

1 X 660 MW PANKI TPS EXTN.

VOLUME - II B & III

**TECHNICAL SPECIFICATION
FOR
WORKSHOP EQUIPMENT**

SPECIFICATION NO. PE – TS – 426 - 568 – A001



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA**

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SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS

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1.0 SCOPE OF ENQUIRY/ INTENT OF SPECIFICATION

- 1.1 This specification includes, but not limited to design (i.e. preparation and submission of drawing /documents including "As Built" drawings and O&M manuals), engineering, manufacture, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles (as applicable), fill of lubricants & consumables, along with spares for erection, start up and commissioning as required, foundation bolts, nuts, lock nuts, washers, levelling pads, forwarding, proper packing, shipment and delivery at site of Workshop Equipments package for 1X660 MW PANKI TPS EXTN. specified as above complete with all accessories for the total scope defined as per BHEL NIT & tender technical specification, amendment & agreements till placement of order.
- 1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve the vendor from the responsibility of providing such facilities to complete the supply of **WORKSHOP EQUIPMENTS**.
- 1.3 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 purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgement is not in full accordance herewith.
- 1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.
- 1.5 The general term and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.
- 1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the



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same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

- 1.7 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.
- 1.8 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.
- 1.9 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.10 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder /vendor and Customer/ Purchaser/Employer will mean BHEL and /or Customer including their consultant as interpreted by BHEL in the relevant context.



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1.0 SYSTEM DESCRIPTION AND SCOPE OF WORK

Various types of equipment / machines which are included in bidder's scope of work and required for the maintenance and repair workshop of the power station equipment are given under :-

S. N.	EQUIPMENT NAME	OFFERED EQUIPMENT	ACCESSORIES	QTY.
1.	Vertical Turret Lathe M/C	Max. jobs Dia.- 1650 mm, Max.jobs Height.- 1100 mm, Max.jobs Wt.-8000 Kg, Main Motor rating 40 HP, 415 V, 3 Phase AC, other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
2.	Heavy Duty Lathe M/C	Max.jobs Length.- 4000 mm, Max.jobs Dia.- 1650 mm., Max jobs Wt.- 5000Kg, Main Motor rating 18.5 Kw,415 V, 3 Phase AC, other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
3.	Heavy Duty Lathe M/C -1	Max.jobs Length-4000 mm, Max. jobs Dia.-1650 mm. Max.jobs Wt.- 5000 Kg, motor rating 18.5 Kw,415 V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
4.	Medium Duty Lathe M/C -1	Max.jobs Length- 2000 mm, Max.jobs Dia.- 640 mm, Main motor rating 11 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
5.	Medium Duty Lathe M/C -2	Max.jobs Length.-3000 mm, Max.jobs Dia.- 640 mm, Main motor rating 11 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
6.	Medium Duty Lathe M/C -3	Max.jobs Length- 2000 mm, Max. Dia.- 910 mm, Main motor rating 11 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
7.	Universal Milling M/C	Table/Job Area.-1500 x 400 mm., Max.jobs Height.- 365 mm. Max.Wt.-580 Kg, Main motor rating 11 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
8.	Surface Grinding M/C	Max. Grd. Surface cap.1500 X120 mm, Max.jobs Height-400 mm, Max.jobs Wt.-425 Kg./(225+chuck)	Accessories as per Manufacturer standard	1
9.	Cylindrical Grinding M/C	Max.jobs Dia.-280 mm, Jobs between centre 1000 mm, Main motor rating 3.5 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1



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S. N.	EQUIPMENT NAME	OFFERED EQUIPMENT	ACCESSORIES	QTY.
10.	Slotting M/C	Max.jobs Height.-400 mm, Max. jobs Dia.-800 mm, Main motor rating 9.3 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
11.	Radial Drill M/C	Max. Drill.Dia.-60 mm. Max. jobs Height.-1425 mm, Main motor rating 7.5 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	2
12.	Column Drill M/C	Max. Drill.Dia.-60 mm. Max. job Height.-450 mm, Main motor rating 5.5 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
13.	Hydraulic Press M/C	Max. Presser.-100 T. Stroke Length.-300 mm. Opening:-1000X1000 mm, Main motor rating 5.5 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
14.	Hydraulic Press M/C	Max. Presser.-60 T. Stroke Length.-300 mm, Opening:-1000X1000 mm, Main motor rating 5.5 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
15.	Plate Bending M/C	Max. Plate thickness (MS)-25 mm. Max. Plate Width- 2000 mm. Min. Pipe Dia.-450 mm, Main motor rating 15 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
16.	Plate Shearing M/C	Max. Plate thickness (MS).-13 mm, Max. Plate Thickness (SS)-9 mm, Max. Plate Width- 1000 mm, Main motor rating 2.2 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
17.	Dynamic Balancing	M/C Max. job Weight - 3000 Kg. Max. Dia.-1600 mm. Journal Dia. Range.- 20-160mm. Belt Driven Dia. Range -30-300 mm, Main motor rating 7.5 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1



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S. N.	EQUIPMENT NAME	OFFERED EQUIPMENT	ACCESSORIES	QTY.
18.	Shaper M/C	Max. Length.-650 mm. Max. Breadth -500 mm. Max.Height.-450 mm, Main motor rating 3.7 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
19.	Pipe Bending M/C	10 To 150 NB Pipe, Main motor rating 1.5 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	2
20.	Tool and Cutter Grinding M/C	Dist. Between Centre -760 mm. Dist. Between Cent.& Work Head -615 mm. Center Height.-130 mm, Main motor rating 0.75 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	2
21.	Power Hacksaw M/C	Cutting Dia./Sq.- 300/250 mm, Main motor rating 1.5 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	2
22.	Welding Generator-M/C	Current Range.- 45A-300A, motor rating 13.5 Kw.415 V,3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard	1
23.	Welding Transformer M/C	Current Range.- 60A-400A	Accessories as per Manufacturer standard	3

3.0 PAINTING SCHEDULE

Painting of workshop equipments: Following painting specification shall be followed for above workshop equipments except for item no. 23 and 24, for which, manufacture's standard painting specification shall be followed.

At Works

Surface Preparation: Degreasing and surface preparation to SA 2 1/2.

Prime coat:- Two (2) coat of Epoxy based polyamide cured (2) pack HB zinc phosphate primer. Dry-film thickness 80 microns.

Intermediate coat: One (1) layer 2 pack high build epoxy polyamide MIO, dry film thickness 120 micron.

Finish coat: Application of two coats of poly urethane. Dry-film thickness 60 microns.

Total system: Dry film thickness 260 microns.

Final shade of paint shall be as per manufacturer's standard only.



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NOTES:-

1) Maintenance tools and tackles as required for the various machines, commissioning spares for various machines as applicable, first fill lubricant /coolant for each equipment is included in Bidder's scope of work.

2) Machines shall be supplied with the manufacturer's standard accessories & other accessories as indicated above. Bidder shall submit list of all other special accessories in their bid & furnish item wise price in the price bid.

2.0 **The followings shall also be included in bidder's scope of work:-**

2.1 Required numbers of machines in new / unused condition along with standard accessories and special accessories as listed above in the specification.

2.2 First fill of lubricants, oil, coolants etc. for all machines.

2.3 Painting of equipment shall be done by the bidder before despatch as per the attached painting schedule. Bidder shall also supply adequate quantity of loose touch up paint along with the equipment so that damage in transition, if any, can be taken care.

2.4 Base plates, Support plates, anchor bolts, foundation bolts and nuts, lifting lugs, eye bolts etc. if any. All commissioning spares shall be included in the scope of work of each equipment / item.

2.5 Terminal points for electrical shall be the power supply terminals in respective machines and power cable glands and lugs shall be in bidder's scope.

2.6 The electrical equipment supplied as a part of machine shall include isolating switch for power supply isolation incorporating mechanical safety as required.

2.7 Commissioning spares shall be included in the scope of work of the bidder.

2.8 A complete unused new set of special purpose service / maintenance tools & tackles shall be supplied with each machine. The tools shall be supplied in steel tool box & shall be of the best quality & specially protected against rusting in tropical climate.

2.9 Five (5) metres of power cable (spare) shall be supplied alongwith each machine / item.

2.10 Any other works not covered above but required for the safe operation of the machines.

3.0 **CODES & STANDARD**

The machines covered under the scope of work shall be new, of streamlined construction, rugged and vibration free in line with the Indian / international standard and practices.

4.0 **SERVICES BY CUSTOMER**

4.1 Draining arrangement of liquid coolant from source to the nearest drain.

4.2 Construction of Workshop building.

4.3 Pipe trench & cable trenches, doors / windows, rolling shutter, ramp and glass partition wall, if any.

4.4 Cable termination.



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4.5 One no. EOT crane of 10 tonnes capacity.

4.6 Erection and commissioning of workshop machines.

5.0 **DOCUMENTS AND DATA REQUIRED TO BE SUBMITTED AFTER PLACEMENT OF LOI**

Following drawings and documents shall be submitted to BHEL for approval after the placement of LOI:-

- a) General arrangement drawing indicating overall dimensions, total weights, foundation details and bill of material for all types of machines including requirement of withdrawal space.
- b) Final details of motors (machine wise) indicating guaranteed power consumption as per BHEL's format.
- c) Manual calculation for selection of machines including authentic supporting literature (e.g. handbook / standards).
- d) Manual calculation for requirement of air / water quantity and pressure including authentic supporting literature (e.g. handbook / standards).
- e) Final filled up Data sheet "B" / Data sheet "C"
- f) Quality assurance plan being followed for all items of each type of machine starting from raw material to final product including routine and type test being conducted at works.
- g) Write - up on working principle and special safety features envisaged for each type of machines.
- h) Final requirement of air and water indicating quantity, pressure and terminal points, if any.
- i) Painting schedule.
- j) O & M manual.
- k) List of spares (commissioning).
- l) List of Tools and Tackles.
- m) Schedule of lubricants indicating quantity, make and trade name of at-least three manufacturers.
- n) Data sheet of machines.

NOTE:-

- 1) The list of drawings and documents to be submitted after placement of order shall be forwarded to the successful bidder after award of contract.
- 2) Only manual calculation with authentic supporting literature shall be furnished (e.g. Hand book / standards / codes).



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- 3) Drawings and documents not covered above but required to check safety of machines / system shall be submitted during detailed engineering stage without any commercial implication.

6.0 **General requirement**

01. All the drawings shall be prepared in Auto Cad - 2007 version or higher and required number of hardcopies and soft copies of all the drawings, documents, O & M and spare parts manuals shall be furnished to BHEL during detailed engineering stage as per Annexure – III enclosed with the NIT specification.
02. Inspection checklist / quality plan and recommended field quality plan for each machine and submitted to BHEL for approval after placement of order and any changes required by BHEL / CUSTOMER for the same shall be incorporated and adhered by the bidder without any commercial implications.
03. BHEL will require 21 days time to offer their comments on the drawings and documents being submitted by the bidder from the date of receipt.
04. All drawings including general arrangement, civil foundation drawing shall be furnished to BHEL during detailed engineering stage and shall include BOQ / BOM in tabular form indicating all major components including bought out items, standard as well as optional accessories which are covered under the bidder's scope of supply and their quantity, material of construction indicating its applicable code / standard, weight, make.
05. All drawings of each machine including general arrangement and foundation drawings shall be furnished to BHEL during detailed engineering stage and shall include / indicate the following details for clarity w.r.t. inspection, construction, erection and maintenance etc. :-
- All drawings and documents shall bear BHEL's title block and drawing / document number. However, BHEL's drawing / document numbering scheme shall be furnished to the successful bidder after the placement of L.O.I.
 - All drawings shall indicate the list of all reference drawings including general arrangement and foundation drawings.
 - All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view and all major self manufactured, bought out items, standard as well as optional accessories which are covered under the bidder's scope of supply shall be labelled and included in BOQ / BOM in tabular form.
 - Specification / schedule of coolant / oil for oil cooler / lubricant / paint indicating atleast 3 trade name shall be made as a part of general arrangement drawing of each machine.
 - Extreme location of various items / assembly due to movement shall be shown in dotted lines indicating the dimensions of the same from the extreme point of idle location.
 - Location of motor (s), control panel along with dimensions shall be shown in the drawing.
 - Space required for the door opening of panel shall be shown in dotted lines with dimensions in all the general arrangement drawing.

