 ECW (SG AUX.) PUMPS



TECHNICAL SPECIFICATIONS
MISCELLANEOUS PUMPS

SPECIFICATION
NO.:

PE-TS-401-100-N001

VOLUME:

IIB

SECTION:

B

1X500 MW FG UNCHAHAR TPP STG-IV

REV. NO.


0

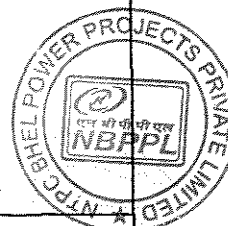
DATE:


09.10.14

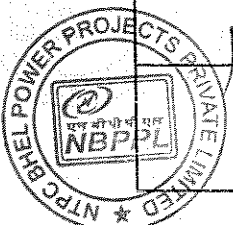
SECTION B

PROJECT INFORMATION


CLAUSE NO.	PROJECT INFORMATION 11748		
1.00.00	<p>BACKGROUND</p> <p>Feroze Gandhi Unchahar Thermal Power Station, FGUTPS was conceived as a Load Centre coal based Power Station of 1050 MW capacity by UPSEB. The land for the project was acquired and stage-I (2x210MW) was implemented by UPSEB. The 2x210 MW Unchahar station was taken over by NTPC from Uttar Pradesh Rajya Vidyut Utpadan Nigam of Uttar Pradesh in 1992. Thereafter, NTPC implemented Stage- II (2x210 MW) and Stage-III (1X 210 MW).</p> <p>The present expansion proposal is to install one additional unit of 500 MW under Stage-IV thus making the ultimate capacity of the FGUTPP 1550 MW.</p>		
1.01.00	<p>LOCATION AND APPROACH</p> <p>The plant is located in Raebareli district of Uttar Pradesh, having latitude and longitude of 25°54'50"N and 81°19'50"E respectively. It is bounded by villages Khnapur, Faridpur and Khaliqpur Khurd. Mustafabad town is located at a distance of about 3 Kms from the plant. Unchahar railway station on Allahabad-Raebareli broad gauge (BG) section of Northern Railway (NR) is 2 Kms away. The nearest airport is located at Lucknow a distance of approximately 110 km from the project site.</p> <p>Vicinity Plan of the project is placed at Annexure-I</p>		
1.02.00	<p>LAND REQUIREMENT</p> <p>During the implementation of FGUTPS, Stage-I, II & III total area of about 2203 acres of land was acquired. The plant facilities, ash disposal and township for this expansion Stage-IV (1x500 MW) would be accommodated within the available land with dismantling and relocation of some buildings. No additional land has been envisaged to be acquired for this expansion project.</p>		
1.03.00	<p>WATER</p> <p>As per agreement between NTPC & Irrigation department, 105 Cusec of water is supplied through S.S Canal to NTPC-Unchahar. The Stage-IV (500MW) consumptive water requirement shall be accommodated within the existing commitment of water to FGUTPP. Sharda sahayak canal and Dalmau Pump House (DPH) on Purwa Branch Canal are available sources of water for the project and therefore, the make up water requirement for the plant is proposed to be drawn from these sources.</p>		
1.04.00	<p>COAL AVAILABILITY AND TRANSPORTATION</p>		
1.04.01	<p>Coal Availability</p>		
<p>FGUTPP STAGE-IV (1X500 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION - VI PART-A</p>	<p>SUB-SECTION-II PROJECT INFORMATION</p>	<p>PAGE 1 OF 12</p>

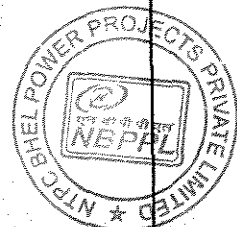


CLAUSE NO.	PROJECT INFORMATION 11749														
	<p>The coal requirement shall be about 2.7 Million tonnes per year.</p> <p>The matter has been taken up with Ministry of Coal, Govt. of India for Long Term Coal Linkage for Stage-IV (1x500 MW)..Coal requirement for FGUTPP, Stage-I ,II & III is being met from North Karanpura Coal fields of CCL. For FR purposes, coal from North Karanpura Coal fields of CCL has been considered.</p>														
1.04.02	<p>Coal Transportation</p> <p>The envisaged mode of coal transportation from the coal mines to the power plant is by Indian Railways rakes. The rakes shall be unloaded at the track hopper.</p>														
1.04.03	<p>Coal Quality Parameters and Fuel Oil Characteristics</p> <p>The Coal quality parameters and Fuel Oil Characteristics are enclosed as Annexures-II-1 and II-2 to this subsection.</p>														
1.05.00	<p>CAPACITY & POWER EVACUATION</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 15%;">Stage-I</td> <td style="width: 35%;">: 2x210 MW</td> <td style="width: 50%;">Under Commercial Operation</td> </tr> <tr> <td>Stage-II</td> <td>: 2x210 MW</td> <td>Under Commercial Operation</td> </tr> <tr> <td>Stage-III</td> <td>: 1x210 MW</td> <td>Under Commercial Operation</td> </tr> <tr> <td>Stage-IV</td> <td>1x 500 MW</td> <td>Present proposal</td> </tr> </table> <p>The existing capacity of plant is 1050 MW Step up/ power evacuation voltage for station is 220 KV. Presently 1000 MW is already being evacuated at 220 KV, addition of another 500 MW at 220 KV may cause overloading of 220 KV systems and lead to increase in fault levels at 220 KV system. Considering this 400 KV has been considered as step-up/power evacuation voltage for Stage-IV. Power Generated from FGUTPP- Stage IV, 500 MW unit would be stepped up to the evacuation voltage level through suitably rated Generator Transformer.</p> <p>The power generated from Stage-IV is envisaged to be absorbed by Northern Region beneficiaries. For finalisation of Associated Transmission System (ATS) of the project, the matter would be taken up with Power Grid Corporation of India Ltd. (PGCIL)/CEA/appropriate authority depending on the various routes/options of power sale envisaged for the project.</p>			Stage-I	: 2x210 MW	Under Commercial Operation	Stage-II	: 2x210 MW	Under Commercial Operation	Stage-III	: 1x210 MW	Under Commercial Operation	Stage-IV	1x 500 MW	Present proposal
Stage-I	: 2x210 MW	Under Commercial Operation													
Stage-II	: 2x210 MW	Under Commercial Operation													
Stage-III	: 1x210 MW	Under Commercial Operation													
Stage-IV	1x 500 MW	Present proposal													
1.06.00	<p>METEOROLOGICAL DATA</p> <p>Important meteorological data from nearest observatory at Allahabad is placed at Annexure - III.</p>														
1.07.00	<p>PLANT WATER SCHEME</p>														
	<p>FGUTPP STAGE-IV (1X500 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION - VI PART-A</p>	<p>SUB-SECTION-II PROJECT INFORMATION PAGE 2 OF 12</p>												