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h)

Details of job feeding and withdrawal direction with arrow and its required space shall be shown in dotted lines with dimensions from some reference point like edge / centre of the machine.

i)

Location of operator and required space for his movement shall be shown in the general arrangement drawing in dotted lines with dimensions from some reference point like edge / centre of the machine.

j)

Requirement of withdrawal space for maintenance, if any, shall be shown in the general arrangement drawing in dotted lines with dimensions from the reference point like edge /centre of the machine.

k)

Recommended clearance / maintenance space around the machine shall be shown in the general arrangement drawing in dotted lines with dimensions from the reference point like edge / centre of the machine.

l)

Mounting details of each machine indicating size and required number of holes and the distances between them shall be indicated in the general arrangement drawing.

m)

Distance between the mounting holes and distances of the same from some reference point like centre line of machine / edge of the machine to ensure correct construction of foundation and to know maximum space required for civil foundation and mechanical equipment.

n)

Technical parameters of the machine shall be furnished (gearbox details, job rpm, vibration limit, noise level at a distance of 1.0 metre at a level of 1.5 metres above ground, V - belt details, details of pulley, details of all motors and hydraulics, whether the machine will be dispatched / delivered in the assembled condition or dismantled condition indicating the weight as the case may be, recommended capacity of E.O.T Crane, weight of heaviest (single) part / component of the machine, weight of machine along with accessories, job and total weight shall be furnished separately etc.) in all the general arrangement drawing and those shall be indicated in the drawing with dimensions to the extent possible. Details of electrical panel, wiring diagram, other relevant electrical and C&I details as applicable shall also be furnished.

o)

Details of cable entry for each machine shall be shown in all the 3 views (plan, elevation and side view).

p)

Hardness and type / method of hardening of various parts of each machine shall be indicated in the general arrangement drawing.

06.

Manual Calculation for motor (s) sizing shall be furnished to BHEL during detailed engineering stage for approval along with the copy of authentic supporting literature e.g. Hand book, National / international Standards etc in line with the technical specification.

07.

O & M manual shall be furnished to BHEL for approval during detailed engineering stage along with the general arrangement drawing.

08.

Drawing / data sheet of all accessories shall be furnished to BHEL for approval during detailed engineering stage indicating brief specification.

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09.

Operational write-up along with safety features and interlock / control details of each machine shall be furnished to BHEL separately for approval during detailed engineering stage.

10.

Separate drawing for lifting arrangement of machine during erection shall be furnished to BHEL for approval indicating dimensions and details of lifting lugs, rope etc.

11.

Civil foundation drawing of each machine shall be furnished to BHEL for approval during detailed engineering stage showing / including the followings:-

a)

Scope of work by BHEL and vendor which shall be indicated with different legend or in the form of note.

b)

Weight of moving parts, its frequency and its height from floor shall be furnished.

c)

Recommended location of cable trench for feeding cable to machine shall be furnished along with the details of cable entry.

d)

Civil loads per bolt (static and dynamic) shall be furnished in tabular form considering weight of maximum size of job and worst cutting force.

12.

Separate general arrangement drawing of drive arrangement shall be furnished to BHEL for approval during detailed engineering stage.

13.

Characteristic curve of motor shall be furnished to BHEL for approval during detailed engineering stage showing torque, speed, current & voltage.

14.

Design of machines shall be such that no cooling water / air from external source shall be required for cooling of any part of machine. Necessary cooling arrangement, as required, shall be provided by the bidder in their machines.

15.

First fill of all oil, lubricants, coolants etc. shall be included in scope of work of the bidder for each machine and shall be supplied along with the machine and **price for the same shall be taken care in the price bid, if any.**

16.

Filled up sketch indicating various dimensions for the space requirements of each equipment, centre line of job feeding and its dimension from some reference point like the centre line of machine or edge of the machine, location of operator, direction of job feeding & withdrawal and details of cable entry.

17.

Bidder has to depute competent designer (s) of each machine at BHEL’s office during detailed engineering stage to discuss drawings and other technical documents as and when required by BHEL. However, minimum 7 days notice shall be served for the same.

18.

Make of various bought items shall be as indicated in the NIT specification. Bidder will seek approval from BHEL during detailed engineering stage for those items which are not appearing in the list but required for the machine. However, Bidder shall not approach BHEL for approval of additional make of any item which is already appearing in the list.

19.

Painting specification and schedule shall be provided by the bidder for each machine as indicated in the NIT specification. However, painting specification of those items / equipments which are not covered in the specification, bidder to prepare the painting specification (suitable for sea atmosphere) for each item / machine / equipment and will be submitted to BHEL / CUSTOMER for approval after placement of order and any



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changes required by BHEL / CUSTOMER for the same shall be incorporated and adhered by the bidder without any commercial implications. Bidder to include adequate quantity of loose touch up paint for each item / equipment / machine which is required to be supplied along with the item / equipment / machine to take care damage during transit and price for the same, if any, shall be taken care in the price bid.

20. Noise level for each machine at a horizontal distance of 1.0 metre from the edge of the machine and at a height of 1.5 metres from the ground shall be limited to 85 dba and the same shall be shown during the "PG" test.
21. Inspection checklist / MQP etc. shall be prepared by the bidder and will be submitted to BHEL / CUSTOMER for approval after placement of order and any changes required by BHEL / CUSTOMER for the same shall be incorporated and adhered by the bidder without any commercial implications. Necessary instruments / job material (steel plate / bar etc.) as required for the testing / inspection of machines shall be arranged by the bidder and shall also be included in bidder's scope of work.
22. All foundation nuts, bolts, lock nuts, washers etc. as required for fixing the machine with foundation shall be included in bidder's scope of work for each machine and the same shall be supplied along with the machine and **price for the same shall be taken care in the price bid, if any.**
23. All necessary guards, devices, tools & other means that will effectively protect all personnel from any accidental or injury that may occur while machine is in running condition shall be in bidder's scope of work and shall be provided and shown in the drawings to be submitted during detail engineering stage.
24. Offered machines shall be suitable for the electrical conditions like voltages, frequencies, variations etc. as indicated in project information of NIT specification.
25. BHEL, will provide one (1) no. feeder per machine. Bidder to note & confirm that they will distribute the power requirement of various motors at their end only for this feeder.
26. List of maintenance tools / hand tools & tackles in terms of numbers only indicating sizes / ratings etc. in annexure form for each machine shall be submitted during detail engineering stage and the same shall be included in bidder's scope of work. Maintenance tools and tackles shall be supplied along with the tool box(es) and **price for the same shall be taken care in the final price bid, if any.**
27. List of commissioning spares in terms of numbers only indicating sizes / ratings etc. in annexure form for each machine shall be indicated in the offer and shall be supplied along with the machine. **Price for the same shall be taken care in the final price bid, if any.**
28. One (1) no. EOT Crane of capacity 10 Tonnes shall be provided by BHEL in the workshop building for maintenance of the machines. Bidder to check and confirm that the heaviest part of individual machine shall not exceed 10 Tonnes.
29. Necessary earthing studs / facilities for the machine and cables within the machine shall be provided by the bidder.
30. All machines shall be provided with DOL starter.



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31. Bidder to furnish the Signed & stamped copy of quality plan for motors attached with the NIT specification during detail engineering stage.
32. Cable Glands shall be double compression tinned brass type and the cable glands shall be supplied as a part of the each machine and **price for the same shall be taken care in the price bid, if any.**
33. All cable lugs shall be heavy-duty tin-plated crimping type the cable lugs shall be supplied as a part of each machine and **price for the same shall be taken care in the price bid, if any.**
34. All technical parameters of LV motors shall comply data sheet –A for LV motors.
35. Filled up motor data sheet of motor (for each motor) and filled up electrical load data format (enclosed with the NIT specification) for each machine shall be submitted during detail engineering stage.
36. All the hand wheels shall be polished / Nickel - Chrome plated.
37. List of standard accessories (which will be supplied free of cost along with the machine) in terms of numbers only for each machine shall be indicated in the offer and included in bidder's scope of work. **Price for the same shall be taken care in the price bid, if any.**
38. Bidder to indicate the material of construction of major parts of the machines indicating relevant IS / BS no.

7.0 **SPECIFIC REQUIREMENTS REGARDING ERECTION / TESTING & COMMISSIONING**

Field quality plan for all machines shall be prepared by the bidder during detailed engineering stage as per agreed schedule and the same shall be approved by BHEL to facilitate handling of equipment, erection & commissioning.

8.0 **BID EVALUATION CRITERIA**

The bid shall be evaluated based on the price quoted for main machine, commissioning spares, tools and tackles, manufacturer's standard accessories and special accessories as per specification and any technical loading due to non adherence to the technical specification. However, the price for recommended spares and other special / optional accessories which are not included in bidder's scope of work shall not be considered for evaluation purpose.

9.0 **CONDITION OF REJECTION**

Bid may be rejected if the data which have asked in clause No. 5.0 above is not properly filled-up and submitted along with the bid with company seal.

10.0 **INSPECTION, TESTING AND CODES**

- 10.1 The machine offered shall conform to the latest relevant Indian / international Codes / Standards, their electrical drives shall conform to the latest Indian Electricity Rules and shall comply for the currently applicable statutory regulations and safety codes for the locality where the equipment shall be installed.



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	<u>WORKSHOP EQUIPMENT</u>		REV	0
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- 10.2 Each machine before despatch shall be shop assembled & tested for its performance in the presence of purchaser's representative. Vendor to ensure the proper quality checks during manufacturing & assembly of machine, including identification, co-relation & verification of material test certificates for critical components like gears, shafts, spindles, sleeves etc. and radiographic tests for welds and ultrasonic tests on forging/castings to ensure defects free components and furnish test procedure, reports & test certificates on shop tests.
- 11.0 Drawing / document distribution schedule is attached in the NIT specification. Bidder shall follow the same during detail engineering stage.



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ANNEXURE - I**MAKES OF SUB VENDORS ITEMS OF WORKSHOP EQUIPMENT**

S. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
1.	BEARINGS	SKF	-	
		FAG	-	
		TATA	-	
		NBC	-	
2.	V- BELT	FENNER	-	
		DUNLOP	-	
3.	HYDRAULIC POWER PACK	VICKERS-PERRY	-	
		REXROTH	-	
4.	PVC POWER CABLES	APAR INDUSTRIES LTD.	MUMBAI	
		CORDS CABLE INDUSTRIES LTD.	NEW DELHI	
		DIAMOND POWER INFRASTRUCTURE LTD	VADODARA	
		GOYOLENE FIBRES (INDIA) PVT.LTD	MUMBAI	
		GOVIND CABLE INDUSTRIES	KOLKATA	
		GUPTA POWER INFRASTRUCTURE LIMITED	BHUBNESWAR	
		HAVELLS INDIA LIMITED	NOIDA	
		KEI INDUSTRIES LTD.	NEW DELHI	
		KRISHNA ELECTRICAL INDUSTRIES LTD	GWALIOR	
		KEC INTERNATIONAL LIMITED	MUMBAI	
		MANSFIELD CABLES COMPANY LTD.	NOIDA	
		NICCO CORPORATION LTD.	KOLKATA	
		PARAMOUNT COMMUNICATIONS LTD.	NEW DELHI	
		POLYCAB WIRES PVT. LTD.	MUMBAI	
		RADIANT CORPORATION PRIVATE LIMITED	HYDERABAD	
		RAVIN CABLES LIMITED	MUMBAI	
		SUYOG ELECTRICALS LTD.	VADODARA	
		SRIRAM CABLES PVT. LTD.	NEW DELHI	
		SCOT INNOVATION WIRES AND CABLES PVT. LTD.	SOLAN	
		SAM CABLES & CONDUCTORS (P) LTD	UDHAM SINGH NAGAR	
5.	PVC CONTROL CABLES	THERMO CABLES LTD	HYDERABAD	
		ADVANCE CABLE TECHNOLOGIES (P) LTD	BANGALORE	
		APAR INDUSTRIES LTD., CMI	MUMBAI	



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S. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		LTD		
		CMI LIMITED	FARIDABAD	
		CORDS CABLE INDUSTRIES LTD	NEW DELHI	
		CRYSTAL CABLE INDUSTRIES LTD	KOLKATA	
		DELTON CABLES LTD	NEW DELHI	
		DIAMOND POWER INFRASTRUCTURE LTD	VADODARA	
		ELKAY TELELINKS LTD	NEW DELHI	
		GEMSCAB INDUSTRIES LTD	NEW DELHI	
		GOVIND CABLE INDUSTRIES	KOLKATA	
		GUPTA POWER INFRASTRUCTURE LIMITED	BHUBNESWAR	
		HAVELLS INDIA LIMITED	NOIDA	
		INCOM CABLES (P) LTD	NEW DELHI	
		KEI INDUSTRIES LTD	NEW DELHI	
		KRISHNA ELECTRICAL INDUSTRIES LTD	GWALIOR	
		KEC INTERNATIONAL LIMITED	MUMBAI	
		MANSFIELD CABLES COMPANY LTD	NOIDA	
		NICCO CORPORATION LTD	KOLKATA	
		PARAMOUNT COMMUNICATIONS LTD	NEW DELHI	
		POLYCAB WIRES PVT. LTD	MUMBAI	
		RAVIN CABLES LIMITED	MUMBAI	
		SUYOG ELECTRICALS LTD	VADODARA	
		SPECIAL CABLES PVT. LTD	NEW DELHI	
		SCOT INNOVATION WIRES AND CABLES PVT. LTD	SOLAN	
		SAM CABLES & CONDUCTORS (P) LTD	UDHAM SINGH NAGAR	
		SPM POWER & TELECOM PVT. LTD	HYDERABAD	
		TORRENT CABLES LTD	AHMEDABAD	
		THERMO CABLES LTD	HYDERABAD	
		TIRUPATI PLASTOMATICS PVT. LTD	JAIPUR	
		UNIVERSAL CABLES LTD	SATNA	
6.	XLPE POWER CABLES	APAR INDUSTRIES LTD	MUMBAI	
		CORDS CABLE INDUSTRIES LTD	NEW DELHI	
		CRYSTAL CABLE INDUSTRIES LTD	KOLKATA	
		DIAMOND POWER INFRASTRUCTURE LTD	VADODARA	



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S. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		GEMSCAB INDUSTRIES LTD	NEW DELHI	
		GOVIND CABLE INDUSTRIES	KOLKATA	
		GUPTA POWER INFRASTRUCTURE LIMITED	BHUBNESWAR	
		HAVELLS INDIA LIMITED	NOIDA	
		KEI INDUSTRIES LTD	NEW DELHI	
		KRISHNA ELECTRICAL INDUSTRIES LTD	GWALIOR	
		KEC INTERNATIONAL LIMITED	MUMBAI	
		MANSFIELD CABLES COMPANY LTD	NOIDA	
		PARAMOUNT COMMUNICATIONS LTD	NEW DELHI	
		POLYCAB WIRES PVT. LTD	MUMBAI	
		RAVIN CABLES LIMITED	MUMBAI	
		SUYOG ELECTRICALS LTD	VADODARA	
		SPECIAL CABLES PVT. LTD	NEW DELHI	
		SCOT INNOVATION WIRES AND CABLES PVT. LTD	SOLAN	
		SRIRAM CABLES PVT. LTD	NEW DELHI	
		TORRENT CABLES LTD	AHMEDABAD	
		THERMO CABLES LTD	HYDERABAD	
		TIRUPATI PLASTOMATICS PVT. LTD	JAIPUR	
7.	XLPE CONTROL CABLES	APAR INDUSTRIES LTD	MUMBAI	
		CABLE CORPORATION OF INDIA LTD	MUMBAI	
		CRYSTAL CABLE INDUSTRIES LTD	KOLKATA	
		DIAMOND POWER INFRASTRUCTURE LTD	VADODARA	
		GEMSCAB INDUSTRIES LTD	NEW DELHI	
		HAVELLS INDIA LIMITED	NOIDA	
		KEI INDUSTRIES LTD	NEW DELHI	
		KRISHNA ELECTRICAL INDUSTRIES LTD	GWALIOR	
		KEC INTERNATIONAL LIMITED	MUMBAI	
		PARAMOUNT COMMUNICATIONS LTD	NEW DELHI	
		POLYCAB WIRES PVT. LTD	MUMBAI	
		RADIANT CORPORATION PRIVATE LIMITED	HYDERABAD	
		RAVIN CABLES LIMITED	MUMBAI	
		SUYOG ELECTRICALS LTD	VADODARA	
		SRIRAM CABLES PVT. LTD	NEW DELHI	
		TORRENT CABLES LTD	AHMEDABAD	
		UNIVERSAL CABLES LTD	SATNA	



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S. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
8.	PUMP FOR COOLANT	PHULSONS RAJPURA / RAJAMANE INDUSTRIES PVT. LTD.	BANGLORE	
9.	LT MOTORS	SIEMENS NGEF (up to 15KW) CROMPTON KIRLOSKAR BHARAT BIJLI ALSTOM ABB	- - - - - - -	
10.	PAINT	ASIAN PAINTS (I) LTD. BERGER PAINTS INDIA LTD GOODLASS NEROLAC JENSON & NICHOLSON (I) LTD CDC CARBOLINE (I) LTD. SHALIMAR PAINTS LTD. ADDISON PAINTS LTD GRAND POLYCOAT BOMBAY PAINTS HEMPLE PAINTS (SINGAPORE) JOTUN PAINTS	- - - - - - - - - - - -	

NOTE:

1. THE SUB VENDOR LIST ABOVE IS INDICATIVE ONLY AND IS SUBJECT TO BHEL AND CUSTOMER APPROVAL DURING DETAILED ENGINEERING STAGE WITHOUT ANY COMMERCIAL & DELIVERY IMPLICATION TO BHEL.

BIDDER TO PROPOSE SUB VENDOR WITHIN 4 WEEKS OF PLACEMENT OF LOI. THEREAFTER NO REQUEST FOR ADDITIONAL SUB-VENDOR SHALL BE ENTERTAINED.

2. DEALERS ARE NOT ACCEPTABLE FOR ANY ITEM OF THE PACKAGE. BIDDER SHALL PROCURE ALL ITEMS INCLUDING PLATES, STRUCTURAL, FLANGES; COUNTER FLANGES ETC. FROM APPROVED SUB VENDOR ONLY.
3. THE INSPECTION CATEGORY WILL BE INTIMATED AFTER AWARD OF CONTRACT BY BHEL/CUSTOMER. HOWEVER, THE SAME WILL BE ADHERED BY THE BIDDER WITHOUT ANY COMMERCIAL AND DELIVERY IMPLICATION TO BHEL/ CUSTOMER.



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ANNEXURE-II**DRAWINGS, DATA / DOCUMENTS TO BE FURNISHED BY THE SUCCESSFUL BIDDER**

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

Sl. No.	BHEL DRG.NO	DRAWING TITLE	REMARKS	SUBMISSION SCHEDULE - WEEK NUMBER FROM DATE OF LOI
1.	PE-V0-426-568-A001	Inspection Check List / Manufacturing Quality Plan of Machine/equipment	APPROVAL	2
2.	PE-V0-426-568-A002	GA, Foundation Detail and Data sheet of Machine /Equipment with detailed BOM	APPROVAL	2
3.	PE-V0-426-568-A004	O & M Manual for WORKSHOP EQUIPMENT	INFORMATION	8
4.	PE-V0-426-568-A006	Erection Procedure for WORKSHOP EQUIPMENT	INFORMATION	8

- The above drawing list is tentative and shall be finalized with the successful bidder after placement of order. Every repeat submission within one (1) week. Response time by BHEL within three (3) weeks after receiving of drawing.
- Drawings shall be prepared in Auto-Cad latest edition. Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified elsewhere in the specification.
- All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.:
 - All drawings and documents shall indicate the list of all reference drawings including general arrangement.
 - All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view; all major self-manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.
 - Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names.
 - All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.



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ANNEXURE - III**Drawings / documents distribution schedule**

S.N.	DESCRIPTION	CUSTOMER / CONSULTANT	BHEL / Customer SITE	PEM (ENGINEERING)
1)	Drawings / documents during approval stage	10	Nil	6 – hard copy and 1 – soft copy (CD)
2)	Finally approved drawings / documents	10	9	6 – hard copy and 6 - softcopy (CD)
3)	As built drawings / documents	10	9	6 – hard copy and 6 - softcopy (CD)
4)	Approved erection / installation manual	10	9	6 – hard copy and 6 - softcopy (CD)
5)	Approved O & M manuals	10	9	6 – hard copy and 6 - softcopy (CD)

Note: The above requirement is minimum. However, exact quantities of drawings / documents requirement shall be informed to the successful bidder during detailed engineering stage for which no commercial implication shall be entertained by BHEL.

All drawings & documents shall be prepared in Autocad and submitted for review / approval in soft copies also. Catalogues shall be scanned for soft copy.

Note:- Manually prepared drawings are not acceptable.

Soft copy in CD Rom and Reproducible Tracings of all drawings / documents shall be submitted along with Final / As-Built submission.

“Bidder to note that BHEL reserve the right for drg/doc submission through web based Document Management System. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.

- Internet explorer version – Minimum Internet Explorer 7
- Internet speed – 2 mbps (Minimum preferred)
- Pop ups from our external DMS IP (124.124.36.198) should not be blocked
- Vendor's Internal proxy setting should not block DMS application's link (<http://124.124.36.198/wrenchwebaccess/login.aspx>)”



TITLE: 1X660 MW PANKI TPS EXTN.
TECHNICAL SPECIFICATION
FOR
WORKSHOP EQUIPMENT

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SECTION – IB

Specific Technical Requirement (Electrical)



TITLE :
TECHNICAL SPECIFICATION
FOR
WORKSHOP EQUIPMENTS (ELECTRICAL PORTION)
1X660 MW UPRVUNL PANKI TPS

SPECIFICATION NO.
VOLUME NO. : II-B
SECTION :
REV NO. 00 : DATE : 06.06.19
SHEET : 1 OF 3

TECHNICAL SPECIFICATION
FOR
WORKSHOP EQUIPMENTS
(ELECTRICAL PORTION)

	TITLE : TECHNICAL SPECIFICATION FOR WORKSHOP EQUIPMENTS (ELECTRICAL PORTION) 1X660 MW UPRVUNL PANKI TPS	SPECIFICATION NO.
		VOLUME NO. : II-B
		SECTION :
		REV NO. 00 : DATE : 06.06.19
		SHEET : 2 OF 3

1.0 **EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:**

- a) Services and equipment as per “Electrical Scope between BHEL and Vendor”.
- b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The 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) Electrical load requirement for **WORKSHOP EQUIPMENTS**.
- e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer/BHEL approval without any commercial and delivery implications to BHEL
- g) 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/BHEL approval without any commercial implication to BHEL.
- h) Motor shall meet minimum requirement of motor specification.
- i) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.
- j) Cable BOQ worked out based on routing of cable listing provided by the vendor for “ both end equipment in vendor’s scope”shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

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

Refer “Electrical Scope between BHEL and Vendor”.

3.0 **DOCUMENTS TO BE SUBMITTED ALONG WITH BID**

- 3.1 The electrical specification without any deviation from the technical/quality assurance requirements stipulated shall be deemed to be complied by the bidder in case bidder furnishes the overall compliance of package technical specification in the form of



TITLE :
TECHNICAL SPECIFICATION
FOR
WORKSHOP EQUIPMENTS (ELECTRICAL PORTION)
1X660 MW UPRVUNL PANKI TPS

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compliance certificate/No deviation certificate.