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CLAUSE NO.	PROJECT INFORMATION 11750			
	The Plant water scheme is described below.			
1.07.01	Source of Water			
	The source of water for the project is normally from the Allahabad branch canal of the Sharda Sahayak link canal. During the canal closure period, water will be drawn from the Dalmau canal.			
1.07.02	Water Requirement			
	Normal Make up water requirement for this project would be about 2000 Cu.M/hr with ash water re-circulation system in operation. However, whenever ash water system needs to be operated in once thru mode, water drawl shall be of the order of 3300 cum/hr.			
1.07.03	Raw Water System			
	Raw water shall be drawn from the source by a gravity channel upto raw water pump house located inside the plant. It is envisaged to provide three (3) numbers (3 x 50 % Capacity) of raw water pumps for supplying water to Water PT Plant in the raw water pump house. In addition two (2) numbers (2 x 100% capacity) of pumps shall be provided to supply raw water for ash handling plant which shall be operated as and when required. Separate set of pipelines of carbon steel construction shall be provided from respective raw water pumps to Water treatment plant and Ash Water tanks.			
1.07.04	The quality of Raw water and Clarified water is enclosed with this sub-section			
1.08.00	Criteria for Wind Resistant Design of Structures and Equipment			
	All structures and equipment of the power plant, including plant auxiliary structures and equipment, shall be designed for wind forces as given in Sub-Section- D-01, Part-B, Section-VI, i.e. Technical Specification for Civil and Structural Works.			
1.09.00	Criteria for Earthquake Resistant Design of Structures and Equipment			
	All power plant structures and equipment, including plant auxiliary structures and equipment shall be designed for seismic forces as given in Sub-Section- D-01, Part-B, Section-VI, i.e. Technical Specification for Civil and Structural Works.			
FGUTPP STAGE-IV (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-A	SUB-SECTION-II PROJECT INFORMATION	PAGE 3 OF 12	



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CLAUSE NO.

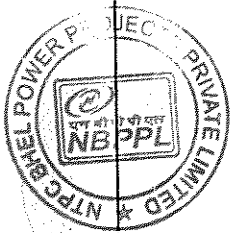
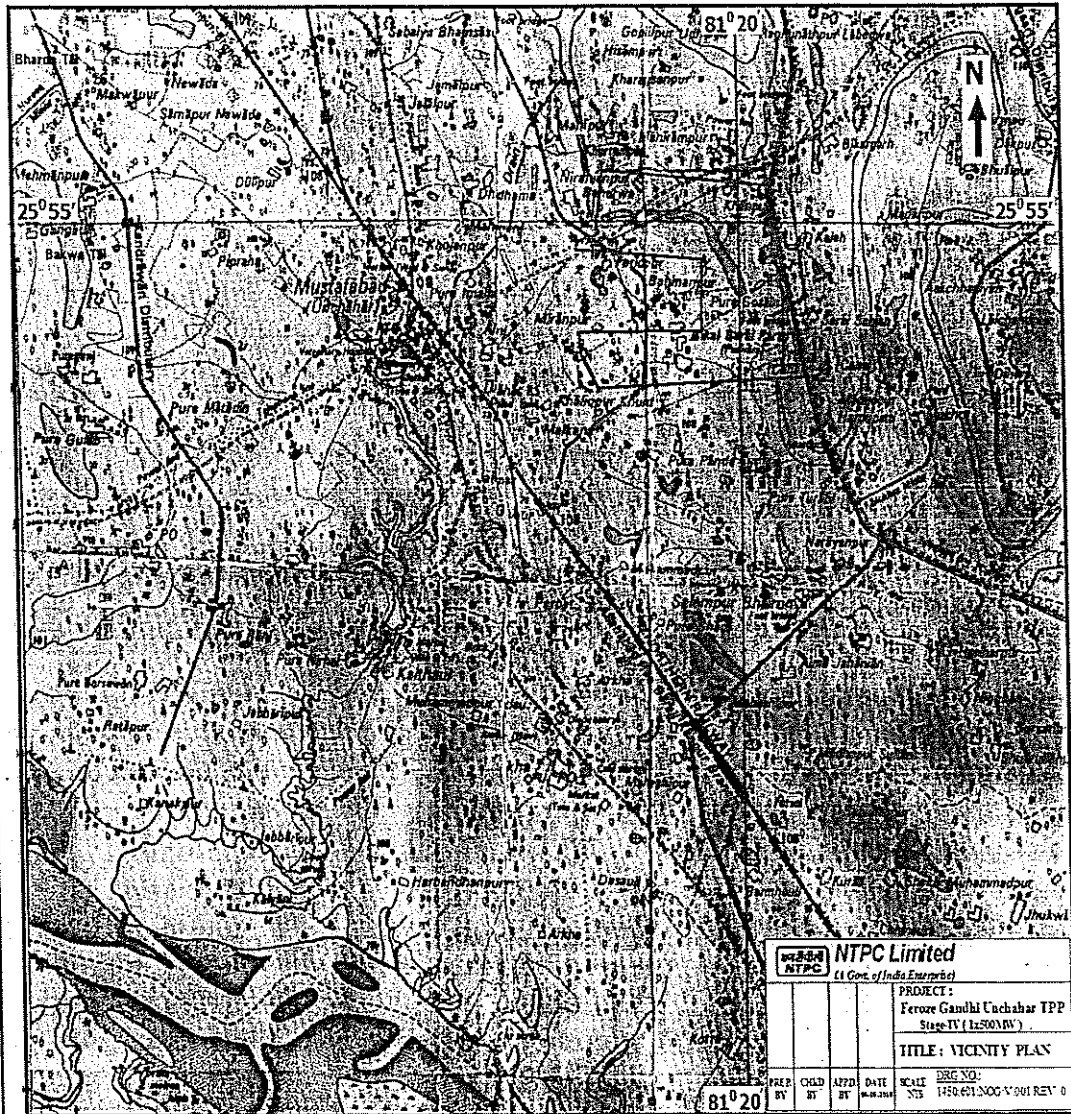
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PROJECT INFORMATION



VICINITY PLAN

ANNEXURE-I



FGUTPP STAGE-IV (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-A	SUB-SECTION-II PROJECT INFORMATION	PAGE 6 OF 12
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CLAUSE NO.