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

4.0 List of enclosures :

- a) Electrical scope between BHEL & vendor
- b) Quality plan for motors
- c) Datasheet A (Annexure- I)
- d) Customer (M/s DCPL) specification for Motors
- e) Datasheet-C
- f) Electrical Load data format (Annexure –II)

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGE: WORKSHOP EQUIPMENTS (Supply Package)

PROJECT: 1X660 MW UPRVUNL PANKI TPS

<u>S.NO</u>	<u>DETAILS</u>	<u>SCOPE SUPPLY</u>	<u>SCOPE E&C</u>	<u>REMARKS</u>
1	415 V MCC	BHEL	BHEL	240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motors.
3	Power cables, control cables and screened control cables	BHEL	BHEL	Incoming cable from BHEL supplied MCC will be informed by BHEL. Screened control cable between DCS & field equipment will also be informed by BHEL. Vendor shall provide lugs & glands accordingly.
4	Cable trays, accessories & cable trays supporting system	BHEL	BHEL	
5	Cable glands and lugs for equipments supplied by Vendor	Vendor	BHEL	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and control cables.
6	Conduit and conduit accessories for cabling between equipments supplied by vendor	BHEL	BHEL	
7	Equipment grounding & lightning protection	BHEL	BHEL	
8	Below grade grounding	BHEL	BHEL	
9	LT Motors with base plate and foundation hardware	Vendor	BHEL	Makes shall be subject to BHEL approval at contract stage.
10	Recommended O & M spares	Vendor	-	As per specification
11	Any other equipment/material/service required for completeness of system but not specified above (to ensure trouble free and efficient operation of the system).	Vendor	BHEL	
12	Electrical equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

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

QUALITY PLAN FOR MOTORS BELOW 55 KW (LV)

		QUALITY PLAN		CUSTOMER :		PROJECT			SPECIFICATION :			
						TITLE			NUMBER :			
						QUALITY PLAN			SPECIFICATION			
						NUMBER PED-506-00-Q-006, REV-01			TITLE			
		SHEET 1 OF 2		SYSTEM		ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-	
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./MFG. SPEC.	MFG. DRG./MFG. SPEC.	-DO-	2	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUFR'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/BHEL SPEC./DATA SHEET	SAME AS COL.7	TEST REPORT	2	1		NOTE -1 & NOTE-3
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-	NOTE -1 & NOTE-3
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									

	QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION : TITLE :			
	SHEET 2 OF 2		SYSTEM			ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION		VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-	
NOTES: 1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON 2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER. 3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY. <u>Legends for Inspection agency</u> 1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER) P. PERFORM W. WITNESS V. VERIFY												
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

QUALITY PLAN FOR MOTORS 55 KW & ABOVE

		QUALITY PLAN	CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :			
			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
			SHEET 1 OF 9			SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.0	RAW MATERIAL & BOUGHT OUT CONTROL											
1.1	SHEET STEEL, PLATES, SECTION, EYEBOLTS	1.SURFACE CONDITION	MA	VISUAL	100%	-	FREE FROM BLINKS, CRACKS, WAVINESS ETC	LOG BOOK	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	-DO-	3	-	-	
		3.PROOF LOAD TEST (EYE BOLT)	MA	MECH. TEST	-DO-	-DO-	-DO-	INSPEC. REPORT	3	-	2	
1.2	HARDWARES	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, UN-EVENNESS ETC.	-DO-	3	-	-	
		2.PROPERTY CLASS	MA	VISUAL	SAMPLES	MANFR'S DRG./SPEC BOOK	RELEVENT IS/SPEC.	SUPPLIERS TC & LOG	3	-	2	PROPERTY CLASS MARKING SHALL BE CHECKED BY THE VENDOR
1.3	CASTING	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK	3	-	2	
		2.CHEM. & PHY. PROP.	MA	CHEM & MECH TEST	1/HEAT NO.	MANFR'S DRG./SPEC	RELEVENT IS/	SUPPLIER'S TC	3	-	2	HEAT NO. SHALL BE VERIFIED
		3.DIMENSIONS	MA	MEASUREMENT	100%	MANUFR'S DRG.	MANUFR'S DRG.	LOG BOOK	3	-	2	
1.4	PAINT & VARNISH	1.MAKE, SHADE, SHELF LIFE & TYPE	MA	VISUAL	100% CONTINUOUS	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	LOG BOOK	3	-	2	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN		CUSTOMER :		PROJECT			SPECIFICATION :			
				BIDDER/ :		TITLE			NUMBER :			
				VENDOR		QUALITY PLAN			SPECIFICATION :			
SHEET 2 OF 9		SYSTEM		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED
		2. CHEM. & PHYSICAL PROPERTIES	MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	MFG. DRG. SPEC.	RELEVANT IS	SUPPLIER'S TC	3	-	2	
		3. DIMENSIONS	MA	MEASUREMENT	100%	-DO-	MANUFR'S DRG.	LOG BOOK	3	-	2	
		4.INTERNAL FLAWS	CR	UT	-DO-	ASTM-A388	MANUFR'S SPEC. BHEL SPEC.	-DO-	3	2	1	
1.6	SPACE HEATERS, CONNNECTORS, TERMINAL BLOCKS, CABLES, CABLE LUGS, CARBON BRUSH TEMP. DETECTORS, RTD, BTD'S	1. MAKE & RATING	MA	VISUAL	-DO-	MANUFR'S DRG. SPEC.	MANUFR'S DRG. SPEC.	-DO-	3	-	2	FOR DIA OF 55 MM & ABOVE
		2. PHYSICAL COND.	MA	-DO-	-DO-	-	NO PHYS. DAMAGE, NO ELECTRICAL DISCONTINUITY	-DO-	3	-	2	
		3.DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	MANUFR'S DRG./ SPEC.	MANUFR'S DRG. / SPEC.	-DO-	3	-	2	
		4.PERFORMANCE/ CALIBRATION	MA	TEST	100%	-DO-	-DO-	INSP. REPORT	3	-	2	
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :		
				BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE		
		SHEET 3 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION		VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND. ETC.	MA	VISUAL	100%	-	NO VISUAL DEFECTS	INSPT. REPORT	3	-	2	FOR MV MOTOR INSULATION/VARNISH THICKNESS SHALL BE MORE THAN THE BURS HEIGHT * MOTOR MANUFACTURER TO CONDUCT VISUAL CHECK FOR SURFACE FINISH ON RANDOM BASIS (10% SAMPLE) AT HIS WORKS AND MAINTAIN RECORD FOR VERIFICATION BY BHEL/CUSTOMER.
		2. OTHER CHARACTERISTICS	MA	TEST	SAMPLE	MANUF'S SPEC.	MANUF'S SPEC.	LOG BOOK AND OR SUPPLIER'S TC	3	-	2	
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND.	MA	VISUAL	100%	-	NO VISUAL DEFECTS (FREE FROM BURS)	LOG BOOK	3	-	-	
		2.DIMENSIONS INCLUDING BURS HEIGHT	MA	MEASUREMENT	SAMPLE	MANUFR'S DRG. .	MANUFR'S DRG.	-DO-	3	-	2	
		3. ACCEPTANCE TESTS	MA	ELECT. & MECH TESTS	-DO-	MANUF'S SPEC./ RELEVANT IS	RELEVANT IS	SUPPLIER'S TC	3	-	2	
1.9	CONDUCTORS	1. SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	LOG BOOK	3*	-	2*	
		2.ELECT. PROP, & MECH. PROP	MA	ELECT. & MECH.TEST	SAMPLES	RELEVANT IS/ BS OR OTHER STANDARDS	RELEVANT IS/ BS OR OTHER STANDARDS	SUPPLIERS TC & VENDOR'S INSPN. REPORTS	3	-	2	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN		CUSTOMER :		PROJECT TITLE			SPECIFICATION : NUMBER :			
				BIDDER/ VENDOR :		QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			
		SHEET 4 OF 9		SYSTEM		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION		VOLUME III	
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	10			11
1.10	BEARINGS	3.DIMENSIONS	MA	MEASUREMENT	-DO-	-DO-	-DO-	Log Book	3	-	2	
		1.MAKE & TYPE	MA	VISUAL	100%	MANFR'S DRG./ APPROVED DATASHEET	MANFR'S DRG./ APPROVED DATASHEET	-DO-	3	-	2	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	BHEL DATA SHEET	BHEL DATA SHEET BEARING MANUF'S CATALOGUES	-DO-	3	-	2	
		3.SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	2	
1.11	SLIP RING (WHEREVER APPLICABLE)	1.SURFACE COND.	MA	VISUAL	100%	-	-DO-	-DO-	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	
		3.TEMP.WITH-STAND CAPACITY	MA	ELECT.TEST	-DO-	MANUF'S SPEC./ BHEL SPEC.	MANUF'S SPEC./ BHEL SPEC.	-DO-	3	-	2	
		4.HV/IR	MA	-DO-	100%	-DO-	-DO-	-DO-	3	-	2	
1.12	OIL SEALS & GASKETS	1.MATERIAL OF GASKET	MA	VISUAL	100%	MANUF'S DRG/SPECS	MANUF'S DRG./ SPECS.	-DO-	3	-	-	
		2.SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN		CUSTOMER :		PROJECT			SPECIFICATION :			
				BIDDER/ :		TITLE			NUMBER :			
		SHEET 5 OF 9		VENDOR		QUALITY PLAN			SPECIFICATION :			
		SYSTEM		NUMBER PED-506-00-Q-007, REV-03			TITLE					
				ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION		VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.0	IN PROCESS											
2.1	STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR)	1.WORKMANSHIP & CLEANNES	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	3/2	2	-	
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-	
2.2	MACHINING	1.FINISH	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	2	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-	
		3.SHAFT SURFACE FLOWS	MA	PT	-DO-	RELEVANT SPEC./ASTM-E165	MANUF'S SPEC./BHEL SPEC./	-DO-	2	-	1	
2.3	PAINTING	1.SURFACE PREPARATION	MA	VISUAL	100%	MANFR'S SPEC/BHEL SPEC./RELEVANT STAND	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
		2.PAINT THICKNESS (BOTH PRIMER & FINISH COAT)	MA	MEASUREMENT BY ELCOMETER	SAMPLE	-DO-	-DO-	-DO-	2	-	-	
		3.SHADE	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	2	-	-	
		4.ADHESION	MA	CROSS CUTTING & TAPE TEST	-DO-	-DO-	-DO-	Log Book	2	-	-	
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN		CUSTOMER :			PROJECT TITLE		SPECIFICATION : NUMBER :			
				BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03		SPECIFICATION : TITLE			
		SHEET 6 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION		VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.4	SHEET STACKING	1.COMPLETENESS	MA	MEASUREMENT	SAMPLE	MANUFR'S SPEC.	MANUFR'S SPEC.	Log Book	2	-	-	(FOR MOTORS OF 2MW AND ABOVE) * ON 10% RANDOM SAMPLE
		2.COMPRESSION & TIGHTENING	MA	MEASUREMENT	100%	-DO-	-DO-	Log Book	2	-	-	
		3.CORE LOSS & HOTSPOT	MA	ELECT.TEST	-DO-	-DO-	-DO-	Log Book	2	1*	1	
2.5	WINDING	1.COMPLETENESS	CR	VISUAL	100%	MANUFR'S SPEC./BHEL SPEC.	MANUFR'S SPEC./BHEL SPEC.	Log Book	2	-	-	
		2.CLEANLINESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-	
		3.IR-HV-IR	CR	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	2	-	1	
		4.RESISTANCE	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	
		5.INTERTURN INSULATION	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-	
		6.SURGE WITH STAND AND TAN. DELTA TEST	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	
											FOR MV MOTOR	
2.6	IMPREGNATION	1.VISCOSCITY	MA	PHY. TEST	AT STARTING	-DO-	-DO-	Log Book	2	-	-	THREE DIPS TO BE GIVEN
		2.TEMP. PRESSURE VACCUM	MA	PROCESS CHECK	CONTINUOUS	-DO-	-DO-	Log Book	2	-	-	
		3.NO. OF DIPS	MA	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE									
									BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN		CUSTOMER :			PROJECT TITLE		SPECIFICATION : NUMBER :				
				BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03		SPECIFICATION : TITLE				
		SHEET 7 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)		SECTION		VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
1	2	3	4	5	6	7	8	9	10	P	W	V	11
2.7	COMPLETE STATOR ASSEMBLY	4.DURATION	MA	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1		VERIFICATION FOR MV MOTOR ONLY
2.8	BRAZING/COMPRESSION JOINT	1.COMPACTNESS & CLEANLINESS	MA	VISUAL	100%	-DO-	-DO-	Log Book	2	-	-		
2.9	COMPLETE ROTOR ASSEMBLY	1.COMPLETENESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-		
		2.SOUNDNESS	CR	MALLET TEST & UT	-DO-	-DO-	-DO-	Log Book	2		1		
		3.HV	MA	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	2		1		
2.10	ASSEMBLY	1.RESIDUAL UNBALANCE	CR	DYN. BALANCE	-DO-	MFG SPEC./ ISO 1940	MFG. DWG.	Log Book	2		1		
		2.SOUNDNESS OF DIE CASTING	CR	ELECT. (GROWLER TEST)	-DO-	MFG. SPEC.	MFG. SPEC.	Log Book	2		1		
		1.ALIGNMENT	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	2	-	-		
		2.WORKMANSHIP	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	2	-	-		
		3.AXIAL PLAY	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	2	-	1		
		4.DIMENSIONS	MA	-DO-	-DO-	MFG.DRG./ MFG SPEC.	MFG. DRG/ RELEVANT IS	Log Book	2	-	-		
		5.CORRECTNESS, COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	2	-	-		
6. RTD, BTD & SPACE HEATER MOUNTING.	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	2		1				
BHEL			PARTICULARS		BIDDER/VENDOR								
			NAME										
			SIGNATURE										
			DATE					BIDDER'S/VENDORS COMPANY SEAL					

		QUALITY PLAN		CUSTOMER :		PROJECT			SPECIFICATION :			
				BIDDER/ :		TITLE			NUMBER :			
		SHEET 8 OF 9		VENDOR		QUALITY PLAN			SPECIFICATION :			
		SYSTEM		NUMBER PED-506-00-Q-007, REV-03			TITLE			SECTION		
				ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			VOLUME III					
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
3.0	TESTS	1.TYPE TESTS INCLUDING SPECIAL TESTS AS PER BHEL SPEC.	MA	ELECT.TEST	1/TYPE/SIZE	IS-325/ BHEL SPEC./ DATA SHEET	IS-325/ BHEL SPEC./ DATA SHEET	TEST REPORT	2	1*	1	* NOTE - 1
		2.ROUTINE TESTS INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^{\$}	1	^{\$} NOTE - 2
		3.VIBRATION & NOISE LEVEL	MA	-DO-	100%	IS-12075 & IS-12065	IS-12075 & IS-12065	-DO-	2	1 ^{\$}	1	^{\$} NOTE - 2
		4.OVERALL DIMENSIONS AND ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPC. REPORT	2	1	-	
		5.DEGREE OF PROTECTION	MA	ELECT. & MECH. TEST	1/TYPE/ SIZE	RELEVANT IS	BHEL SPEC. AND DATA SHEET	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		6. MEASUREMENT OF RESISTANCE OF RTD & BTD	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^{\$}	1	^{\$} NOTE - 2
		7. MEASUREMENT OF RESISTANCE, IR OF SPACE HEATER	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^{\$}	1	^{\$} NOTE - 2
		8. NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPC. REPORT	2	1 ^{\$}	1	^{\$} NOTE - 2
		9.EXPLOSION FLAME PROOF NESS (IF SPECIFIED)	MA	EXPLOSION FLAME PROOF TEST	1/TYPE	IS-3682 IS-8239 IS-8240	IS-3682 IS-8239 IS-8240	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		10. PAINT SHADE, THICKNESS & FINISH	MA	VISUAL & MEASUREMENT BY ELKOMETER	SAMPLE	BHEL SPEC. & DATA SHEET	BHEL SPEC. & DATA SHEET	TC	2	1 ^{\$}	1	SAMPLING PLAN TO BE DECIDED BY INSPECTION AGENCY ^{\$} NOTE - 2
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE									
BIDDER'S/VENDORS COMPANY SEAL												



		QUALITY PLAN		CUSTOMER :		PROJECT TITLE		SPECIFICATION : NUMBER :				
				BIDDER/ : VENDOR		QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03		SPECIFICATION : TITLE				
		SHEET 9 OF 9		SYSTEM		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)		SECTION		VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY P W V			REMARKS
1	2	3	4	5	6	7	8	9	10			11
NOTES: 1 DEPENDING UPON THE SIZE AND CRITICALLY, WITNESSING BY BHEL SHALL BE DECIDED. 2 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON. 3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THESE TEST MAY NOT BE REPEATED. 4 WHEREVER CUSTOMER IS INVOLVED IN INSPECTION, AGENCY (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER. <u>Legends for Inspection agency</u> 1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER) P. PERFORM W. WITNESS V. VERIFY												
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE									
												BIDDER'S/VENDORS COMPANY SEAL

DATA SHEET A		
SL NO.	DESCRIPTION	
		1X660 MW UPRVUNL PANKI TPS EXT.
A	General	
1	Manufacturer & country of origin	DURING DETAILED ENGINEERING
2	Motor type	SQUIREL CAGE INDUCTION MOTOR
3	Efficiency class	IE3
4	Type of starting	DOL
5	Maximum acceptable kW rating of LV motor	200
6	Rating up to which Single phase motors permitted.	
7	Installation (Indoors/ Outdoors)	indoor/outdoor
8	Degree Of Protection	IP55 WITH CANOPY FOR OUTDOOR IP55 FOR INDOOR
9	Name of the equipment driven by motor & Quantity	DURING DETAILED ENGINEERING
10	Maximum Power requirement of driven equipment	DURING DETAILED ENGINEERING
11	Rated speed of Driven Equipment	As per system requirement
12	Design ambient temperature (Degree Celcius)	50 deg C
B	Design and Performance Data	
1	Frame size & type designation	DURING DETAILED ENGINEERING
2	Type of duty	AS PER REQUIREMENT
3	Rated Voltage	240/415 V
4	Rated Frequency	50 Hz
5	System fault level at rated voltage	50kA for 1 sec
6	LV System grounding	solidly grounded
7	Permissible variation for	
a	Voltage	+/-10%
b	Frequency	+/-5%
c	Combined voltage & frequency	10%
8	Rated output at design ambient temp (by resistance method)	as per requirement
9	Synchronous speed & Rated slip	as per requirement

10	Minimum permissible starting voltage	80% of rated voltage
11	TYPE OF STARTER PROVIDED IN MCC	As per system requirement
12	Starting time in sec with mechanism coupled	
a	At rated voltage	As per system requirement
b	At min starting voltage	
13	Locked rotor current as percentage of FLC (including IS tolerance)	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) (a) Below 110KW : 10.0 (b) From 110 KW & upto 200 KW : 9.0
14	Torque	
a	Starting	a) Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.
b	Maximum	B) Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.
15	Permissible temp rise at rated output over ambient temp & method	Thermal class 155 (F) insulation, temperature rise limited to class-B.
16	Noise level in (dB)	85 (dB) at 1 M
17	Amplitude of vibration	As per IS-12075/IEC-60034-14
18	Efficiency & P.F. at rated voltage & frequency	
a	At 100% load	Efficiency as per IS 12615, IEC: 60034-30 (Latest

b	At 75% load	revision), P.F. as per requirement.
c	At starting	Efficiency as per IS 12615, IEC: 60034-30 (Latest revision), P.F in line with starting requirement as per relevant standard.
C	Constructional Features	
1	Method of connection of motor driven equipment	As per system requirement
2	Applicable Standard	as per relevant standard
3	DOP of Enclosure	IP55 WITH CANOPY FOR OUTDOOR IP55 FOR INDOOR
4	Method of cooling	IC 411 (TEFC), IC 511 (TETV) or IC 611 (CACA).
5	Class of insulation	All motors shall have class F insulation but limited to class B temperature rise
6	Main terminal box	
a	Type	Refer Specific technical requirement for motors
b	Power Cable details (Conductor, size, armour/unarmour)	1.1 kV XLPE armour cable, size shall be provided during detailed engineering
c	Cable Gland & lugs details (Size, type & material)	Refer Specific technical requirement for motors
d	Permissible Fault level (kArms & duration in sec)	
e	Degree of Protection	
7	Earth Conductor Size & Material	Refer Specific technical requirement for motors
8	Space heater details (30KW & ABOVE) (Voltage & watts)	Refer Specific technical requirement for motors
9	Flame proof motor details (if applicable)	During detailed engineering
a	Enclosure	
b	suitability for hazardous area	
i	Zone O / I / II	
ii	Group IIA / IIB / IIC	
c	Degree of Protection	
9	No. of Stator winding	As per system requirement
10	Winding connection	As per system requirement
11	Kind of rotor winding	As per system requirement
12	Kind of bearings	Refer Specific technical requirement for motors
13	Direction of rotation when viewed from NDE	Motor shall be bi-directional

14	Paint Shade & type	Glossy light grey finish no 631 of IS 5, for details refer Specific technical requirement for motors
15	Net weight of motor	DURING DETAILED ENGINEERING
16	Outline mounting drawing No (To be enclosed as annexure)	DURING DETAILED ENGINEERING
D	Characteristic curves/ drawings	
1	(To be enclosed for motors of rating >55KW)	DURING DETAILED ENGINEERING
2	Torque speed characteristic	
3	Thermal withstand characteristic	
4	Current vs time	
5	Speed vs time	
E	Tests on motors	As applicable (As per QAP/For Project specific requirement if any refer Specific technical requirement for motors)

CHAPTER 17 : AC & DC MOTORS**1.00 MOTORS****1.1 SCOPE**

This specification is intended to cover design, manufacture, assembly and testing of AC Squirrel Cage Induction Motors for use in Thermal Power Plants and is supplement to the driven equipment specifications under which these motors are being procured for the project.

SITE CONDITIONS

Site conditions are covered in 'Project Data', contained in specification of the driven equipment.

1.2 Gases, Fumes & Dust Particles

1.2.01 General - Sulphur dioxide and/or trioxide fumes mildly present. Climate is tropical, conducive to fungus growth.

1.2.02 Dust Particles

1 Outdoor locations - Heavily dusty with abrasive dust and coal particles of size five (5) to hundred (100) microns present in atmosphere in large quantity.

2 Indoor Locations.

2.1 Coal conveyors - As for outdoor as per clause 1.02.02.1 above.

2.2 Other locations - Lightly dusty with abrasive dust and coal particles of size five (5) to twenty (20) microns present in atmosphere.

1.2.03 Special Fumes

1 Water treatment plant and acid cleaning room - Acid and alkali fumes present.

2 Fuel oil pumping areas & Hydrogen generation plant - Explosive fumes (flameproof motors required).

1.2.04 For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.

1.3 LOCATION OF MOTOR - As required

1.4 **SPECIFICATIONS & STANDARDS**.....Motors shall comply with the latest revisions of all relevant standards of BIS (IS-325, IS-900, IS-996, IS-1231, IS-1885, IS-2148, IS-2223, IS-2253, IS-2254, IS-2848, IS-3202, IS-4029, IS-4691, IS-4722, IS-4728, IS-4889, IS-6362, IS-7816, IS-8223, IS-8789, IS: 12615, IS:3177 and IEC : 60034 3Φ Induction motor) except as modified herein or in driven equipment specification.

Motors conforming to BS or IEC Publications, which ensure equivalent quality shall also be acceptable. In case of any difference between IS Specification/International Standards (IEC; NEMA etc.), this motor specification prevails.

1.5 TYPE

1.5.1 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 **Efficiency class-IE2**, conforming to IS 12615, or IEC:60034-30.
- c) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.

1.5.2 DC Motors Shunt wound.

1.6 VOLTAGE (NOMINAL)

1.6.1 LV Motors

For motors upto and including 200 KW - Four hundred fifteen (415) V.

1.6.2 MV MOTORS

For motors above 200kW upto and including 1500kW, Three point three (3.3) kV.