11758 PROJECT INFORMATION



CLIMATOLOGICAL TABLE

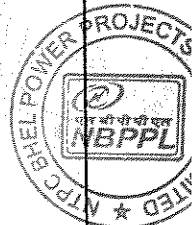
ANNEXURE-III
(PAGE 1 OF 2)

जलवायवी सारणी
CLIMATOLOGICAL TABLE

1951 से 1980 तक के अवधि पर अवलोकन
BASED ON OBSERVATIONS FROM 1951 TO 1980

स्थान: अहमदाबाद
LAT 20°27' N LONG 71°44' E
उचाई: 66 मीटर
HEIGHT ABOVE M.S.L. 66 METERS

STATION LEVEL PRESSURE	MEAN				EXTREMES		HUMIDITY		CLOUD AMOUNT		NO. OF MONTHLY RAINY DAYS		TOTAL IN DRIEST MONTH WITH YEAR		TOTAL IN HEAVIEST MONTH WITH YEAR		MEAN WIND SPEED			
	DRY BULB °C	WET BULB °C	DAILY MAX °C	DAILY MIN °C	HIGHEST MONTH °C	LOWEST MONTH °C	RELATIVE HUMIDITY %	VAPOUR PRESSURE mm	ALL CLOUDS	LOW CLOUDS	MONTHLY TOTAL	LOWEST	HIGHEST	mm	mm	DAYS		mm		
1000.2	32.5	10.6	23.0	6.7	27.9	4.5	31.1	28	2.9	07	26	2.9	07	19.2	1.8	126.0	0.0	70.9	24	
1003.1	20.6	16.0	27.2	11.2	32.4	6.1	30.1	27	1.1	02	1968	2.9	05	15.6	1.4	103.9	0.0	51.3	11	
1000.0	16.0	12.5	27.2	11.2	32.4	6.1	30.1	27	1.1	02	1968	2.9	05	15.6	1.4	103.9	0.0	51.3	11	
1000.0	24.0	16.5	27.2	11.2	32.4	6.1	30.1	27	1.1	02	1968	2.9	05	15.6	1.4	103.9	0.0	51.3	11	
1000.0	33.0	18.0	30.6	10.5	39.0	10.9	42.5	30	7.2	02	1973	2.9	05	9.2	0.9	81.6	0.0	35.5	11	
1000.0	31.4	18.5	30.6	10.5	39.0	10.9	42.5	30	7.2	02	1973	2.9	05	9.2	0.9	81.6	0.0	35.5	11	
1000.0	30.2	19.1	39.4	22.5	43.5	17.3	48.1	29	12.7	01	1979	2.9	05	5.7	0.6	43.7	0.0	20.0	01	
1000.0	30.2	19.1	39.4	22.5	43.5	17.3	48.1	29	12.7	01	1979	2.9	05	5.7	0.6	43.7	0.0	20.0	01	
1000.0	33.5	22.2	42.3	26.7	49.9	22.5	47.3	30	17.2	11	1980	2.9	05	9.9	0.7	62.3	0.0	54.0	19	
1000.0	40.1	22.0	40.1	26.7	49.9	22.5	47.3	30	17.2	11	1980	2.9	05	9.9	0.7	62.3	0.0	54.0	19	
1000.0	32.8	25.3	40.1	26.5	45.2	24.0	40.8	09	19.4	21	1979	2.9	05	05.4	4.4	52.5	0.0	178.0	23	
1000.0	37.3	25.5	40.1	26.5	45.2	24.0	40.8	09	19.4	21	1979	2.9	05	05.4	4.4	52.5	0.0	178.0	23	
1000.0	39.4	28.4	41.1	28.4	50.3	23.5	45.6	01	22.0	22	1901	2.9	05	300.1	12.0	702.1	20.2	229.4	15	
1000.0	31.5	27.0	32.7	25.7	30.5	23.6	42.7	03	21.1	20	1972	2.9	05	12.6	1.2	126.5	19.18	166.3	15	
1000.0	28.3	26.9	33.2	24.7	30.2	22.3	39.6	11	10.3	22	1920	2.9	05	307.6	14.4	914.7	53.3	335.3	20	
1000.0	30.4	26.1	33.2	24.7	30.2	22.3	39.6	11	10.3	22	1920	2.9	05	307.6	14.4	914.7	53.3	335.3	20	
1000.0	25.9	21.3	33.1	20.5	35.0	15.9	40.6	03	11.7	19	1989	2.9	05	189.0	8.7	781.5	0.5	206.2	04	
1000.0	22.9	22.9	33.1	20.5	35.0	15.9	40.6	03	11.7	19	1989	2.9	05	189.0	8.7	781.5	0.5	206.2	04	
1000.0	19.0	15.0	28.7	13.8	32.7	9.6	35.9	07	5.9	30	1905	2.9	05	40.1	2.2	576.8	0.0	160.3	04	
1000.0	18.4	15.4	28.7	13.8	32.7	9.6	35.9	07	5.9	30	1905	2.9	05	40.1	2.2	576.8	0.0	160.3	04	
1000.0	14.0	11.7	24.0	9.3	28.4	6.3	31.1	02	-0.7	26	1949	2.9	05	11.7	0.5	185.6	0.0	96.0	01	
1000.0	20.7	15.6	24.0	9.3	28.4	6.3	31.1	02	-0.7	26	1949	2.9	05	11.7	0.5	185.6	0.0	96.0	01	
997.5	24.5	19.4	32.0	19.5	48.1	9.0	40.8	-0.7				2.9	1.3	1017.7	40.9	1635.5	410.5	335.3	6.1	
994.0	20.9	21.3	30	30	30	30	100	100				3.1	1.4	1894	1908					
30	30	30	30	30	30	30	100	100				30	21	29	28	99	99	99	99	24





TECHNICAL SPECIFICATIONS
MISCELLANEOUS PUMPS

SPECIFICATION
NO.:

PE-TS-401-100-N001

VOLUME:

IIB

SECTION:

C

1X500 MW FG UNCHAHAR TPP STG-IV

REV. NO.

0

DATE:

09.10.14

SECTION C

SPECIFIC TECHNICAL REQUIREMENTS

C1: SPECIFIC TECHNICAL REQUIREMENTS FOR PUMPS

C2: SPECIFIC TECHNICAL REQUIREMENTS FOR MOTORS




TECHNICAL SPECIFICATIONS
MISCELLANEOUS PUMPS
1X500 MW FG UNCHAHAR TPP STG-IV

SPECIFICATION
NO.:
VOLUME:
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IIB
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C1
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SECTION C1

SPECIFIC TECHNICAL REQUIREMENTS FOR PUMPS

	TECHNICAL SPECIFICATIONS MISCELLANEOUS PUMPS	SPECIFICATION NO.: PE-TS-401-100-N001		
		VOLUME: IIB	SECTION: C1	
	1X500 MW FG UNCHAHAR TPP STG-IV	REV. NO. 0	DATE: 09.10.14	

1.0 SPECIFIC TECHNICAL REQUIREMENTS:

DELIVERY:

Delivery of miscellaneous pumps shall be as per NIT requirement.

2.0 Horizontal Pumps:

2.1 Horizontal Pumps with Mechanical seal shall be supplied with gland packing arrangement to site and gland packing arrangement shall be replaced by vendor with mechanical seal arrangement at site after commissioning of the pumps with gland packing. However Mechanical seal shall be despatched alongwith main supply for this purpose. Shaft sleeve and any other item required for satisfactory operation of Mechanical seal after replacement at site shall be provided by the pump supplier without any cost implication to BHEL.