For CHP conveyors motor above 160 kW, 3.3 kV, AC supply is to be used. However all the motors on stacker reclaimer shall be on 415 V AC only.

1.6.3 HV Motors

For motors above 1500kW - eleven(11) KV

1.6.4 All motors are to be designed for system grounding described in "System Particulars" under site information of the Driven Equipment Specification.

1.7 FREQUENCY (NOMINAL) - fifty (50) Hertz

1.8 NUMBER OF PHASES - Three (3)

1.9 SPEED - As required by the driven equipment

1.10 TYPE OF STARTING :

Direct on-line (VFD/Soft-starter/star/delta starting in special cases)

1.11 DUTY

1.11.1 Continuous motor rating shall be arrived at considering 15% margin over the duty point input or 10% over the maximum demand of the driven equipment,

Motor shall be capable of starting and accelerating to full speed at full load (including loaded equipment e.g. mills and conveyors etc) at eighty (80)



percent nominal voltage at motor terminals. Mill motors may be permitted to start with terminal voltage not below 90%.

1.14.2 Cold Motor Starting Under specified voltage variations two (2) starts in quick succession and third start five (5) minutes thereafter, all with full load (including loaded equipment eg mills and conveyors etc) of driven equipment. No additional start will be made till lapse of further thirty (30) minutes.

1.14.3 Hot Motor Starting Under specified voltage variations, one (1) immediate and two (2) fifteen (15) minutes interval starts all with full load (including loaded equipment e.g. mills and conveyors etc) of driven equipment. No additional start will be made till lapse of further thirty (30) minutes.

1.14.4 Motor shall also be suitable for three (3) equally spread starts per hour when the motor is under normal service condition.

1.14.5 Break-away Starting Current Breakaway starting current as percent of full load current for various motor ratings shall not exceed the values given below:

1.14.5.1 Motors above 1500 KW upto 4000kW 600% without any positive tolerance except for ID Fan Motor.

1.14.5.2 Motors above 4000 KW 450%. Not subject to any positive tolerance.

1.14.5.3 For D.C. Motors the starting current shall be limited to 2 times full load current.

1.14.5.3 **Starting voltage requirement**

a) All Motors (except Mill Motors)

- 80% of rated voltage for Motors upto 4000 kW
- 75% of rated voltage for Motors above 4000 kW

b) For Mill Motors:

- 85% of rated voltage for Motors above 1000 kW
- 90% of rated voltage for Motors below 1000 kW

Except AOP & JOP motors running on D.G emergency supply, starting voltage shall be 80%.

1.14.5.4 **Starting Time**

1.14.5.4.1 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.

1.14.5.4.2 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.

1.14.5.4.3 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.



1.14.5.5 Torque Requirements:-

- 1.14.5.5.1 Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10%. Motor full load torque.
- 1.14.5.5.2 Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty Motors.

1.15 SAFE STALL TIME

- 1.15.1 To avoid problem in selecting standard protective relays without using speed switches, safe stall time under hot conditions (corresponding to 110% nominal voltage at motor terminals) shall be more than the accelerating time (corresponding to 80% nominal voltage at motor terminals) by the following minimum values :
- 1.15.1.01 Two (2) seconds, where accelerating time (at 80% nominal voltage) does not exceed 20 seconds.
- 1.15.1.02 Three (3) seconds, where accelerating time (at 80% nominal voltage) exceeds 20 seconds.
- 1.15.1.03 At no stage, speed switch shall be provided to achieve the above requirements mentioned under Clause No. 1.14.5.4

1.16 CLASS OF INSULATION

- 1.16.1 LV Motors Class F.
- 1.16.2 MV & HV Motors Class F
- 1.16.03 However temperature rise shall be restricted to limits corresponding to Class 'B' insulation for both HT & LT motors. The temperature under abnormal running conditions shall be limited to 5°C above class 'B' limits.
- 1.16.04 The value of the polarization index for motors above 200kW should not be less than 2 when determined according to IS: 7816.
- 1.17 **TEMPERATURE RISE UNDER NORMAL CONDITIONS.....** Temperature rise over specified design ambient temperature when motor is running with full load at nominal supply voltage & frequency shall not exceed the values given below:

S.No.	Specified Design Ambient Temperature	Thermometer Method	Resistance Method
1.17.01	50°C	60°C	70°C
1.17.02	45°C	65°C	75°C
1.17.03	40°C	70°C	80°C

1.18 BUS TRANSFER WITHSTAND CAPABILITY

Motors will be connected to an automatic bus transfer system and hence may be subjected to one hundred and fifty (150) percent of the nominal voltage during changeover of buses due to the vector difference between the residual voltage and incoming supply voltage and the duration of this condition may be one second. Motors shall be capable of withstanding the voltage and torque stresses developed under such conditions without damage. The manufacturer/vendor shall indicate the special precautions taken to meet the above requirements and confirm.

- 1.18.01 That about 5000 bus transfers, in lifetime of motor, shall not puncture its insulation.
- 1.18.02 That motor shall be capable of withstanding heavy inrush transient current caused by such bus transfers without damage.
- 1.18.03 That the motor windings shall be adequately braced to satisfactorily withstand mechanical stresses under these conditions.
- 1.18.04 The motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torques under these conditions.

1.19 TYPE OF ENCLOSURE

- 1.19.01 Outdoor Motors IP 55 (Additional canopy to be provided by EPC contractor.
- 1.19.02 Indoor Motors IP 55
- 1.19.03 IP-55 degree of protection shall be achieved without application of any compound, putty etc.
- 1.19.04 Motor located in hazardous area shall have flameproof enclosure conforming to IS: 2148 /Equiv. as detailed below:
- a) Fuel Oil area : Group IIB
 - b) Hydrogen generation plant area : Group IIC (or Group-I, Div-II as per NEC or Class-1, Gr-B, Div-II as per NEMA/IEC60034).

1.20 METHOD OF COOLING

- 1.20.1 Method of cooling shall be IC 411 (TEFC), IC 511 (TETV) or IC 611 (CACA). However, motors rated 3000kW or above can be closed air circuit water cooled (CACW).
- 1.20.2 Large capacity motors not available with above types of cooling may be accepted with IC 81 W for IC 91 W (CACW) cooling subject to the approval of the Owner.

1.21 TYPE OF MOUNTING As required for the driven equipment.**1.21 MAXIMUM MECHANICAL VIBRATIONS**

- 1.21.01 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.

1.21.02 Noise level

The noise level of motors shall not exceed 85 db (A) at 1m from operating motor measured in accordance with IS: 10265.

1.21.03 Motor body shall have two earthing points on opposite sides.

1.21.04 11 KV motors shall be offered with Separate Insulated Connector (Elastimould or Equivalent make) as per IEEE 386. The offered Elastimould terminations shall be provided with protective cover and trifurcating sleeves. Elastimould termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.

1.21.05 3.3 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Suitable termination kit shall be provided for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. 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.

1.21.06 The spacing between gland plate & centre of terminal stud shall be as per Table-I.

TABLE - I

DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS

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

For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.

1.21.07 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.

1.21.08 For motors rated 1500 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.

1.21.09 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.

(a)	Below 110KW	:	10.0
(b)	From 110 KW & upto 200 KW	:	9.0
(c)	Above 200 KW & upto 1000KW	:	10.0
(d)	From 1001KW & upto 4000KW	:	9.0
(e)	Above 4000KW	:	6 to 6.5

1.22 WINDING & INSULATION

- (a) Type : Non-hygroscopic, oil resistant, flame resistant
- (b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature.
- (c) 11kV & 3.3 kV : Thermal class 155 (F) insulation.
AC motors
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
- (d) 240VAC, 415V : Thermal Class(B) or better
AC & 220V
DC motors

1.23 DIRECTION OF ROTATION

1.23.1 As needed by driven equipment.

1.23.2 The 3 phase motor shall, however, be suitable for operation in both directions of rotation. A plate showing direction of rotation as determined by the phase sequence on the terminals marking shall be screwed at non-driving end of the body of the motor.

1.23.3 If, in the case of HT motors, fan is suitable for only one direction of rotation, the fan shall be so designed that with the slight modification work, it can be made suitable for other direction of rotation also. No extra material shall be required for doing above modification work.

1.24 BEARINGS



- 1.24.1 General Greased ball, roller and/or sleeve bearing shall be rated for minimum standard life of 20,000 hours taking bearing and driven equipment loads into account. Loss of grease shall be scarce and it shall not creep along shaft into motor housing.
- Bearing shall be effectively sealed against dust ingress and shall be pressure grease gun lubricated.
- If the bearings are oil lubricated, a drain plug shall be provided for draining residual oil and oil level gauge shall be provided to show precisely oil level required under standstill and running conditions.
- Unless otherwise approved, bearing lubricating system shall be such that no external forced oil or water is necessary to maintain required oil supply to keep bearing temperature within design limits.
- For MV & HV motors, the bearings shall be insulated wherever necessary to prevent damage to motor bearings from shaft current.
- When pressure oiling is required for horizontal motors, bearings shall be sleeve type arranged for pressure oiling supplied from lubrication system of driven machine, with ring oiling for starting and emergency duty. Ring oiling system shall be adequate for starting and continuous operation of motor for at least half an hour, without pressure oiling system in operation. Oil sight flow gauges shall be provided to indicate oil flow through each bearing.
- Lubricants shall be selected for prolonged storage and normal use of motors in tropical climate and shall contain corrosion and oxidation inhibitors. Greases shall have suitable bleeding characteristics to minimize setting. The selected lubricants shall be indigenously available.
- Sleeve bearings for use with motors having flexible coupling with limited end play, shall have adequate axial end play to prevent transmission of thrust from driven equipment to motor bearings.
- Bearings shall be of reputed make subject to the approval of the Owner/Consulting Engineer.
- 1.24.2 Large motors Large motors shall preferably have spherically seated babitted, ring forced, feed lubricated, water-cooled bearings. If anti-friction bearings are provided, these shall be roller bearings rated for a minimum standard life of 30000 hours taking all bearing and driven equipment loads into account.
- 1.25 **SHAFT EXTENSION** Key slotted bare shaft extension of required length with key on driving end.
- 1.26 **DRAIN HOLES** Two (2) drain holes with plugs, one (1) on either end of motor at the bottom most point.
- 1.27 **LIFTING DEVICES** Motors shall be provided with eyebolts, lugs or other means to facilitate safe lifting.
- 1.28 **DOWEL PINS**..... It shall be possible to drill holes vertically inclined through motor feet or mounting flange for installing dowel pins after assembling motor and driven equipment, before despatch (for completed driving + driven

equipment assembly) or at site after erection (for separate supplies of above equipment).

1.29 **CENTERING SPIGOT**..... Flange mounted motor shall have centering spigot to match driven equipment socket.

1.30 **EASE OF MAINTENANCE**..... Motor shall be so constructed that it can be de-assembled and reassembled with ease.

1.31 **NAMEPLATES**..... Motor shall have nameplate(s) showing diagram of connections, all particulars as per IS: 325 and following additional information:

In addition, an arrow block shall be screwed on to the body of motor on the non-driving end to indicate direction of rotation of motor.

1.31.1 Temperature rise under normal/abnormal conditions.

1.31.2 Type of bearing and recommended lubricants.

1.32 **FINISH**..... Motor shall have glossy, light grey finish No. 631 as per IS: 5 for withstanding site conditions as per Clause 1.00 above.

All sharp edges and scales shall be removed from the surface, which shall then be thoroughly degreased, de-rusted and given two (2) coats of primer and two (2) coats of finish paint. It is preferred that a phosphate coat is given to motor prior to application of primer coat. Motors for water treatment plant shall have Zinc Chromate base with acid resistant Epilex 4 paint.

1.33 **TERMINAL BOXES**

1.33.1 GeneralMotors shall be provided with separate terminal boxes for main, space heaters, embedded temperature detectors, bearing temperature indicators and moisture detectors terminals. When it is not possible to provide LT motors with separate terminal box for space heater terminals, space heater terminals shall be adequately segregated from the main terminals in the single box. Terminal boxes shall be weatherproof and water-tight confirming to minimum IP-55 degree of protection with removable front cover for making connections. IP-55 degree of protection shall be achieved without application of compound. Space between and around terminals shall be adequate for easily connecting aluminium conductor cables. Terminal box arrangement shall be to the approval of the Owner /Consulting Engineer. All terminal boxes shall be suitable for proper termination of the type and tentative size of cables specified in Clause 1.34 below, however, exact size of cables shall be furnished by Owner during engineering stage.

The terminal boxes shall be complete with cable glands and termination accessories as required. Suitable non-magnetic material construction shall be adopted for terminal boxes where single core cables are to be terminated. All HT motors shall be provided with phase segregated terminal box.

Terminal bushings and clamps shall be non-absorbent, non- inflammable, insulated material for connecting with cable.

1.33.2 **Main Terminal Box**



1.33.2.1 LV Motors Main terminal box shall be capable of being turned through 360 degrees in steps of 90 degrees.

1.33.2.2 MV & HV Motors Motor shall be provided with two (2) terminal boxes for stator terminals. One (1) terminal box shall be for phase terminals while other one for forming star connection. These should be interchangeable to facilitate cable routing.

Neutral terminal box for HT motors rated above 1500 KW shall be suitable for mounting of three (3) Nos. wound/bar primary/ring type cast resin insulated current transformers for differential protection. These transformers shall be supplied and mounted in the motor terminal box. In addition to above, 3 Nos. of identical current transformers shall be supplied loose for mounting in the switchgear. Stator phase terminal box may either be phase segregated or standard terminal box suitable for both top and bottom entry of cables (i.e. they should be capable of being turned through 180 Degrees). The terminal box shall be designed for termination of XLPE cables using heat shrinkable or push on type terminating Kit. Terminal leading shall be stud type or leading wire type.

1.33.2.3 Cable End Boxes.....Terminal Boxes shall be provided with cable end boxes having cable lugs and cable glands for cables of sizes as specified in Clause 1.34 below.

Cable box shall be suitable for glanding the cables; and shall have adequate space between cable glands terminating studs to allow suitable bends of cable inside the cable box for all 3 phases of relevant cable sizes specified.

1.33.2.4 The terminal boxes shall be capable of withstanding at the terminals the system fault level (as indicated below) without rupture for a duration of atleast 0.25 seconds.

Min. fault level for MV Motors - 40 KA

Min. fault level for LV & HV Motors - 50 KA

1.33.2.5 **PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:**

NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:

Motor MCR in KW	Clearance
UP to 110 KW	10mm
Above 110 KW and upto 150 KW	12.5mm
Above 150 KW	19mm

1.33.2.6 Terminal Accessories.....Each terminal end shall be furnished with bimetallic washers, spring washers, nuts and crimp type aluminium (preferably tinned) lugs suitable for cables of sizes as specified in Clause 1.34 below.

1.34 **TYPE AND SIZE OF CABLES**

1.34.1 **Space Heaters**



- 1.34.1.1 For LV Motors: Two point five (2.5) mm², two (2) core copper conductor PVC insulated, armoured and FRLS PVC sheathed heavy duty 650/1100 V grade cable to IS: 1554 (Part-I).
- 1.34.1.2 For MV & HV Motors: Six (6) mm² two core aluminium conductor PVC insulated armoured and FRLS PVC sheathed heavy duty 650/1100V grade cable to IS: 1554 (Part-I).
- 1.34.2 For Embedded Temperature Detectors two sets of six (6) Twisted triad 0.5 mm² ATC copper conductor armoured, shielded cable, 650/1100 V Grade IS: 1554 (Part-I). For bearing temperature, RTDS, two (2) sets of four (4) twisted triad 0.5 mm², ATC copper conductor armoured shielded 650/1100 V Grade, IS: 1554 (Part-I).
- 1.34.3 Bearing Temperature Indicators - For each indicator, 0.5 mm² six (6) tarnished triad ATC copper conductor, PVC insulated, shielded armoured and FRLS PVC sheathed heavy duty 650/1100 V grade cable as per IS: 1554 Part-I. Two (2) cables one (1) for each bearing temperature indicator.
- 1.34.4 For Moisture Detectors.....As for space heaters as per Clause 33.01.01 above.
- 1.34.5 **For Main Terminals**

LT Motors

1. Three (3) core cablesStranded aluminium conductor, XLPE insulated, colour coded, laid up, PVC sheathed, GI wire / strip armoured, FRLS PVC jacketed overall, 650 / 1100V grade, heavy-duty cables as per IS: 1554 (Part-I).
2. Single core cablesStranded aluminium conductor, XLPE insulated, hard drawn aluminium wire/ strip armoured FRLS PVC jacketed overall, 650 / 1100V grade, heavy duty cable as per IS: 1554 (Part-I).

HT Motors

1. Three (3) core cables stranded aluminium conductor, XLPE insulated, screened colour coded, laid up, PVC sheathed, GI wire/strip armoured FRLS PVC jacketed overall, 6.6 KV / 11 KV grade, heavy duty cables as per requirement for unearthed system as per IS: 7098 (Part-II).

The size and no. of cable to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box, cable gland and lugs suitable for the same.

Cable size may be increased in some cases because of large number of cables in under-ground ducts or because of voltage drop consideration. The supplier shall supply with terminal box and cable accessories suitable for higher size of cable at no extra cost.

1.35 **EARTHING**

- 1.35.01 General..... Two (2) grounding terminals one (1) on either side at the bottom suitable for connecting mild steel/GI flat/GI wire grounding conductor, size of grounding conductor shall be decided during detailed engineering.



- 1.35.02 LV Motors.....At each earthing point, two (2) drilled and tapped holes with hexagonal head bolts, plain washers, spring washers and tinned lugs (for motors upto 5.5 KW) for size of conductor specified shall be provided.
- 1.35.03 MV & HV Motors.....Non-corrodible metallic grounding pad shall be welded or brazed at each earthing point. The size of grounding pad shall be 75x65x25 mm. Grounding pad shall have 40 mm apart two (2) drilled and tapped holes with hexagonal head bolts, plain washers and spring washers for size of conductor specified. In addition, one suitable earthing terminal shall be provided inside the stator phase terminal box for earthing metallic shield of XLPE cables.
- 1.36 **EMBEDDED TEMPERATURE DETECTORS**.....HT motor shall be provided with six (6) Nos. duplex resistance temperature detectors (RTDs) embedded in stator winding at locations where high temperatures are expected. In addition one (1) duplex type RTD shall be provided in each bearing. The RTDs shall be 3 wire duplex platinum resistance type having a value of 100 ohms at 0 Deg.C
- 1.37 **BEARINGS TEMPERATURE INDICATORS**..... HT motors shall be provided with dial type two (2) bearing temperature indicators and will have two (2) sets of contacts, each set having 2 NO + 2 NC contacts rated for 5A at 240V AC and 0.5A at 220V DC. One set will be set to operate at lower value to give alarm and other set at a higher value to trip the motor.
- 1.38 **SPACE HEATERS**.....Valve / Damper actuator motors; and Motors above 30 KW shall be provided with one (1) or two (2) space heaters suitable for 240V, 50 Hertz single phase AC supply and of adequate capacity to maintain motor internal temperature above dew point to prevent moisture condensation or deterioration of insulation during shut down. Heaters shall be mounted inside the motor in accessible locations so that their removal and replacement is simple. Motors upto 30 kW shall have stator windings suitable for connections to 24V, 50 Hz AC supply for space heating.
- Motors upto 30 kW shall have stator windings suitable for connection to 24V, 50 Hz ac supply for space heating
- The terminals of space heaters shall be brought out to a separate totally enclosed dust proof and weatherproof terminal box.
- 1.39 **HOT AIR TEMPERATURE DETECTOR**
- If the motor is of CACA or CACW enclosure, a thermometer with alarm contracts in hot air circuit shall be provided.
- 1.40 **WATER FLOW INDICATOR**
- If the motor is of CACW enclosure a provision shall be made for visual indication of water flow and flow switch shall also be provided with alarm contacts. Thermometers shall be provided in water inlet and outlet circuits.
- 1.41 **MOISTURE DETECTORS**.....Motors with type of cooling 1C 81W or 1C 91 W shall be provided with moisture detectors for raising alarm in the event of water tube failure.

- 1.42 **BED PLATE**.....Whenever motor is supplied with driven equipment the Supplier shall ensure that bed plate suits both motor and driven equipment and is adequately braced to keep vibration and misalignment within allowable limits to the approval of driven equipment and motor manufacturers.
- 1.43 **OTHER ACCESSORIES**..... Motor shall be supplied with all accessories and parts other than those, specified above which are necessary and/or useful for efficient operation.
- 1.44 **TYPE TEST**
- 1.44.01 **HT MOTORS**
- a) 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. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract.
 - b) The type tests shall be carried out in presence of the Purchaser's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the Purchaser'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.
 - c) In case the contractor has conducted such specified type test(s) within last five years as on the date of bid opening, he may submit during detailed engineering the type test reports to the Purchaser's 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 Purchaser's 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.
 - d) 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 five 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 five 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 Purchaser's either at third party lab or in presence of client representative and submit the reports for approval.
 - e) **LIST OF TYPE TESTS TO BE CONDUCTED**

The following type tests shall be conducted on each type and rating of HT motor

- i) No load saturation and loss curves upto approximately 115% of rated voltage
- ii) Measurement of noise at no load.
- iii) Momentary excess torque test (subject to test bed constraint).
- iv) Full load test(subject to test bed constraint)
- v) 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) LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED

The following type test reports shall be submitted for each type and rating of HT motor

- i) Degree of protection test for the enclosure followed by IR, HV and no load run test.
- ii) Terminal box-fault level withstand test for each type of terminal box of HT motors only.
- iii) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15
- iv) Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15

1.44.02

LT Motors

- a) LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Purchaser's approval the reports of all the type tests as listed in this specification and carried out within last five 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.
- b) However if the contractor is not able to submit report of the type test(s) conducted within last five 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 Purchaser's shall conduct all such tests under this contract at no additional cost to the Purchaser either at third party lab or in presence of client representative and submit the reports for approval.

1.44.03

LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED

1 x 660 MW – Panki Thermal Power Station

Bidding Doc. No. : 14A14-SPC-G-0001



The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only

- i) Measurement of resistance of windings of stator and wound rotor.
- ii) No load test at rated voltage to determine input current power and speed.
- iii) Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors)
- iv) Full load test to determine efficiency power factor and slip .
- v) Temperature rise test.
- vi) Momentary excess torque test.
- vii) High voltage test.
- viii) Test for vibration severity of motor.
- ix) Test for noise levels of motor(Shall be limited as per clause no 1.21.01 of this section)
- x) Test for degree of protection and
- xi) Over speed test.
- xii) Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1

1.44.04 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.

1.45 INFORMATION WITH PROPOSAL

1.45.1 AC Motor Data Sheet.

1.45.2 Dimension Drawing/Foundation load details of motor and driven equipment.
1.45.03 Manufacturer's catalogue showing constructional details.

1.46.00 **INFORMATION ON AWARD OF CONTRACT**.....Within six (6) weeks from the date of award of the Contract, following shall be furnished:

1.46.01 Motor Data Sheet.

1.46.02 Certified binding dimension drawing of motor complete with all accessories and fittings specifically showing terminal boxes, terminal spacing and sizes, earthing connections and sizes thereof, mounting details, lifting lugs, final foundation loads and dimensions with tolerances of centering spigot (where needed), shaft extension and key.

1.46.03 Following characteristics curves:

1.46.03.01 Torque-speed curves for motor at eighty (80), hundred (100) and hundred ten (110) percent rated voltage as well as torque-speed curve for driven equipment.

1.46.03.02 Current-speed curves at eight (80), hundred (100) and hundred ten (110) percent rated voltage

1.46.03.03 Current-time curves at eighty (80), hundred (100) and hundred ten (110) percent rated voltage.

1.46.03.04 Thermal withstand curves for hot and cold at eighty (80), hundred (100) and hundred ten (110) percent rated voltage.