2.2 Successful bidder(vendor) to demonstrate Vibration, Parallel operation and Noise level to be demonstrated at site (at rated duty points) for each Horizontal Pump. Vendor to bring necessary instrumentation for the same at site.

3.0 Important Note:-


3.1 MDCC after final inspection shall be provided to vendor on the basis of following:-

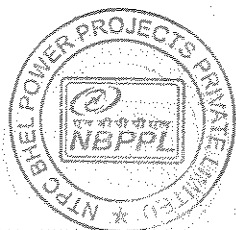
3.1.1 List of items packed in each box with description & quantity.

3.1.2 Photograph of each box in open & closed condition.


3.2 Bidder to include handling instructions in engineering drg/doc and packing to be done in such a way to avoid damage of items in transit and long storage at site and same shall be approved in contract stage by BHEL/Customer.

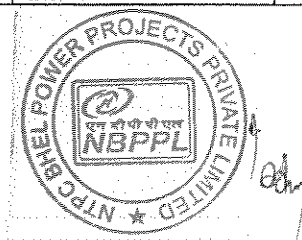
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	<div style="text-align: right; margin-bottom: 10px;">  </div> <p style="text-align: center;">Annexure-I to ECW system Specification</p> <p style="text-align: center;">GENERAL SPECIFICATION FOR HORIZONTAL PUMPS</p> <p>(1) SCOPE</p> <p>This specification covers the design, material, construction features, manufacture, inspection, testing the performance at the Vendor's/Sub-Vendor's Works and delivery to site of Horizontal Centrifugal Pumps.</p> <p>(2) CODES AND STANDARDS</p> <p>The design, material, construction, manufacture inspection and performance testing of Horizontal Centrifugal Pumps shall comply with all currently applicable statutes, regulations and safety codes in the locality where the Equipment will be installed. Nothing in these specifications shall be construed to relieve the Vendor of this responsibility. The Equipment supplied shall comply with the latest applicable Indian Standards listed below. Other National Standards are acceptable, if they are established to be equal or superior to the Indian Standards.</p> <p>(3) LIST OF APPLICABLE STANDARDS</p> <p>IS : 1520 : Horizontal Centrifugal Pumps for clear cold fresh water</p> <p>IS : 5120 : Technical requirements of rotodynamic special purpose pumps</p> <p>API : 610 : Centrifugal pumps for general refinery service.</p> <p>IS : 5639 : Pumps Handling Chemicals & corrosion liquids</p> <p>IS : 5659 : Pumps for process water</p> <p>HIS : Hydraulic Institute Standards, USA</p> <p>ASTM-1-165-65: Standards Methods for Liquid Penetration Inspection.</p> <p>In case of any contradiction with aforesaid standards and the stipulations as per the technical specifications as specified hereinafter the stipulations of the technical specifications shall prevail.</p> <p>(4) DESIGN REQUIREMENTS</p> <p>(a) The Pump shall be capable of developing the required total head at rated capacity for continuous operation. Also the pumps shall be capable of being operated to give satisfactory performance at any point on the HQ characteristics curve. The operating range of the pump shall be 40% to 120% of the duty point unless otherwise mentioned elsewhere. The maximum efficiency of pump shall preferably be within $\pm 10\%$ of the rated design flow as indicated in data sheets.</p>		
<p>SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION - VI PART-B</p>	<p>SUB-SECTION-A-12 ECWS</p>	<p>PAGE 12 OF 33</p>




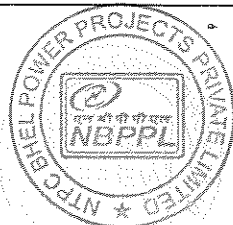
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CLAUSE NO.	<p style="text-align: center;">TECHNICAL REQUIREMENTS</p> <div style="text-align: right; border: 1px solid black; padding: 2px;">  </div>									
	<p>(b) The total head capacity curve shall be continuously rising from the operating point towards shut – off without any zone of instability with the highest head at shut-off condition. Shut-off head shall be more than the rated design head and the percentage variation may vary depending on the specific speed of the pumps (i.e) 10-15% for pumps of specific speed upto 1000 US units, about 15 to 20% for specific speed in the range of 1000 to 2000 US units, about 20% to 40% for specific speed of 2000 to 4000 US units and above 50% for specific speed of 4000 to 7000 US Units</p> <p>(c) Pumps of a particular category shall be identical and shall be suitable for parallel operation with equal load division. The head Vs capacity and BHP Vs capacity characteristics should match to ensure even load sharing and trouble free operation throughout the range. Components of identical pumps shall be interchangeable.</p> <p>(d) Pumps shall run smoothly without undue noise and vibration. Peak to peak vibration limits shall be restricted to the following values during operation:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Speed</th> <th style="text-align: center;">Antifriction Bearing</th> <th style="text-align: center;">Sleeve Bearing</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1500 rpm and below</td> <td style="text-align: center;">75.0 micron</td> <td style="text-align: center;">75.0 micron</td> </tr> <tr> <td style="text-align: center;">3000 rpm</td> <td style="text-align: center;">50.0 micron</td> <td style="text-align: center;">65.0 micron</td> </tr> </tbody> </table> <p>The noise level shall not exceed 85 dBA overall sound pressure level reference 0.0002 microbar (the standard pressure reference for air sound measurement) at a distance of 1 M from the equipment surface.</p> <p>(e) The pumps shall be capable of starting with discharge valve fully open and close condition. Motors shall be selected to suit to the above requirements.</p> <p>(f) Pumps shall be so designed that pump impellers and other accessories of the pumps are not damaged due to flow reversal.</p> <p>(g) The Contractor under this specification shall assume full responsibility in the operation of pump and motor as a unit.</p> <p>(5) DESIGN CONSTRUCTION</p> <p>(a) Design and construction of various components of the pumps shall conform to the following general specifications. For material of construction of the components, data sheets shall be referred to.</p> <p>(b) Pump Casing</p> <p>Pump casing shall have axially or radially split type construction as specified. The casing shall be designed to withstand the maximum shut-off pressure developed by the pump at the pumping temperature.</p> <p>Pump casing shall be provided with a vent connection and piping with fittings & valves. Casing drain as required shall be provided complete with drain valves, piping and plugs. It shall be provided with a connection for suction and</p>	Speed	Antifriction Bearing	Sleeve Bearing	1500 rpm and below	75.0 micron	75.0 micron	3000 rpm	50.0 micron	65.0 micron
Speed	Antifriction Bearing	Sleeve Bearing								
1500 rpm and below	75.0 micron	75.0 micron								
3000 rpm	50.0 micron	65.0 micron								
<p>SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION - VI PART-B</p>	<p>SUB-SECTION-A-12 ECWS</p>	<p>PAGE 13 OF 33</p>							




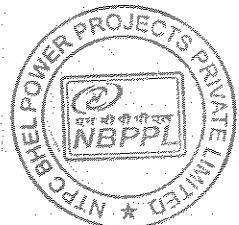
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CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p>discharge pressure gauge as standard feature. It shall be structurally sound to provide housing for the pump assembly and shall be designed hydraulically to minimum radial load at part load operation.</p> <p>(c) Impeller</p> <p>Impeller shall be closed, semi-closed or open type as specified elsewhere and designed in conformance with the detailed analysis of the liquid being handled.</p> <p>The impeller shall be secured to the shaft, and shall be retained against circumferential movement by keying, pinning or lock rings. On pumps with overhung shaft, impellers shall be secured to the shaft by a lockout or cap screw which tightness in the direction of normal rotation.</p> <p>(d) Impeller/Casing Wearing Rings</p> <p>Replaceable type wearing rings shall be provided at suitable locations of pumps as per manufacturer's standard practice. Suitable method of locking the wearing ring shall be used.</p> <p>(e) Shaft</p> <p>The critical speed shall be well away from the operating speed and in no case less than 130% of the rated speed.</p> <p>The shaft shall be ground and polished to final dimensions and shall be adequately sized to withstand all stresses from rotor weight, hydraulic loads, vibration and torques coming in during operation.</p> <p>(f) Shaft Sleeves</p> <p>Renewable type fine finished shaft sleeves shall be provided at the stuffing boxes/mechanical seals. Length of the shaft sleeves must extend beyond the outer faces of gland packing of seal end plates so as to distinguish between the leakage between shaft and shaft sleeve and that past the seals/gland.</p> <p>Shaft sleeves shall be fastened to the shaft to prevent any leakage or loosening. Shaft and shaft sleeve assembly should ensure concentric rotation.</p> <p>(g) Bearings</p> <p>Heavy duty bearings, adequately designed for the type of service specified in the enclosed pump data sheet and for long, trouble free operation shall be furnished.</p> <p>The bearings offered shall be capable of taking both the radial and axial thrust coming into play during operation. In case, sleeve bearings are offered additional thrust bearings shall be provided. Antifriction bearings of standard type, if provided, shall be selected for a minimum life 20,000 hrs. of continuous operation at maximum axial and radial loads and rated speed.</p>		
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-A-12 ECWS	PAGE 14 OF 33



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CLAUSE NO.	TECHNICAL REQUIREMENTS 		
	<p>Proper lubricating arrangement for the bearings shall be provided. The design shall be such that the bearing lubricating element does not contaminate the liquid pumped. Where there is a possibility of liquid entering the bearings suitable arrangement in the form of deflectors or any other suitable arrangement must be provided ahead of bearings assembly.</p> <p>Bearings shall be easily accessible without disturbing the pump assembly. A drain plug shall be provided at the bottom of each bearings housing.</p> <p>(h) Stuffing Boxes</p> <p>Stuffing boxes of packed ring construction type shall be provided wherever specified. Packed ring stuffing boxes shall be properly lubricated and sealed as per service requirements and manufacturer's standards. If external gland sealing is required, it shall be done from the pump discharge. The Bidder shall provide the necessary piping valves, fittings etc. for the gland sealing connection.</p> <p>(i) Mechanical Seals</p> <p>Wherever specified in pump data sheet, mechanical seals shall be provided. Unless otherwise recommended by the tenderer, mechanical seals shall be of single type with either sliding gasket or bellows between the axially moving face and shaft sleeves or any other suitable type. The sealing faces should be highly lapped surfaces of materials known for their low frictional coefficient and resistance to corrosion against the liquid being pumped.</p> <p>(j) The pump supplier shall coordinate with the seal maker in establishing the seal chamber of circulation rate for maintaining a stable film at the seal face. The seal piping system shall form an integral part of the pump assembly. For the seals under vacuum service, the seal design must ensure sealing against atmospheric pressure even when the pumps are not operating. Necessary provision for seal water supply along with complete piping fittings and valves as required shall form integral part of pump supply.</p> <p>(k) Pump Shaft Motor Shaft Coupling</p> <p>The pump and motor shafts shall be connected with an adequately sized flexible coupling of proven design with a spacer to facilitate dismantling of the pump without disturbing the motor. Necessary coupling guards shall also be provided.</p> <p>(l) Base Plate</p> <p>A common base plate mounting both for the pump and motor shall be furnished. The base plate shall be fabricated steel and of rigid construction, suitably ribbed and reinforced. Base plate and pump supports shall be so constructed and the piping unit so mounted as to minimise misalignment caused by mechanical forces such as normal piping strain, internal differential thermal expansion and hydraulic piping thrust. Suitable drain troughs and drip lip shall be provided.</p>		
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-A-12 ECWS	PAGE 15 OF 33

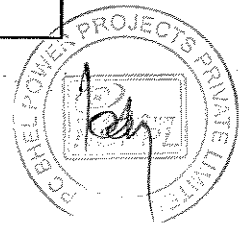


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EQUIPMENT COOLING WATER SYSTEM													
	TEST / CHECKS	Material Test	WPS/PQR/Weider Qualification	DPT/MPI	Assembly Fit Up	Visual & Dimensional Check	UT	RT	Hydraulic / Water Fill	Balancing	Type Test	Performance Test	Other Test
	ITEM / COMPONENTS												
A	PLATE TYPE HEAT EXCHANGER		Y	Y ³	Y	Y			Y				
A.1	Heat Transfer Plates	Y ¹		Y ²		Y	Y ^{5a}						Y ⁷
A.2	Gaskets	Y				Y							
A.3	Cover Plates (Front & Rear)	Y ¹				Y	Y ^{5a}						
A.4	Tie Rods	Y¹		Y⁴			Y^{5b}						
B	HORIZONTAL CENTRIFUGAL PUMP				Y	Y							Y ¹⁰
B.1	Casing	Y ¹		Y ⁴		Y			Y				
B.2	Impeller	Y ¹		Y ⁴		Y				Y ⁹			
B.3	Shaft	Y ¹		Y		Y	Y ^{5b}			Y ⁹			
B.4	Fabricated Components	Y ¹	Y	Y ³	Y	Y	Y ^{5a}	Y ⁶	Y ⁸				

NOTES

- 1 One per heat / HT batch
- ~~2 DP Test shall be conducted for 10% of the lot of HT plates. However, in case of any defect, entire lot shall be tested and only defect free plates shall be accepted.~~
- 3 100% DP Test shall be conducted on butt welds and 10% DPT on fillet weld after final run.
- 4 100% DPT shall be carried out on machined surfaces.
- 5a UT shall be done on plates with thickness 25 mm or above.
- 5b UT shall be done on shaft / tie rod with diameter 50 mm or above.
- 6 RT shall be conducted on butt joints having plate thickness above 10 mm. Quantum of RT shall be based on pressure rating.
- ~~7 Each Plate after pressing shall be subject to either of the following tests, as per Manufacturer Practice~~
 - a) Light Box Test
 - b) Vacuum Test
 - ~~c) Air Chamber Test~~



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CLAUSE NO.

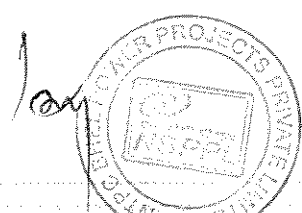
QUALITY ASSURANCE



- 8 All pressure retaining parts shall be hydrostatically tested at 200% of pump rated head or 150% of shut – off head, whichever is higher, for at least 30 minutes. No leakage is allowed.
- 9 Static and Dynamic Balancing shall be carried out on complete rotor assembly.
- 10 All pumps shall be tested at rated speed, for head, flow capacity, efficiency and power consumption for the entire operating range i.e. from shut off head to maximum flow. A minimum of 7 readings shall be taken to plot the curve, with one reading at design flow. Testing standard shall be HIS (Hydraulic Institute Standard) of USA.

Performance test shall be carried out with contract motor, wherever Liquidated Damages are to be ascertained based on performance test at shop.
- 11 For Piping & Valves, refer LP Piping System.
- ~~12. Heat Transfer Plates of Heat Exchanger shall be pressed from one piece in a single mechanical operation with one single die having homogenous and continuous pattern.~~
- ~~13. Gasket groove in each plate of Heat Exchanger should be able to support the gasket to ensure a long gasket life.~~

SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION VI PART-B	SUB-SECTION-E-106 EQUIPMENT COOLING WATER SYSTEM (SG & AUX. SYSTEM)	PAGE 2 OF 2
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TECHNICAL SPECIFICATIONS
MISCELLANEOUS PUMPS

SPECIFICATION
NO.:

PE-TS-401-100-N001

VOLUME:

IIB

SECTION:

C2

1X500 MW FG UNCHAHAR TPP STG-IV

REV. NO.

0

DATE:

09.10.14

SECTION C2

SPECIFIC TECHNICAL REQUIREMENTS FOR MOTORS



**TECHNICAL CONDITIONS OF CONTRACT
ELECTRICAL EQUIPMENT SPECIFICATION
FOR
MISCELLANEOUS PUMPS (HORIZONTAL)
1 x 500 MW UNCHAHAAR STAGE-IV**



1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

- a) Services and equipment as per “Electrical Scope between NBPPL 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 same shall be provided by the bidder without any extra charge.
- 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 Miscellaneous Pumps.
- 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 /NBPPL approval without any commercial and delivery implications to NBPPL
- i) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/NBPPL approval without any commercial implication to NBPPL.
- j) Motor shall meet minimum requirement of motor specification.

2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:

Refer “Electrical Scope between NBPPL and Vendor”.

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/quality assurance requirements stipulated. In line with this two signed and stamped copies of the following shall be furnished by the bidder as technical offer:



- a) A copy of this sheet ”Electrical equipment Specification for Miscellaneous Pumps” and sheet “Electrical Scope between NBPPL and Vendor” with bidder’s signature and company stamp.
- b) List of Erection and Commissioning spares.
- c) List of Erection & Maintenance tools & tackles.
- d) Electrical load requirement

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.

4.0 List of enclosures :

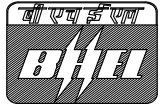
- 4.1.1 Electrical scope between NPBBL & vendor (Annexure-I).
- 4.1.2 Technical specification for Electric Motors.
- 4.1.3 Quality Assurance Plan for motors.
- 4.1.4 Load data format (Annexure-II).

BHEL SPEC. NO. : PE-TS-401-100-N001 Rev. No.: 00 Dated : 09.10.14	Section C2: SPECIFIC TECHNICAL REQUIREMENTS FOR MOTORS	
TECHNICAL SPECIFICATIONS		Page 1 of 2

	TECHNICAL CONDITIONS OF CONTRACT ELECTRICAL EQUIPMENT SPECIFICATION FOR MISCELLANEOUS PUMPS (HORIZONTAL) 1 x 500 MW UNCHAHAAR STAGE-IV	
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- 5.0 The stipulations of Customer Technical specification, Section-C2 shall prevail in case of any conflict between the stipulations of Customer Technical specification, Section-C2.

BHEL SPEC. NO. : PE-TS-401-100-N001 Rev. No.: 00 Dated : 09.10.14	Section C2: SPECIFIC TECHNICAL REQUIREMENTS FOR MOTORS	
TECHNICAL SPECIFICATIONS		Page 2 of 2



TECHNICAL CONDITIONS OF CONTRACT
ELECTRICAL EQUIPMENT SPECIFICATION
MISCELLANEOUS PUMPS (HORIZONTAL)
1 x 500 MW UNCHAHAAR STAGE-IV
ANNEXURE – I TO SECTION – C2 : ELECTRICAL SCOPE BETWEEN NBPPL AND VENDOR



S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	11kV & 3.3kV Switchgear	NBPPL	NBPPL	
2	415V MCC Starter cum control panel (if applicable)	NBPPL Vendor	NBPPL NBPPL	415 V AC, 3 phase, 3 wire supply shall be provided by NBPPL based on load data provided by vendor at contract stage for all equipment supplied by vendor. Further, the 415V AC (3 phase 4 Wire) requirement / 240V AC requirement to be arranged/derived by vendor by providing suitable Control Transformer.
3	Local Push Button Station (for motors)	NBPPL	NBPPL	Located near the motor.
4	Power cables, control cables and screened control cables for a) both end equipment in NBPPL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	NBPPL Vendor NBPPL	NBPPL NBPPL NBPPL	1. For 3.c): Sizes and quantity of cables required shall be informed by vendor at contract stage (based on inputs provided by NBPPL). Finalisation of cable sizes shall be done by NBPPL. Vendor shall provide lugs & glands accordingly. 2. Cabling/ termination by NBPPL.
5	Junction box for control & instrumentation cable	Vendor	NBPPL	
6	Any special type of cable like compensating, co-axial, prefab, MICC, fibre optical etc.	Vendor	NBPPL	Refer scope/ C&I portion of specification for scope of fibre Optical cables if used between PLC/ micro processor & DCS.
7	Cable trays, accessories & cable trays supporting system 100/ 50 mm cable trays/ Conduits/ Galvanised steel cable troughs for local cabling	NBPPL Vendor	NBPPL NBPPL	Local cabling from nearby main route cable tray (NBPPL scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ cable conduits/ Galvanised steel cable troughs.

BHEL SPEC. NO.: Rev. No.: Dated :	Section C: TECHNICAL CONDITIONS OF CONTRACT	DOC. NO.: Rev. No.:
TECHNICAL SPECIFICATIONS		Page 1 of 3

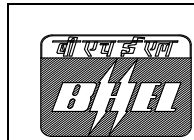


TECHNICAL CONDITIONS OF CONTRACT
ELECTRICAL EQUIPMENT SPECIFICATION
MISCELLANEOUS PUMPS (HORIZONTAL)
1 x 500 MW UNCHAHAAR STAGE-IV
ANNEXURE – I TO SECTION – C2 : ELECTRICAL SCOPE BETWEEN NBPPL AND VENDOR



S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
8	Cable glands and lugs for equipment supplied by Vendor	Vendor	NBPPL	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty copper lugs for power & control cables.
9	Conduit and conduit accessories for cabling between equipment supplied by vendor	Vendor	NBPPL	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
10	Lighting	NBPPL	NBPPL	
11	Equipment grounding & lightning protection	NBPPL	NBPPL	
12	Below grade grounding	NBPPL	NBPPL	
13	LT Motors with base plate and foundation hardware	Vendor	NBPPL	Makes shall be subject to NBPPL approval at contract stage.
14	Mandatory spares	Vendor	-	Vendor to quote as per specification.
15	Recommended O & M spares, E & C spares, erection & maintenance tools & tackle.	Vendor	-	As specified elsewhere in specification
16	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor	NBPPL	
17	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable (excluding power cables) in enclosed excel format shall be submitted by vendor during detailed engineering stage.
18	Equipment layout drawings	Vendor	-	For preparation of cabling layout drawings by NBPPL, vendor shall furnish

BHEL SPEC. NO.: Rev. No.: Dated :	Section C: TECHNICAL CONDITIONS OF CONTRACT	DOC. NO.: Rev. No.:
TECHNICAL SPECIFICATIONS		Page 2 of 3



TECHNICAL CONDITIONS OF CONTRACT
ELECTRICAL EQUIPMENT SPECIFICATION
MISCELLANEOUS PUMPS (HORIZONTAL)
1 x 500 MW UNCHAHAHAR STAGE-IV
ANNEXURE – I TO SECTION – C2 : ELECTRICAL SCOPE BETWEEN NBPPL AND VENDOR



S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
				Electrical equipment layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling,
19	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

1. Make of all electrical equipment/items supplied shall be reputed make & shall be subject to approval of NBPPL/customer after award of contract.
2. All QPs shall be subject to approval of NBPPL/customer after award of contract without any commercial implication.

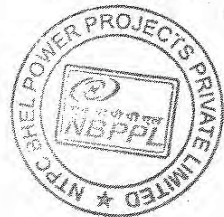
BHEL SPEC. NO.: Rev. No.: Dated :	Section C: TECHNICAL CONDITIONS OF CONTRACT	DOC. NO.: Rev. No.:
TECHNICAL SPECIFICATIONS		Page 3 of 3

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SUB-SECTION - B-09


MOTORS

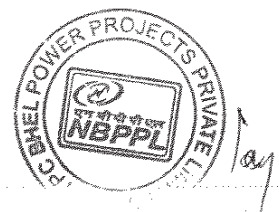
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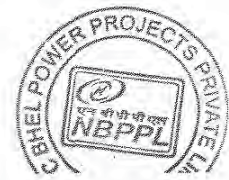
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.09.00	The responsibility of coordination with electrical agencies and obtaining all necessary clearances shall be of the contractor.			
1.10.00	Degree of Protection Degree of protection for various enclosures as per IS:4691, IEC60034-05 shall be as follows :- i) Indoor motors - IP 54 ii) Outdoor motors - IP 55 iii) Cable box-indoor area - IP 54 iv) Cable box-Outdoor area - IP 55			
2.00.00	CODES AND STANDARDS 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) Energy Efficient motors : IS 12615			
3.00.00	TYPE			
3.01.00	AC Motors: a) Squirrel cage induction motor suitable for direct-on-line starting. b) Continuous duty LT motors upto 160 KW Output rating (at 50 deg.C ambient temperature), shall be Energy Efficient motors, Efficiency class-Eff 1, conforming to IS 12615. c) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.			
3.02.00	DC Motors Shunt wound.			
4.00.00	RATING (a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor. (b) Whenever the basis for motor ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings			
SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-B-09 MOTORS	PAGE 2 OF 9	




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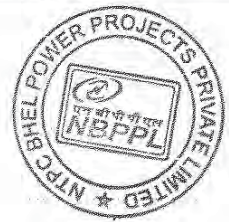
CLAUSE NO.	TECHNICAL REQUIREMENTS			
	<p>shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.</p> <p>(c) For BFP motor the starting MVA shall be restricted to 58 MVA.</p>			
5.00.00	<p>TEMPERATURE RISE</p> <p>Air cooled motors</p> <p>70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation.</p> <p>Water cooled</p> <p>80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.</p> <p>41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class Y wet wound Boiler circulation pump motor.</p>			
6.00.00	<p>OPERATIONAL REQUIREMENTS</p>			
6.01.00	<p>Starting Time</p>			
6.01.01	<p>For motors with starting time upto 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.</p>			
6.01.02	<p>For motors with starting time more than 20 secs. and upto 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.</p>			
6.01.03	<p>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.</p>			
6.01.04	<p>Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.</p>			
6.02.00	<p>Torque Requirements</p>			
6.02.01	<p>Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.</p>			
6.02.02	<p>Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.</p>			
<p>SINGRAULI STPP STAGE-III (1X600 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION - VI PART-B</p>	<p>SUB-SECTION-B-09 MOTORS</p>	<p>PAGE 3 OF 9</p>	




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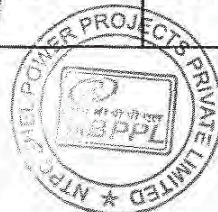
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
6.03.00	<p>Starting voltage requirement</p> <p>(a) 85% up to 1500KW (except for AOP motor which is 80%)</p> <p>(b) 80% from 1501 KW to 4000KW</p> <p>(c) 75% > 4000KW</p>		
7.00.00	<p>DESIGN AND CONSTRUCTIONAL FEATURES</p>		
7.01.00	<p>Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors, space heater terminals inside the main terminal box may be acceptable.</p>		
7.02.00	<p>All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACW) 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</p> <p>(a) Fuel oil area : Group - IIB</p> <p>(b) Hydrogen generation plant area : Group - IIC (or Group-I, Div-II as per NEC)</p>		
7.03.00	<p>Winding and Insulation</p> <p>(a) Type : Non-hygroscopic, oil resistant, flame resistant</p> <p>(b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature. However the conveyor motor shall be suitable for 3 consecutive hot starts.</p> <p>(c) 11kV & 3.3 kV AC motors : Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Pressure Impregnated i.e resin poor method. The lightning impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15</p> <p>(d) 240VAC, 415V AC & 220V DC motors : Thermal Class (B) or better</p>		
7.04.00	<p>Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.</p>		
<p>SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION - VI PART-B</p>	<p>SUB-SECTION-B-09 MOTORS</p>	<p>PAGE 4 OF 9</p>




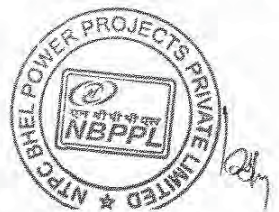
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.		
7.06.00	Noise level for all the motors shall be limited to 85dB(A) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits prescribed in IS:12075 / IEC 60034-14 . Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.		
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.		
7.08.00	Motor body shall have two earthing points on opposite sides.		
7.09.00	HT 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. In case cable box is offered, then Employer shall provide termination kit. 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.		
7.10.00	The spacing between gland plate & centre of terminal stud shall be as per Table-I.		
7.11.00	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.		
7.12.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV /415V systems without any injurious effect on its life.		
7.13.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.		
7.14.00	11kV and 3.3 kV motor Terminal Box shall be suitable for fault level of 750MVA for 0.12 sec and 250 MVA for 0.12 sec respectively. Elastimould termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.		
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box suitable for the same.		
8.00.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP Motor.		
SINGRAULI STPP STAGE-III (1X600 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-B-09 MOTORS	PAGE 5 OF 9



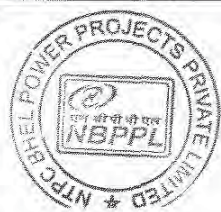
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
	(a) Upto 110KW	:	11.0 (For AOP motor it shall be 8.0)	
	(b) Above 110KW & upto 1500KW	:	10.0	
	(c) Above 1500KW & upto 4000KW	:	9.0	
	(d) Above 4000KW	:	6 to 6.5	
9.00.00	CW Motor shall be designed with minimum power factor of 0.8 at design point.			
10.00.00	TYPE TEST			
10.01.00	HT MOTORS			
10.01.01	The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII-(BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.			
10.01.02	The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.			
10.01.03	In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the owner for waiver of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The owner reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.			
10.01.04	Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this			
SINGRAULI STPP STAGE-III (1X600 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION - VI PART-B	SUB-SECTION-B-09 MOTORS	PAGE 6 OF 9	



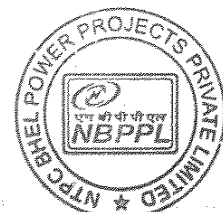
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
10.01.05	<p>contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.</p> <p>LIST OF TYPE TESTS TO BE CONDUCTED</p> <p>The following type tests shall be conducted on each type and rating of HT motor</p> <ul style="list-style-type: none"> (a) No load saturation and loss curves upto approximately 115% of rated voltage (b) Measurement of noise at no load. (c) Momentary excess torque test (subject to test bed constraint). (d) Full load test(subject to test bed constraint) (e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., coolant flow and its temp. 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. (f) Lightning Impulse withstand test on the sample coil shall be as per IEC-60034, part-15 (g) Surge-withstand test on interturn insulation shall be as per clause no. 5.1.2 of IEC 60034, part-15 		
10.01.06	<p>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</p> <p>The following type test reports shall be submitted for each type and rating of HT motor</p> <ul style="list-style-type: none"> (a) Degree of protection test for the enclosure followed by IR, HV and no load run test. (b) Terminal box-fault level withstand test for each type of terminal box of HT motors only. 		
10.02.00	<p>LT Motors</p>		
10.02.01	<p>LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening.</p>		
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	<p>These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.</p>			
10.02.02	<p>However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.</p>			
10.02.03	<p>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</p> <p>The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only</p> <ol style="list-style-type: none"> 1. Measurement of resistance of windings of stator and wound rotor. 2. No load test at rated voltage to determine input current power and speed 3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors) 4. Full load test to determine efficiency power factor and slip . 5. Temperature rise test . 6. Momentary excess torque test. 7. High voltage test . 8. Test for vibration severity of motor. 9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section) 10. Test for degree of protection and 11. Overspeed test. 			
10.03.00	<p>All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.</p>			
10.04.00	<p>The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.</p>			
<p>SINGRAULI STPP STAGE-III (1X500 MW) EPC PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION - VI PART-B</p>	<p>SUB-SECTION-B-09 MOTORS</p>	<p>PAGE 8 OF 9</p>	



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CLAUSE NO.	TECHNICAL REQUIREMENTS																															
	<p style="text-align: center;">TABLE - I</p> <p style="text-align: center;">DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Motor MCR in KW</th> <th style="text-align: right;">Minimum distance between centre of stud and gland plate in mm</th> </tr> </thead> <tbody> <tr> <td>UP to 3 KW</td> <td style="text-align: right;">As per manufacturer's practice.</td> </tr> <tr> <td>Above 3 KW - upto 7 KW</td> <td style="text-align: right;">85</td> </tr> <tr> <td>Above 7 KW - upto 13 KW</td> <td style="text-align: right;">115</td> </tr> <tr> <td>Above 13 KW - upto 24 KW</td> <td style="text-align: right;">167</td> </tr> <tr> <td>Above 24 KW - upto 37 KW</td> <td style="text-align: right;">196</td> </tr> <tr> <td>Above 37 KW - upto 55 KW</td> <td style="text-align: right;">249</td> </tr> <tr> <td>Above 55 KW - upto 90 KW</td> <td style="text-align: right;">277</td> </tr> <tr> <td>Above 90 KW - upto 125 KW</td> <td style="text-align: right;">331</td> </tr> <tr> <td>Above 125 KW-upto 200 KW</td> <td style="text-align: right;">203</td> </tr> </tbody> </table> <p>For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.</p> <p>PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:</p> <p>NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Motor MCR in KW</th> <th style="text-align: right;">Clearance</th> </tr> </thead> <tbody> <tr> <td>UP to 110 KW</td> <td style="text-align: right;">10mm</td> </tr> <tr> <td>Above 110 KW and upto 150 KW</td> <td style="text-align: right;">12.5mm</td> </tr> <tr> <td>Above 150 KW</td> <td style="text-align: right;">19mm</td> </tr> </tbody> </table>			Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm	UP to 3 KW	As per manufacturer's practice.	Above 3 KW - upto 7 KW	85	Above 7 KW - upto 13 KW	115	Above 13 KW - upto 24 KW	167	Above 24 KW - upto 37 KW	196	Above 37 KW - upto 55 KW	249	Above 55 KW - upto 90 KW	277	Above 90 KW - upto 125 KW	331	Above 125 KW-upto 200 KW	203	Motor MCR in KW	Clearance	UP to 110 KW	10mm	Above 110 KW and upto 150 KW	12.5mm	Above 150 KW	19mm	
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