- 1.46.03.05 Efficiency, power factor, current and speed versus power output curves.
- 1.46.03.06 Speed-time curves at eight (80), hundred (100) and hundred ten (110) percent rated voltage.
- 1.46.03.07 Negative phase sequence current withstand characteristics.

1.47 COMMISSIONING CHECK LIST (HT MOTORS)

A PRELIMINARY CHECKS

Check the following:

1. Check the name plate details according to specification. Discrepancies, if any, to be satisfactorily resolved.
2. Check tightness of all bolts, clamps and connecting terminals.
3. Check body earthing
4. Check whether bearing lubrication is adequate
5. Check clearance inside terminal box
6. Checking stator (motor air gap) Check – Grease lubrication (for ball or roller bearing) is adequate if the motor was in storage for very long period replace the grease, by fresh grease after flushing the bearing clean. Excess grease in the bearing (housing ... is overheat of bearings) Check the free rotation of the rotor in decoupled condition. Check the air gap between stator and rotor at four positions 90° apart at driving and non-driving end. Compare the recorded values with factory results. For slip ring motors : with starting resistances.
 - a) Check the variation of resistance
 - b) Check brush lifting and slip ring short.

B COMMISSIONING CHECKS

1. Meggar tests of motor winding and cables
2. Continuity check of motor windings control and power cables
3. Measure resistance of motor winding (in case of large motors)
4. Control and interlocks should be checked
5. Motor protection relay to be calibrated
6. Phase sequence and direction of rotation
7. Other than DOL scheme to be checked example trafo starts
9. Measure starting current starting timer and no load current
10. On load operations starting and running currents (observed vibrations, temperatures of bearings and body)
11. On load operation, starting and running currents (observed vibrations, temperatures of bearings and body)
12. In case of forced water cooling of start or check winding temperatures as ready by built in RTDs.
13. Water level (start up cooling) low to be checked for limit switch operation.

1.48 COMMISSIONING CHECK LIST (LT MOTORS)**A PRELIMINARY CHECKS**

Check the following:

1. Check the name plate details according to specification. Discrepancies, if any, to be satisfactorily resolved.
2. Check tightness of all bolts, clamps and connecting terminals.
3. Check body earthing
4. Check whether bearing lubrication is adequate
5. Check clearance inside terminal box

B COMMISSIONING CHECKS

1. Meggar tests of motor winding and cables
2. Continuity check of motor windings control and power cables
3. Over load and short circuit relay tests and settings
4. Control and interlocks should be checked
5. Phase sequence and direction of rotation
6. Operation of timer in case of star delta starting
7. Measure starting current starting timer and no load current
8. On load operations starting and running currents

1.49 DC MOTOR SPECIFICATION

DC Motor will be of continuous duty type totally enclosed fan cooled (TEFC) having IP-54 degree of protection suitable for 220 V DC supply. DC motor will be shunt wound type having high torque characteristic suitable for Bi-directional rotation at rated speed and output. The general constructional features and details of DC motor will be in line with details/ particulars stipulated in the specification for AC squirrel cage induction motors.

Contractor will furnish the data in respect of DC motors.

DATASHEET

	Auxiliary power supply	
1.1	HV supply	
	11kV, 3 Φ , 3W, 50 Hz non effectively earthed	Motors rated above 1500 kW
	Fault level	50 kA for 1 second
1.2	MV supply	
	3.3kV, 3 Φ , 3W, 50 Hz non effectively earthed	Motors above 200kW upto and including 1500kW
	Fault level	40 kA for 1 second
1.3	LV supply	
	415V, 3 Φ , 3W, 50 Hz effectively earthed	Motors below and including 200kW
	Fault level	50kA for 1 second
	110V, 1 Φ , 2W, 50 Hz effectively earthed	Lighting, space heating, AC control and protective devices
1.4	DC supply	
	220V, 2W, unearthed	DC alarm, control and protective devices.
	Fault level	25 kA for 1 second
2	Range of variation	As indicated in the specification
2.1	AC supply	
	voltage	-----
	Frequency	-----
	Combined voltage & frequency	-----
2.2	DC supply	198 to 240 V
Note: During starting of largest motor, the voltage may drop to 80% of the rated voltage for a period of 60 seconds. All electrical equipment while running shall successfully ride over such period without affecting system performance.		

	TITLE MOTOR DATA SHEET - C	SPECIFICATION NO.
		VOLUME II B
		SECTION D
		REV NO. 00 DATE 06/06/2019
		SHEET 1 OF 2

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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE MOTOR DATA SHEET - C	SPECIFICATION NO.
		VOLUME II B
		SECTION D
		REV NO. 00 DATE 06/06/2019
		SHEET 2 OF 2

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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

[illegible]

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER 2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V : ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)																		
	LOAD DATA (ELECTRICAL)	JOB NO.		426				ORIGINATING AGENCY				PEM (ELECTRICAL)						
		PROJECT TITLE		1X660MW UPRVUNL PANKI				NAME				DATA FILLED UP ON						
		SYSTEM		WORKSHOP EQUIPMENTS				SIGN.				DATA ENTERED ON						
		DEPTT. / SECTION		MAUX				SHEET 2 OF 2		REV. 00		DE'S SIGN. & DATE						



TITLE 1X660 MW PANKI TPS EXTN.
TECHNICAL SPECIFICATION
FOR
WORKSHOP EQUIPMENT

SPECIFICATION NO. PE – TS - 426 - 568 – A001

VOLUME III

SECTION III

REV 0

SHEET OF

SECTION-III

DOCUMENTS TO BE SUBMITTED ALONG WITH BID

SUB-SECTION IIIA – Documents Furnished along with offer

SUB-SECTION IIIB – Compliance cum confirmation certificate

SUB-SECTION IIIC – Electrical Load Data

SUB-SECTION IIID – Pre Bid Clarification



TITLE 1X660 MW PANKI TPS EXTN.
TECHNICAL SPECIFICATION
FOR
WORKSHOP EQUIPMENT

SPECIFICATION NO. PE – TS - 426 - 568 – A001

VOLUME III

SECTION IIIA

REV 0

SHEET OF

DOCUMENTS TO BE FURNISHED WITH OFFER FOR TECHNICAL EVALUATION

- 1) SCHEDULE OF TECHNICAL DEVIATION (IF ANY)
OR

‘NO DEVIATION CERTIFICATE’ – Clearly mentioning that bidder has considered ‘No - Deviation’ from the technical specification provided by BHEL.

- 2) SIGNED AND STAMPED COPY OF COMPLIANCE CUM CONFIRMATION CERTIFICATE.
- 3) Compliance to Electrical load list, duly signed and stamped
- 4) Un priced copy of price format indicating quoted/ not applicable against each row/column

NOTE:

i) NO OTHER DOCUMENTS OTHER THAN THOSE LISTED ABOVE ARE REQUIRED TO BE SUBMITTED FOR TECHNICAL EVALUATION. IN CASE ANY OTHER DOCUMENT IS FURNISHED, THE SAME WILL NOT BE TAKEN INTO CONSIDERATION FOR TECHNICAL EVALUATION.



TITLE:
**TECHNICAL SPECIFICATION FOR
WORKSHOP EQUIPMENT
1X660 MW PANKI TPS EXTN.
COMPLIANCE CUM CONFIRMATION
CERTIFICATE**

SPEC. NO.: PE-TS-426-568-A001
VOLUME: III
SECTION: IIIB
REV. NO. 0
Date:

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate (every sheet) and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions other than those mentioned under "exclusion" in section C and those resolved as per 'Schedule of Deviations', if applicable, with regard to same.
- b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'.
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This shall be within the contracted price with no extra implications to BHEL after award of the contract.
- d) All drawings/ data-sheets/ calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.
- e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified/ intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre - bid discussions, otherwise BHEL/ Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

- f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.
- g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.
- h) Guarantee for plant /equipment shall be as per relevant clause of GCC /SCC /Other Commercial Terms & Conditions.
- i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price and within purview of the tender specification even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities.
- j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.



TITLE:

**TECHNICAL SPECIFICATION FOR
WORKSHOP EQUIPMENT
1X660 MW PANKI TPS EXTN.
COMPLIANCE CUM CONFIRMATION
CERTIFICATE**

SPEC. NO.: PE-TS-426-568-A001

VOLUME: III

SECTION: IIIB

REV. NO. 0

Date:

- k) As built drawings shall be submitted as and when required during the project execution.
- l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONT ROL CODE	REMA RKS	LOAD No.	VERIFICATI ON FROM MOTOR DATASHEE T (Y/N)	KKS NO
	NAME PLATE (Range of Load)	MAX. CONT. DEMA ND (MCR)		RUNNING	STANDBY								SIZE CODE	NOS						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Vertical Turret Lathe M/C	30-35 kW		S	1		D	S													
Heavy Duty Lathe M/C	18.5-20 kW		S	1		D	S													
Heavy Duty Lathe M/C-1	18.5-20 kW		S	1		D	S													
Medium Duty Lathe M/C-1	11-13 kW		S	1		D	S													
Medium Duty Lathe M/C-2	11-13 kW		S	1		D	S													
Medium Duty Lathe M/C-3	11-13 kW		S	1		D	S													
Universal Milling M/C	11-13 kW		S	1		D	S													
Surface Grinding M/C	7.5-9 kW		S	1		D	S													
Cylindrical Grinding M/C	3.5-5 kW		S	1		D	S													
Slotting M/C	9.3-11 kW		S	1		D	S													
Radial Drill M/C	7.5-9 kW		S	2		D	S													
Column Drill M/C	5.5-7 kW		S	1		D	S													
Hydraulic Press M/C	5.5-7 kW		S	1		D	S													
Hydraulic Press M/C	5.5-7 kW		S	1		D	S													
Plate Bending M/C	15-17 kW		S	1		D	S													
NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER 2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V : ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)																				
	LOAD DATA (ELECTRICAL)	JOB NO.		426				ORIGINATING AGENCY				PEM (ELECTRICAL)								
		PROJECT TITLE		1X660 MW PANKI TPS EXTN.				NAME				DATA FILLED UP ON								
		SYSTEM						SIGN.				DATA ENTERED ON								
		DEPTT. / SECTION		MAX				SHEET 1 OF 2		REV. 00		DE'S SIGN. & DATE								

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONT ROL CODE	REMA RKS	LOAD No.	VERIFICATI ON FROM MOTOR DATASHEE T (Y/N)	KKS NO
	NAME PLATE (Range of Load)	MAX. CONT. DEMA ND (MCR)		RUNNING	STANDBY								SIZE CODE	NOS						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Plate Shearing M/C	2.2-4.5 kW		S	1		D	S													
Dynamic Balancing M/C	7.5-9 kW		S	1		D	S													
Shaper M/C	3.7-5 kW		S	1		D	S													
Pipe Bending M/C	1.5-3 kW		S	2		D	S													
Tool and Cutter Grinding M/C	0.75-1.5 kW		S	2		D	S													
Power Hacksaw M/C	1.5-2.5 kW		S	2		D	S													
Welding Generator- Supergen M/C	13.5-15 kW		S	1		D	S													
Welding Transformer M/C	15-18 kW		S	3		D	S													
NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER 2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V : ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)																				
	LOAD DATA (ELECTRICAL)	JOB NO.		426				ORIGINATING AGENCY				PEM (ELECTRICAL)								
		PROJECT TITLE		1X660 MW PANKI TPS EXTN.				NAME					DATA FILLED UP ON							
		SYSTEM						SIGN.					DATA ENTERED ON							
		DEPTT. / SECTION		MAX				SHEET 2 OF 2		REV. 00		DE'S SIGN. & DATE								



TITLE **1X660 MW PANKI TPS EXTN.**
 TECHNICAL SPECIFICATION FOR
 WORKSHOP EQUIPMENT

SPECIFICATION NO. PE-TS-426-568-A101

VOLUME III

SECTION III D

REV 00

DATE

SHEET 1 OF 1

PRE-BID CLARIFICATION SCHEDULE

S. No.	Section/Clause /Page No.	Statement of the referred clause	Clarification Required

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL