

NTPC LIMITED

(A Govt. of India Enterprise)



**PATRATU SUPER THERMAL POWER PROJECT
EXPANSION PHASE-I (3X800 MW).**

**TECHNICAL SPECIFICATION
FOR
WORKSHOP EQUIPMENT**

SPECIFICATION NO: PE-TS-434-568-A001



BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA, U.P

INDIA

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SCOPE OF ENQUIRY



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1.0 SCOPE OF ENQUIRY/ INTENT OF SPECIFICATION

- 1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, painting, proper packing and supply and dispatch to power station site, Performance and guarantee testing and handing over of **WORKSHOP EQUIPMENTS** as per details in different sections / volumes of this specification for **3 X 800 MW PATRATU STPS**.
- 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 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



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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 NTPC including their consultant as interpreted by BHEL in the relevant context.

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SPECIFIC TECHNICAL
REQUIREMENTS



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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	TECHNICAL SPECIFICATION	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 42 Kw,40 HP, 415 V, 3 Phase AC, other parameters as per manufacturer standard.	Accessories as per Manufacturer standard for functioning of equipment	1
2.	Heavy Duty Lathe M/C	Max.jobs Length.- 4000 mm, Max.jobs Dia.- 1650mm., 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 for functioning of equipment	1
3.	Heavy Duty Lathe M/C -1	Max.jobs Langth.-4000 mm, Max. jobs Dia.- 1350mm.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 for functioning of equipment	1
4.	Medium Duty Lathe M/C -1	Max.jobs Length- 2000 mm, Max.jobs Dia.- 640mm, Main motor rating 11 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard for functioning of equipment	1
5.	Medium Duty Lathe M/C -2	Max.jobs Length.-3000 mm, Max.jobs Dia.- 640mm, Main motor rating 11 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard for functioning of equipment	1
6.	Medium Duty Lathe M/C -3	Max.jobs Length- 2000 mm, Max. Dia.- 910mm, Main motor rating 11 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard for functioning of equipment	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 for functioning of equipment	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 for functioning of equipment	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 for functioning of equipment	1



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S. N.	EQUIPMENT NAME	TECHNICAL SPECIFICATION	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 for functioning of equipment	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 for functioning of equipment	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 for functioning of equipment	1
13.	Hydraulic Press M/C Capacity 100 T	Max. Presser.-100 T. Stroke Length.-300 mm. Opening:- 1000X1000 mm, Main motor rating 4.75 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard for functioning of equipment	1
14.	Hydraulic Press M/C Capacity 60 T	Max. Presser.-60 T. Stroke Length.-300 mm, Main motor rating 4.75 Kw, 415V, 3 Phase AC, Other parameters as per manufacturer standard.	Accessories as per Manufacturer standard for functioning of equipment	1
15.	Plate Bending M/C	Max. Plate thickness.-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 for functioning of equipment	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 for functioning of equipment	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 for functioning of equipment	1
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 for functioning of equipment	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 for functioning of equipment	2



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S. N.	EQUIPMENT NAME	TECHNICAL SPECIFICATION	ACCESSORIES	QTY .
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 for functioning of equipment	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-Supergen 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 for functioning of equipment	1
23.	Welding Transformer M/C	Current Range.- 60A-400A	Accessories as per Manufacturer standard for functioning of equipment	3
24.	Battery operated trolley-1	Capacity 50 Ton for handling motor by road with driver cabin and , Size of Trolley 5 m (Length) and 4.0 m (Width) and Ht min. 1.2 m, Battery and charger will be Industrial type heavy duty, Driver Cabin will be provided with steering, Brake, Accelerator, Horn, Flasher & Forward reverse control, Speed of car upto 50 M/min, Battery Use after full Charging minimum 2 Hour, Solid Rubber Wheel	Accessories as per Manufacturer standard for functioning of equipment	1
25.	Battery operated trolley-2	Capacity 40 Ton for handling motor by road with driver cabin , Size of Trolley 4 m (Length) and 3.0 m (Width) and Ht min. 1.2 m, Battery and charger will be Industrial type heavy duty, Driver Cabin will be provided with steering, Brake, Accelerator, Horn, Flasher & Forward reverse control, Speed of car upto 50 M/min, Battery Use after full Charging minimum 2 Hour, Solid Rubber Wheel	Accessories as per Manufacturer standard for functioning of equipment	1



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S. N.	EQUIPMENT NAME	TECHNICAL SPECIFICATION	ACCESSORIES	QTY .
26.	Gas Cutting and heating equipment	Capacity: Welding (Mild Steel)-25 mm (Max.), Cutting (Mild Steel)-150 mm (Max.)	Shank, Mixer, Cutting attachment, One set of torch for cutting, welding and brazing, One set of cutting nozzle, One set of welding nozzle, Oxygen and acetylene single stage regulators, 10 meter oxygen and acetylene fitted hoses, Ray flex goggles, Acetylene and oxygen flash back arrester, Flint spark lighter, Operations spanners, Cylinder Trolley	1
27.	Crimping tools	Hydraulic Crimping tools with dies, cable size used from 10 Sq. mm to 630 Sq. mm of Aluminum, Die sizes (10,16,25,35,50,70,95,120,150,185, 240,300,400, 500 & 630 Sq. mm)	Accessories as per Manufacturer standard for functioning of equipment	1

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 (Annexure-IV). 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.



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- 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 along with 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.
- 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:-

- General arrangement drawing indicating overall dimensions, total weights, foundation details and bill of material for all types of machines including requirement of withdrawal space.
- Final details of motors (machine wise) indicating guaranteed power consumption as per BHEL's format.
- Manual calculation for selection of machines including authentic supporting literature (e.g. handbook / standards).
- Manual calculation for requirement of air / water quantity and pressure including authentic supporting literature (e.g. handbook / standards).



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- 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).
- 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.
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.



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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.
 - 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.
 - 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.
 - 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.
 - 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.
 - 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.

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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.

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.



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- 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 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 /



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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.
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.



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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.

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	



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S. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		DIAMOND POWER INFRASTRUCTURE LTD	VADODARA	
		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	



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S. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		SRIRAM CABLES PVT. LTD	NEW DELHI	
		TORRENT CABLES LTD	AHMEDABAD	
		UNIVERSAL CABLES LTD	SATNA	
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:

BASIC ENGINEERING DOC.

Sl. No.	BHEL DRG.NO	DRAWING TITLE	REMARKS	SUBMISSION SCHEDULE - WEEK NUMBER FROM DATE OF LOI
1.	PE-V0-434-568-A002	GA, Foundation Detail (as required) and Data sheet of Machine / Equipment with detailed BOM	APPROVAL	2
2.	PE-V0-434-568-A001	Inspection Check List / Manufacturing Quality Plan of machine/equipment	APPROVAL	2

List of dwg. /doc after approval of basic dwg. / doc:

Sl. No.	BHEL DRG.NO	DRAWING TITLE	REMARKS	SUBMISSION SCHEDULE - WEEK NUMBER FROM DATE OF LOI
1.	PE-V0-434-568-A003	O & M Manual for WORKSHOP EQUIPMENT	INFORMATION	2 weeks after approval of basic dwg/doc.
2.	PE-V0-434-568-A004	Erection Procedure for WORKSHOP EQUIPMENT	INFORMATION	2 weeks after approval of basic dwg/doc.

- 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.



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- d) 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>)

SUB – SECTION – A-12

SURFACE PREPARATION & PAINTING

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	SPECIFICATION OF SURFACE PREPARATION & PAINTING			
1.01.00	Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.			
1.02.00	All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labelled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.			
1.03.00	Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.			
1.04.00	All pipelines shall be Colour coded for identification as per the NTPC Colour-coding scheme, which will be furnished to the contractor during detailed engineering.			
1.05.00	SURFACE PREPARATION			
1.05.01	All surfaces to be painted shall be thoroughly cleaned of oil. Grease and other foreign material. Surfaces shall be free of moisture and contamination from chemicals and solvents.			
1.05.02	The following surface preparation schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer. SP1 Solvent cleaning SP2 Application of rust converter (Ruskil or equivalent grade) SP3 Power tool cleaning SP4 Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer) SP4* Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns SP5 Shot blasting/ abrasive blasting. SP6 Emery sheet cleaning/Manual wire brush cleaning.			
1.06.00	APPLICATION OF PRIMER/PAINT			
1.06.01	The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.			
1.06.02	Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.			
1.06.03	Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO. CS-9585-001-2	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 1 of 9

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.			
1.06.04	Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.			
1.06.05	Following are the Primer/painting schemes envisaged herein: PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104. PS3* - Zinc Chrome primer (Alkyd base) by dip coat. PS4 - Synthetic Enamel (long oil alkyd) to IS2932. PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744 PS9 - Aluminium paint to IS 2339. PS9* - Heat resistant Aluminium paint to IS-13183 Gr.-1 PS13 - Rust preventive fluid by spray, dip or brush. PS14 - weldable primer-Deoxaluminate or equivalent. PS16 - High Build Epoxy CDC mastic `15' . PS17 - Aliphatic Acrylic Polyurethane CDE134 ,%V=40.0(min.) PS18 - Epoxy based TiO2 pigmented coat PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=40.0(min.) PS-20 - Epoxy based finish paint			
1.06.06	All weld edge preparation for site welding shall be applied with one coat of weldable primer.			
1.06.07	For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.			
1.06.08	SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.			
1.06.09	a) All un-insulated equipments, pipes, valves etc covered in sub-section A-08 (Steam Turbine & Auxiliary system) shall be painted with paint not inferior to Epoxy resin based paints with minimum DFT of 150 micron. The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner: Primer coat – Epoxy based zinc phosphate Intermediate - Epoxy based TiO2 pigmented coat Finish coat - Epoxy based finish coat b) Equipment, pipes etc. with high temperature shall be painted with heat resistant aluminum paint (to be selected based on the service condition of component as per IS-13183). Two coats of paint shall be applied with total DFT 40 micron. c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO. CS-9585-001-2	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 2 of 9

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.06.10	A) Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows: Primer : One coat of unmodified epoxy resin along with polyimide hardener. Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct hardener. Total thickness of primer and paint should not be less than 400 microns.			
	B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows: i) For Indoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be done either manually or by any other approved method. (b) Primer coat shall consist of one coat of chlorinated rubber based zinc phosphate primer having minimum DFT of 50 microns. (c) Intermediate coat (or under coat) shall consist of one coat of chlorinated rubber based paint pigmented with Titanium dioxide with minimum DFT of 50 microns. (d) Top coat shall consist of one coat of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 50 microns. Total DFT of paint system shall not be less than 150 microns. ii) For Outdoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard. (b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns. (c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns. (d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided. The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied. Total DFT shall not be less than 300 microns.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATIONS SECTION VI, PART-B BID DOC. NO. CS-9585-001-2	SUB-SECTION - A-12 SURFACE PREPARATION & PAINTING	Page 3 of 9



1.06.11 Primer/Painting Schedule

Sl. No	Description	Surface Preparation	Primer Coat		Intermediate Coat			Finish Coats			Total Min. Painting DFT (Microns)	Colour Shade	
			Type of Primer	No. of Coats	Min. DFT / coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)	Type of coating	No. Coats	Min. DFT/ Coat (Microns)		
A) Power Cycle Piping													
1.	All insulated Piping, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.	SP3/SP4	PS9*	1	20	-	-	-	PS9*	1	20	40	As per NTPC Colour shade/ coding scheme
2.	All un-insulated Piping, fittings/ components, Pipe clamps, Vessels/Tanks, Equipments etc.	SP3/SP4	PS 5	2	25	-	-	-	PS 4	3	35	155	
			PS 9*	1	20	-	-	-	PS9*	1	20	40	
			PS9*	1	20	-	-	-	PS9*	1	20	40	
3	Constant Load Hanger (CLH) and Variable Load Hanger (VLH)	SP4*	PS19	1	40	-	-	-	PS17	1	30	70	

4	Piping hangers/ supports (other than (3) above. (un-insulated)	SP4 (SP6 - for cleaning of weld joints after erection.)	PS 5	1	40	PS 4	1	40	PS 17	1	40	120
	Valves											
5.	Cast/Forge d	Design temperature < or equal to 60 degC	PS4/PS9	1	40	Polyamide Epoxy	1	100	PS17	1	40	180
		Design temperature above 60 degC and up to 200 degC	PS9*	1	20	-	-	-	PS9*	1	20	40
		Design temperature above 200 degC	PS9*	1	20	-	-	-	PS9*	1	20	40
6.	All auxiliary Structural Steel components for pipe supports	Outside TG building and in SG envelope	Inorganic Ethyl Zinc Silicate	1	75	PS18	1	75	a))Epoxy coat b)Final coat of paint PS17	2 1	35 30	250

		Within building	TG	SP4*	-do-	1	35	PS18	1	35	a) Epoxy coat b) Final coat of paint PS17	2 1	25 30	150
7.	Weld Edges			SP6 (Hand cleaning by wire brushing)	PS13 (Weldable primer)	1	25	-	-	-	-	-	-	25
1. \$ The first 2 finished coats (total min. DFT of 70 microns) shall be done at shop and the 3rd finish coat (min. DFT 35 Microns) shall be applied at site. 2. For valves below 65NB and temperature upto and including 540 DegC, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint. 3. For corrosion protection of threaded hanger rods and variable spring cages, electro galvanizing in full compliance to minimum Corrosion category C3 as per EN ISO12944 is also acceptable. 4. For spring cages, 2 coats of 30 µm (min) zinc-rich epoxy resin primer with zinc content > 80 weight% in dry film followed by 2 coats of 30 µm (min) top coat of Acrylic resin Co-polymerisate with a total combined minimum DFT of 120µm is also acceptable in lieu of above specified paint scheme. 5. For corrosion protection for all inner parts of the hangers shall be at least in full compliance to Corrosion category C3 as per EN ISO12944.														
B) Steam Generator & Auxiliaries:														
1	All surfaces with temperature 95°C or less and which are insulated	SP3/SP4	PS 5	2	30	-	-	-	-	-	PS 4	2 \$	20 \$	100 \$
2	All surfaces with temperature above 95°C and which are insulated	SP3/SP4	PS9*	1	20	-	-	-	-	-	PS9*	1	20	40

Note: 1) SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.

2) For valves below 65NB and temperature upto & including 545 Deg.C, Parkerizing/zinc phosphate corrosion resistant coating as per ASTM F1137 is also acceptable in lieu of Aluminum paint.

C) LOW PRESSURE PIPING

1	All Pipes, components, fittings / valves, Equipments etc.	SP3/SP5	PS3/ PS5	2	25	PS 4	1	30	PS 4	2	35	150	As per NTPC Colour shade/ coding scheme
2	Stainless steel surface, Galvanized steel surface and gun metal surface.	No Painting											
3	On the internal surface for pipes 1000 Nb and above	A coat of primer followed by hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.											

D) Fire Detection & Protection System, Compressed air system, Hydrogen generation plant and Air-conditioning & Ventilation System

For Fire Detection & Protection System, Surface preparation and painting of Fire Water Storage Tanks, all Steel Surfaces (external) exposed to atmosphere (outdoor & indoor installation), Deluge Valves, Alarm Valves, Foam monitors, Water monitors, Foam Proportioning equipments, Foam makers, etc. should be as per the Part-B, Sub Section-A-18, Fire Detection & Protection System

For Air Conditioning System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-17, Air Conditioning System.

For Ventilation System, Surface preparation and painting of all the steel surfaces (external) exposed to atmosphere (outdoor & indoor installation), centrifugal fans – Casing etc. should be as per the Part-B, Sub Section-A-30, Ventilation System.

For compressed air system, Surface preparation and painting of all the steel surfaces should be as per the Part-B, Sub Section-A-16 compressed air system.

For hydrogen generation plant, Surface preparation and painting should be as per the Part-B, Sub-Section-A-19 hydrogen generation plant.

ESP (E)

1	All surfaces with surface temperature 95°C or less (with insulation)	SP3/SP4	PS3/ PS5	1	25	-	-	-	-	PS 4	1	30	55
2	All surfaces with surface temperature above 95°C (with or without insulation)	SP3/SP4	PS5	2	30	-	-	-	-	-	-	-	60

General Notes (Applicable for all above points A to E)

- i) Painting specification for all surfaces with surface temperature 95°C or less (un-insulated) that are not covered above shall be same as that given in Civil Sub-section, Part-B, Section-VI for corrosion protection of steel structures.



- ii) Painting specification for inside surfaces (such as inner surfaces of ducts/ tanks/ mills/ dampers/ ESP etc.) that are not covered specifically in above clauses, shall be provided with 2 coats of suitable primer i.e. PS5/ PS9 (Total DFT 60/40 micron) based on the temperature.

F) FGD System	
(i)	Surface preparation shall be blast cleaned conforming to Sa 2-1/2 Swiss Standard.
(ii)	Primer coat shall consist of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns.
(iii)	Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns.
(iv)	Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided.

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	BID DOC. NO. CS-9585-001-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	TECHNICAL REQUIREMENTS	SUB-SECTION -A-12 Surface Preparation & Painting	Page 9 of 9
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ANNEXURE-V

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT :
		ITEM :	QP NO.: REV.NO.: DATE: PAGE: OF....	PACKAGE : CONTRACT NO. : MAIN-SUPPLIER:
		SUB-SYSTEM:		

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C / N					M	C	N	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	** 10.			11.

		LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS 'W'	 FOR NTPC USE	DOC. NO.:		REV..... CAT.....	
MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER						
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL	

FORMAT NO.: QS-01-QAI-P-09/F1-R1

1/1

ENGG. DIV./QA&I

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO.: CS-9585-001-2	GENERAL TECHNICAL REQUIREMENT	PAGE 78 OF 111
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ANNEXURE-V

SUPPLIER'S LOGO	SUPPLIER'S NAME AND ADDRESS	FIELD QUALITY PLAN		PROJECT :
		ITEM :	QP NO.:	PACKAGE :
		SUB-SYSTEM:	REV. NO.:	CONTRACT NO. :
			DATE:	MAIN-SUPPLIER:
			PAGE: OF....	

SL. NO	ACTIVITY AND OPERATION	CHARACTERISTICS / INSTRUMENTS	CLASS OF CHECK #	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	D*	10.

		LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. LEGEND TO BE USED: CLASS # : A = CRITICAL, B=MAJOR, C=MINOR; 'A' SHALL BE WITNESSED BY NTPC FQA, 'B' SHALL BE WITNESSED BY NTPC ERECTION / CONSTRUCTION DEPTT. AND 'C' SHALL BE WITNESSED BY MAIN SUPPLIER (A & B CHECK SHALL BE NTPC CHP STAGE)		DOC. NO.: REV.....		
MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER					
SIGNATURE				FOR NTPC USE	REVIEWED BY	APPROVED BY

FORMAT NO.: QS-01-QAI-P-09/F2-R1

1/1

ENG. DIV./QA&I

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC.NO.: CS-9585-001-2	GENERAL TECHNICAL REQUIREMENT	PAGE 79 OF111
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TITLE **3X800 MW PATRATU STPS**
TECHNICAL SPECIFICATION
FOR
WORKSHOP EQUIPMENT

SPECIFICATION NO. PE – TS - 434 - 568 – A001		
VOLUME	II	
SECTION	C	
REV	0	
SHEET	OF	

VOL - II B

ELECTRICAL



TITLE :
ELECTRICAL EQUIPMENT SPECIFICATION
FOR
WORKSHOP EQUIPMENT
3X800 MW PVUNL PATRATU TPP PHASE-1

SPECIFICATION NO.
VOLUME NO. : II-B
SECTION :
REV NO. 00 : DATE : 03.08.2019
SHEET : 1 OF 3

TECHNICAL SPECIFICATION

FOR

WORKSHOP EQUIPMENT
(ELECTRICAL PORTION)

	TITLE : ELECTRICAL EQUIPMENT SPECIFICATION FOR WORKSHOP EQUIPMENT 3X800 MW PVUNL PATRATU TPP PHASE-1	SPECIFICATION NO.
		VOLUME NO. : II-B
		SECTION :
		REV NO. 00 : DATE : 03.08.2019
		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 EQUIPMENT**.
- 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

	TITLE : ELECTRICAL EQUIPMENT SPECIFICATION FOR WORKSHOP EQUIPMENT 3X800 MW PVUNL PATRATU TPP PHASE-1	SPECIFICATION NO.
		VOLUME NO. : II-B
		SECTION :
		REV NO. 00 : DATE : 03.08.2019
		SHEET : 3 OF 3

furnishes the overall compliance of package technical specification in the form of compliance certificate/No deviation certificate.

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

4.0 List of enclosures :

- a) Electrical scope between BHEL & vendor
- b) Customer (NTPC) specification for Motors
- c) Customer (NTPC) specification for cable lugs and glands
- d) Quality plan for motors & NTPC quality assurance
- e) Datasheet A & C (Annexure- I)
- f) Sub vendor List for Motors & other Electrical items (Annexure-II)
- g) Electrical Load data format (Annexure –III)
- h) BHEL cable listing format (Annexure –IV)

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS) REV-0, DATE: 03.08.2019

PACKAGE : WORKSHOP EQUIPMENT

SCOPE OF VENDOR: SUPPLY

PROJECT : 3X800 MW Patratu STPP

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V 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	Power cables	BHEL	BHEL	Cable size shall be derived by BHEL based on Electrical load data & shall be informed to vendor at contract stage. Vendor shall provide lugs & glands accordingly.
3	Any other/special type of cable like control, screened control, compensating, co-axial, prefab, MICC, fibre Optic cables etc.	Vendor	BHEL	
4	Cabling material (Cable trays, accessories ,cable tray supporting system, conduits etc.)	BHEL	BHEL	
5	Cable glands ,lugs, and bimetallic strip for equipment 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	Motors alongwith fixing accessories	Vendor	-	Makes shall be subject to customer/ BHEL approval at contract stage.
7	Mandatory spares	Vendor	-	Vendor to quote as per specification.
8	Recommended O & M spares	Vendor	-	As per specification

NOTES:

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

SUB-SECTION – B-07

MOTORS

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	MOTORS			
1.00.00	GENERAL REQUIREMENTS			
1.01.00	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.			
1.02.00	All equipment shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.			
1.03.00	Contractor shall provide fully compatible electrical system, equipment, accessories and services.			
1.04.00	All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.			
1.05.00	Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.			
1.06.00	The responsibility of coordination with electrical agencies and obtaining all necessary clearances for contractors equipment and systems shall be under the contractor scope.			
1.07.00	Degree of Protection			
	Degree of protection for various enclosures as per IEC60034-05 shall be as follows:-			
	i)	Indoor motors	-	IP 54
	ii)	Outdoor motors	-	IP 55
	iii)	Cable box-indoor area	-	IP 54
	iv)	Cable box-Outdoor area	-	IP 55
2.00.00	CODES AND STANDARDS			
	1)	Three phase induction motors	:	IS/IEC:60034
	2)	Single phase AC motors	:	IS/IEC:60034
	3)	Crane duty motors	:	IS:3177, IS/IEC:60034
	4)	DC motors/generators	:	IS/IEC:60034
	5)	Energy Efficient motors	:	IS 12615, IEC: 60034-30
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2		SUB-SECTION-B-07 MOTORS
PAGE 1 OF 10				

CLAUSE NO.	TECHNICAL REQUIREMENTS		
3.00.00	TYPE		
3.01.00	AC Motors:		
	a) Squirrel cage induction motor suitable for direct-on-line starting.		
	b) Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30.		
	c) Crane duty motors shall be squirrel cage Induction motor as per the requirement.		
	d) Motor operating through variable frequency drives shall be suitable for inverter duty. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable.		
3.02.00	DC Motors	Shunt wound	
4.00.00	RATING		
	(a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor.		
	(b) Whenever the basis for motor or driven equipment ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.		
	(c) For BFP motors, starting MVA shall be restricted to meet requirements indicated in B-0.		
5.00.00	TEMPERATURE RISE		
	Air cooled motors		
	70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation.		
	Water cooled		
	80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS
			PAGE 2 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class 90 (Y) wet wound Boiler circulation pump motor. 6.00.00 OPERATIONAL REQUIREMENTS 6.01.00 Starting Time 6.01.01 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. 6.01.02 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. 6.01.03 For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time. 6.01.04 Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met. 6.02.00 Torque Requirements 6.02.01 Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque. 6.02.02 Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors. 6.03.00 Starting voltage requirement (a) Up to 85% of rated voltage for ratings below 110 KW (b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW (c) Up to 85% of rated voltage for ratings from 201 KW to 1000 KW (d) Up to 80% of rated voltage for ratings from 1001 KW to 4000 KW (e) Up to 75 % of rated voltage for ratings above 4000KW Except AOP & JOP motors running on D.G emergency supply, starting voltage shall be 80%.			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 3 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS
7.00.00	DESIGN AND CONSTRUCTIONAL FEATURES
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors, space heater terminals inside the main terminal box may be acceptable.
7.02.00	All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). The method of movement of primary and secondary coolant shall be self-circulated by fan or pump directly mounted on the rotor of the main motor as per IEC 60034-6. However VFD driven motors can be offered with forced cooling type with machine mounted fan or pump driven by separate electric motor. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS: 2148 as detailed below (a) Fuel oil area : Group – IIB (b) Hydrogen generation : Group - IIC or (Group-I, Div-II as per plant area NEC) or (Class-1, Group-B, Div-II as per NEMA / IEC60034)
7.03.00	Winding and 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 AC motors : Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Pressure Impregnated i.e. resin poor method. The lightning Impulse & intertern insulation surge withstand level shall be as per IEC-60034 part-15. However winding insulation for wet wound Boiler circulation pump motor shall be thermal class 90 (Y) or better. (d) 240VAC, 415V AC & 220V DC motors : Thermal Class (B) or better
7.04.00	Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2
SUB-SECTION-B-07 MOTORS	PAGE 4 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.
7.06.00	Noise level for all the motors shall be limited to 85dB (A) except for BFP motor for which the maximum limit shall be 90 dB(A). Vibration shall be limited within the limits prescribed in IS/IEC 60034-14. Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.
7.08.00	Motor body shall have two earthing points on opposite sides.
7.09.00	11 KV motors shall be offered with Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.
7.10.00	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.
7.11.00	The spacing between gland plate & center of terminal stud shall be as per Table-I.
7.12.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.
7.13.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV /415V systems without any injurious effect on its life.
7.14.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box suitable for the same.
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SUB-SECTION-B-07 MOTORS	PAGE 5 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS		
8.00.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP motor.		
	(a) 50 kW to 110 kW	:	11.0
	(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
9.00.00	CW motor shall be designed with minimum power factor of 0.8 at design duty point.		
10.00.00	TYPE TEST		
10.01.00	HT MOTORS		
10.01.01	The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.		
10.01.02	The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.		
10.01.03	In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the employer for waival 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 employer reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.		
10.01.04	Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED "and carried out within last ten years from the date of bid opening. These reports should be for		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS
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CLAUSE NO.	TECHNICAL REQUIREMENTS				
10.01.05	the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the employer either at third party lab or in presence of client/ employer's representative and submit the reports for approval.				
	LIST OF TYPE TESTS TO BE CONDUCTED The following type tests shall be conducted on each type and rating of HT motor (a) No load saturation and loss curves upto approximately 115% of rated voltage (b) Measurement of noise at no load. (c) Momentary excess torque test (subject to test bed constraint). (d) Full load test (subject to test bed constraint) (e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.				
10.01.06	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 (a) Degree of protection test for the enclosure followed by IR, HV and no load run test. (b) Terminal box-fault level withstand test for each type of terminal box of HT motors only. (c) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15 (d) Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15				
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2		SUB-SECTION-B-07 MOTORS	PAGE 7 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS
10.02.00	LT Motors
10.02.01	LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for employer's approval the reports of all the type tests as listed in this specification and carried out within last <i>ten</i> 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.
10.02.02	However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the employer either at third party lab or in presence of client/ employer's representative and submit the reports for approval.
10.02.03	LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only - Measurement of resistance of windings of stator and wound rotor. - No load test at rated voltage to determine input current power and speed - Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors) - Full load test to determine efficiency power factor and slip. - Temperature rise test. - Momentary excess torque test. - High voltage test. - Test for vibration severity of motor. - Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section) - Test for degree of protection and - Over speed test.
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2
SUB-SECTION-B-07 MOTORS	PAGE 8 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS																				
12.	Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1																				
10.03.00	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.																				
10.04.00	The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and “No design Change”. Minor changes if any shall be highlighted on the endorsement sheet.																				
TABLE - I DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS <table><thead><tr><th>Motor MCR in KW</th><th>Minimum distance between centre of stud and gland plate in mm</th></tr><tr><th>UP to 3 KW</th><th>As per manufacturer's practice.</th></tr></thead><tbody><tr><td>Above 3 KW - upto 7 KW</td><td>85</td></tr><tr><td>Above 7 KW - upto 13 KW</td><td>115</td></tr><tr><td>Above 13 KW - upto 24 KW</td><td>167</td></tr><tr><td>Above 24 KW - upto 37 KW</td><td>196</td></tr><tr><td>Above 37 KW - upto 55 KW</td><td>249</td></tr><tr><td>Above 55 KW - upto 90 KW</td><td>277</td></tr><tr><td>Above 90 KW - upto 125 KW</td><td>331</td></tr><tr><td>Above 125 KW-upto 200 KW</td><td>203</td></tr></tbody></table> For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm. 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	Minimum distance between centre of stud and gland plate in mm	UP to 3 KW	As per manufacturer's practice.	Above 3 KW - upto 7 KW	85	Above 7 KW - upto 13 KW	115	Above 13 KW - upto 24 KW	167	Above 24 KW - upto 37 KW	196	Above 37 KW - upto 55 KW	249	Above 55 KW - upto 90 KW	277	Above 90 KW - upto 125 KW	331	Above 125 KW-upto 200 KW	203
Motor MCR in KW	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																				
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 9 OF 10																		

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Motor MCR in KW	Clearance		
	UP to 110 KW	10mm		
	Above 110 KW and upto 150 KW	12.5mm		
	Above 150 KW	19mm		

Cable glands

Cable shall be terminated using double compression type cable glands. Testing requirements of Cable glands shall conform to BS:6121 and gland shall be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected.

Cable lugs/ferrules

Cable lugs/ferrules for power cables shall be tinned copper solderless crimping type suitable for aluminium compacted conductor cables. Cable lugs and ferrules for control cables shall be tinned copper type. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipments. Cable lugs and ferrule shall conform to DIN standards

		QUALITY PLAN	CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :				
			BIDDER/ : VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-006-REV-01			SPECIFICATION TITLE				
			SHEET 1 OF 2			SYSTEM			ITEM AC ELECT. 1. 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	10	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				BIDDER'S/VENDORS COMPANY SEAL			
			NAME									
			SIGNATURE									
			DATE									

MOTOR

TESTS/CHECKS TEMS/COMPONENTS	Visual	Dimensional	Make/Type/Rating /General Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment
Plates for stator frame, end shield, spider etc.	Y	Y	Y	Y	Y				Y
Shaft	Y	Y	Y	Y	Y	Y			Y
Magnetic Material	Y	Y	Y	Y			Y		
Rotor Copper/Aluminium	Y	Y	Y	Y			Y		Y
Stator copper	Y	Y	Y	Y			Y		Y
SC Ring	Y	Y	Y	Y	Y		Y	Y	Y
Insulating Material	Y		Y	Y			Y		
Tubes, for Cooler	Y	Y	Y	Y	Y				Y
Sleeve Bearing	Y	Y	Y	Y	Y				Y
Stator/Rotor, Exciter Coils	Y	Y	Y				Y	Y	
Castings, stator frame, terminal box and bearing housing etc.	Y	Y	Y	Y	Y			Y	
Fabrication & machining of stator, rotor, terminal box	Y	Y			Y			Y	Y
Wound stator	Y	Y					Y	Y	
Wound Exciter	Y	Y					Y	Y	
Rotor complete	Y	Y					Y		
Exciter, Stator, Rotor, Terminal Box assembly	Y	Y					Y		
Accessories, RTD, BTD,CT, Space heater, antifriction bearing, gaskets etc.	Y	Y	Y						
Complete Motor	Y	Y	Y						
Note: 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, No QP for LT motor upto 50KW. 2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard 3. Makes of major bought out items for HT motors will be subject to NTPC approval. Y1 = for HT Motor / Machines only.									

CLAUSE NO.	QUALITY ASSURANCE										एनटीपीसी NTPC
MOTOR											
TESTS/CHECKS ITEMS/ COMPONENTS	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-325/IS-4722 /IS- 9283/IS 2148/IEC60034\IEC 60079-I	vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion	
Plates for stator frame, end shield, spider etc.											
Shaft											
Magnetic Material	Y		Y								
Rotor											
Copper/Aluminium											
Stator copper			Y								
SC Ring											
Insulating Material			Y								
Tubes for Cooler		Y									
Sleeve Bearing		Y									
Stator/Rotor, Exciter Coils											
Castings, stator frame, terminal box and bearing housing etc.											
Fabrication & machining of stator, rotor, terminal box											
Wound stator											
Wound Exciter											
Rotor complete				Y	Y						
Exciter, Stator, Rotor, Terminal Box assembly											
Accessories, RTD, BTD,CT, , Space heater, antifriction bearing, gaskets etc.											
Complete Motor						Y	Y	Y	Y1	Y	
Note: 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, No QP for LT motor upto 50KW. 2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard 3. Makes of major bought out items for HT motors will be subject to NTPC approval. Y1 = for HT Motor / Machines only.											
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)				TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.:CS-9585-001-2				SUB-SECTION-E-51 MOTORS		Page 2 of 2	

	TITLE	LV MOTORS <u>DATA SHEET-A</u> ANNEXURE - I		SPECIFICATION NO.	
				VOLUME	II B
				SECTION	D
				REV NO. 00	DATE 02.08.2019
				SHEET 1 OF 1	

- | | | | |
|------|---|---|--|
| 1.0 | Design ambient temperature | : | 50 °C |
| 2.0 | Maximum acceptable kW rating of LV motor | : | ≤200KW |
| 3.0 | Installation (Indoors/ Outdoors) | : | As required |
| 4.0 | Degree Of Protection (Indoor/Outdoor) | : | IP54/IP55 |
| 5.0 | Type of Cooling | : | TEFC/CACA/TETV |
| 6.0 | Details of supply system | | |
| | a) Rated voltage (with variation) | : | 415V ± 10% |
| | b) Rated frequency (with variation) | : | 50 Hz (Variation: +3% TO –5%) |
| | c) Combined voltage & freq. variation | : | 10% |
| | d) System fault level at rated voltage | : | 50 kA for 1 sec |
| | e) Short time rating for terminal boxes | | |
| | o 110kW & Above (Breaker controlled) | : | 50 kA for 1 sec |
| | o Below 110kW (SFU+ Contactor controlled) | : | 50 KA for 0.20 sec. |
| | f) LV System grounding | : | Solidly |
| 7.0 | Class of insulation | : | Refer clause 7.03.00 of Customer Motor Specification |
| 8.0 | Minimum voltage for starting (As percentage of rated voltage) | : | Refer clause 6.03.00 of Customer Motor Specification |
| 9.0 | Power cables data | : | Shall be given during Detailed engg. |
| 10.0 | Earth Conductor Size & Material | : | Shall be given during Detailed engg. |
| 11.0 | Space heater supply | : | 240 V, 1Φ , 50 Hz |
| 12.0 | Rating up to which Single phase motor | : | Acceptable upto 0.20 kW |
| 13.0 | Tests | : | As per Customer motor spec. (enclosed) |
| 14.0 | Energy efficient/ Flame proof motor | : | As per Customer spec. requirement |

- Also detail Customer spec. for Motors to be referred as enclosed with the specification.

DATASHEET C

CLAUSE NO.	Bidder's Name				
	DE-1B	LT MOTORS			
	A.	GENERAL			
	5.	Manufacturer & Country of origin. (Shall be as per approved QA make)			
	6.	Equipment driven by motor			
	7.	Motor type			
	8.	Quantity			
	B.	DESIGN AND PERFORMANCE DATA			
	18.	Frame size			
	19.	Type of duty			
	20.	Type of enclosure /Method of cooling/ Degree of			
	21.	Applicable standard to which motor generally			
	22.	Efficiency class as per IS 12615			
	23.	(a)Whether motor is flame proof	Yes/No		
		(b)If yes, the gas group to which it conforms as per IS:2148			
	24.	Type of mounting			
	25.	Direction of rotation as viewed from DE END			
	26.	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)			
	27.	Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)			
	28.	Maximum continuous load demand of driven			
	29.	Rated Voltage (volts)			
	30.	Permissible variation of :			
		a. Voltage (Volts)			
		b. Frequency (Hz)			
		c. Combined voltage and frequency			
	31.	Rated speed at rated voltage and			
	32.	At rated Voltage and frequency:			
		a. Full load current			
	EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)				
	TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2				
	DB07: MOTORS				
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CLAUSE NO.	Bidder's Name			
		b. No load current		
	33.	Power Factor at		
		a. 100% load		
		b. NO load		
		c. Starting.		
	34.	Efficiency at rated voltage and frequency,		
		a.100% load		
		b. 75% load		
		c. 50% load		
	35.	Starting current (amps) at		
		a. 100 % voltage		
		b. 85% voltage		
		c. 80% voltage		
	36.	Minimum permissible starting Voltage (Volts)		
	37.	Starting time with minimum permissible voltage		
		a. Without driven equipment coupled		
		b. With driven equipment coupled		
	38.	Safe stall time with 100% and 110% of rated		
		a. From hot condition		
		b. From cold condition		
	39.	Torques :		
		a. Starting torque at min. permissible voltage(kg-		
		b. Pull up torque at rated voltage.		
		c. Pull out torque		
	d. Min accelerating torque (kg.m) available			
	e.Rated torque (kg.m)			
40.	Stator winding resistance per phase (ohms at 20			
41.	GD ² value of motors			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2		DB07: MOTORS
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CLAUSE NO.	Bidder's Name				
	42.	No of permissible successive starts when motor is in hot condition			
	43.	Locked Rotor KVA Input			
	44.	Locked Rotor KVA/KW			
	45.	Vibration limit :Velocity (mm/s)			
	46.	Noise level limit (dBA)			
	C.	CONSTRUCTIONAL FEATURES			
	1.	Stator winding insulation			
		a. Class & Type			
		b. Winding Insulation Process			
		c. Tropicalised (Yes/No)			
		d. Temperature rise over specified maximum ambient temperature of 50 deg C			
		e. Method of temperature measurement			
		f. Stator winding connection			
	2.	Main Terminal Box			
		a. Type			
		b. Location(viewed from NDE side)			
		c. Entry of cables(bottom/side)			
		d. Recommended cable size(To be matched with cable size envisaged by owner)			
		e. Fault level (MVA),Fault level duration(sec)			
		f. Cable glands & lugs details (shall be suitable for			
	3.	Type of DE/NDE Bearing			
	4.	Motor Paint shade			
	5.	Weight of			
		a. Motor stator (KG)			
		b. Motor Rotor (KG)			
		c. Total weight (KG)			
		D.	List of accessories.		
	EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2		DB07: MOTORS
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CLAUSE NO.	Bidder's Name			
	1.	Space Heaters (Applicable for 30 KW & above motor) (Nos./Power in watts/supply voltage)		
	2.	Terminal Box for Space Heater (Yes/No)		
	3.	Speed switch (Yes/No)		
	4.	Insulation of bearing (Yes/No)		
	5.	Noise reducer(Yes/No)		
	6.	Grounding pads		
		i) No and size on motor body		
		ii) Nos on terminal Box		
	7.	Vibration pads		
		i) Nos and size		
		ii) Location		
	8.	Any other fitments		
	E.	List of curves.		
	1.	Torque speed characteristic of the motor		
	2.	Thermal withstand characteristic		
	3.	Starting. current Vs. Time		
	4.	Starting. current Vs speed		
	5.	P.F. and Effi. Vs Load		
	F.	Additional Data to be filled for each rating of DC Motor		
	1.	Rated armature voltage (Volt)		
	2.	Rated field excitation (Amp)		
	3.	Permissible % variation in voltage		
	4.	Minimum Permissible Starting voltage (volt)		
	5.	At rated voltage		
		i)Full load Armature current.(Amp)		
		ii)Full load Field current (Amp)		
	EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2	DB07: MOTORS
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CLAUSE NO.	Bidder's Name		
		iii) No load Armature current (Amp)	
	6.	Full load Field current (Amp)	
	7.	No load Armature current (Amp)	
	8.	Minimum permissible field current (Amp) to avoid	
		i) Maximum permissible voltage	
		ii) Rated voltage	
		iii) Minimum Permissible Voltage	
	9.	Resistance (indicative Values) in ohm	
		i) Armature winding (Arm + IP + Series) at 25	
		ii) Field Winding at 25 deg. C	
	10..	Inductance (indicative values)	
		i) Armature winding	
		ii) Field winding	
	11	Value of trimmer resistance (ohm) to be connected in series with the shunt field to	
		i) 220 V DC	
		ii) 250 V DC	
		iii) 187 V DC	
	12	Value of the external resistance (ohm) required to be connected in series with armature during starting only	
	13	Technical data sheet for external resistance box	
	14	GA drawing of motor	
	15	Starting time calculation	
16	Starter resistance design calculation		
17	Electrical connection diagram of motor		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2	DB07: MOTORS
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Vendor to refer to this list for items in their scope only (as indicated in Electrical scope sheet between BHEL & Vendor)

ANNEXURE II

		PROJECT : PATRATU STPS (3X800 MW) PACKAGE : EPC Sub Package: MOTORS & VVF Drive Panels CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR ; CONTRACTOR-M/S BHEL			REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 20 th April 2017	
Sl. No.	ITEM	QP / INS CAT.	QP No:- 9585-001-QVE-	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER STATUS AS PER NTPC	SC APPL SCHE DULE	REMARKS
1)	L.T (415 V) Motors	Refer Note 1				ABB	FARIDABAD	A		UPTO 55KW
						ABB	BANGALORE	A		55KW - 200KW
						BHARAT BULEE	MUMBAI	A		RQP, FOR FLAME PROOF ALSO
						CGL	AHMEDNAGAR	A		FOR FLAME PROOF ALSO
						JYOTI	BARODA	A		
						KEC	BANGALORE	A		FOR FLAME PROOF ALSO
						KEC	HUBLI	A		UPTO 90KW: FOR FLAME PROOF ALSO
						LHP	SOLAPUR	A		UPTO 200KW
						MARATHON	KOLKATA	A		FOR FLAME PROOF ALSO
						NGEF	BANGALORE	A		UPTO 15KW
						SIEMENS	MUMBAI	A		
2)	HT MOTOR					BHEL	BIHOPAL	A		

Deptt.
d * Distt- Ramgarh

		PROJECT: PATRATU STPS (3X800 MW) PACAKGE: EPC Sub Package: MOTORS & VVF Drive Panels CONTRACTOR: M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR; CONTRACTOR-M/S BHEL		REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 20th April 2017		
Sl. No.	ITEM	QP / INS CAT.	QP No:- 9585-001-.....	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS	SC APPL SCHE	REMARKS

NOTE 1: FOR L.T. MOTORS

a) Less than 30 KW

Acceptance of Motor less than 30 KW is based on COC of the manufacturer & the contractor confirming as follows:
 It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate and tested in accordance with approved drawing /data sheets.

b) 30 KW -50KW

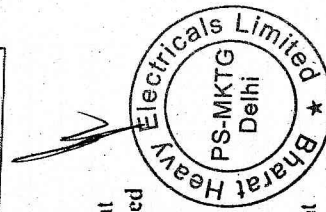
Acceptance of Motor rating between 30 KW & 50 KW is based on NTPC review of Routine Test inspection report as per IS 325 witnessed by main contractor along with COC of the manufacturer & the contractor confirming as follows:
 It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing /data sheets.

c) Above 50 KW as per NTPC approved quality plan

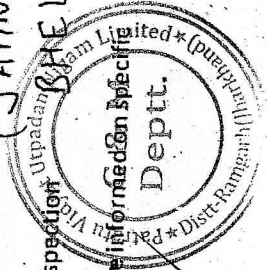
Approval Conditions attached to above vendors-as applicable shall prevail.

General Notes:

- 1) Vendor list & category of the mandatory spares shall be as mentioned above.
- 2) For item not appearing in the above list, main contractor to approach NTPC for acceptable vendors & inspection categorization of the same.
- 3) NTPC Approval conditions to above identified vendors shall be adhered to. Vendor's approval conditions will be request of Main Contractor.



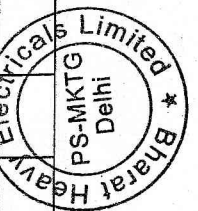
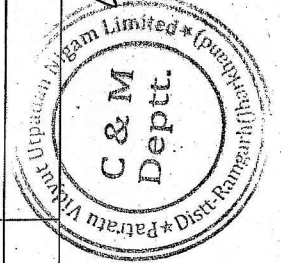
For
(JATIN GAHLAWAT,
UPADAN BHEL



		PROJECT: Patratu STPP (2X660 MW) PACAKGE: EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR: M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017	
Sl. No.	ITEM	QP / INS CAT	QP No:- 9578-001-QVE-	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC AP PL SC HE DU LE	REMARKS	

13.	Junction boxes / Link Boxes/ Test Link Box/ Adapter box, Switch Boxes, Pull Boxes (Hot Dip Galvanized)	III				Main contractor approved sources with galvanization from NTPC approved sources (Note-2)		Noted		
14.	FRP Junction boxes	II	10			Main Contractor approved sources		Noted		

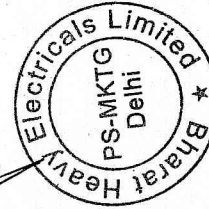
16.	Cable glands	III				Main contractor approved sources		Noted		
17.	Cable lugs	III				M/s Dowell	Mumbai	A		
						M/s Bilets Elektro Werke Ltd.	Umbergaon	A		



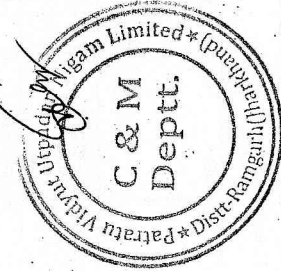
		PROJECT : Patratu STPP (2X660 MW) PACAKGE : EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017	
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							(3 D)				
							M/s Chelna	Nasik	A		
							Additionally Any make's model with VDE or CE or UL or CSA marking or BIS approved with CML no. Refer Note-3				
									Noted		

				PROJECT : Patratu STPP (2X660 MW) PACAKGE : EPC Sub Package: Electrical Equipment Supply & Erection CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2				LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR Contractor-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 24th April 2017			
Sl. No.	ITEM	QP / INS CAT	QP No:- 9578-001-QVE	QP SUB. SCH.	QP APP L SCH EDU LE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC AP PL SC HE DU LE	REMARKS					
1.	M/s M J Engg, Delhi														
2.	M/s Jamna Metal, Delhi														
3.	M/s A. V. Engg, Kolkata														
4.	M/s Inar Profiles, Vishakapatnam														
5.	M/s Anand Udyog, Mumbai														
6.	M/s Techno Engg, Chandigarh														
7.	M/S Steelite Engg, Mumbai														
8.	M/s National Galvanizer, Kolkata														
9.	M/s Unistar Galvanizer, Kolkata														
10.	M/s B.P. Project, Kolkata														
11.	M/s Bajaj Pune														
12.	M/s Electrocare Industries, Mumbai														
13.	M/s B.G. Shirke, Pune														
14.	M/s Gurpreet Galvanizer, Hyderabad														
15.	M/s Sigma, Mumbai														
16.	M/s Radhakrishnan Shetty, Chennai														
17.	Karamlara Mumbai														
18.	Poona Galvanizers Pune														
19.	Neha Galvanizer- Kolkata														
20.	Unittech galvanizers- Hoogly														
21.	Gurpreet galvanizers- Hyderabad														
22.	DMP Projects- Kolkata														

Note-3 : VDE / CE / UL / CSA MARKING FOR PRODUCT QUALITY: SELF CERTIFICATION/VALID CERTIFICATION FROM THIRD PARTY AGENCY OR BIS APPROVAL LETTER WITH CML NO. FOR PRODUCT QUALITY SHALL BE SUBMITTED FOR NTPC'S INFORMATION



Handwritten signature
NTPC



Handwritten signature
(JATIN GAHLAWAT)
BHEL

[illegible]



TITLE

3X800 MW PATRATU STPS

TECHNICAL SPECIFICATION

FOR

WORKSHOP EQUIPMENT

SPECIFICATION NO. PE – TS - 434 - 568 – A001		
VOLUME	III	
SECTION	D	
REV	0	
SHEET	OF	

VOL - III

	TITLE 3X800 MW PATRATU STPS TECHNICAL SPECIFICATION FOR WORKSHOP EQUIPMENT	SPECIFICATION NO. PE – TS - 434 - 568 – A001	
		VOLUME	III
		SECTION	
		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
3X800 MW PATRATU STPS
COMPLIANCE CUM CONFIRMATION
CERTIFICATE**

SPEC. NO.: PE-TS-434-568-A001

VOLUME: III

SECTION:

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
3X800 MW PATRATU STPS
COMPLIANCE CUM CONFIRMATION
CERTIFICATE**

SPEC. NO.: PE-TS-434-568-A001

VOLUME: III

SECTION:

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.



TITLE **3X800 MW PATRATU STPS**
 TECHNICAL SPECIFICATION FOR
 WORKSHOP EQUIPMENT

SPECIFICATION NO. PE-TS-434-568-A001

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

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	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	20	21
ANNEXURE-II																				
Vertical Turret Lathe M/C	30 kW-42 kW		S	1		D	S		I											
Heavy Duty Lathe M/C	18-20 kW		S	1		D	S		I											
Heavy Duty Lathe M/C -1	18-20 kW		S	1		D	S		I											
Medium Duty Lathe M/C -1	11-13 kW		S	1		D	S		I											
Medium Duty Lathe M/C -2	11-13 kW		S	1		D	S		I											
Medium Duty Lathe M/C -3	11-13 kW		S	1		D	S		I											
Universal Milling M/C	11-14 kW		S	1		D	S		I											
Surface Grinding M/C	7-9 kW		S	1		D	S		I											
Cylindrical Grinding M/C	3.5-5.5 kW		S	1		D	S		I											
Slotting M/C	9.3-11 kW		S	1		D	S		I											
Radial Drill M/C	7-10 kW		S	2		D	S		I											
Column Drill M/C	5.5-7 kW		S	1		D	S		I											
Hydraulic Press M/C 100 T	4.75-5.5 kW		S	1		D	S		I											
Hydraulic Press M/C 60 T	4.75-5.5 kW		S	1		D	S		I											
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.		434		ORIGINATING AGENCY		PEM (ELECTRICAL)												
		PROJECT TITLE		3X800 MW PATRATU STPS		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	MAX. CONT. DEMAND (MCR)		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 Bending M/C	15-17 kW		S	1		D	S		I											
Plate Shearing M/C	2.2-3 kW		S	1		D	S		I											
Dynamic Balancing	7.5-9 kW		S	1		D	S		I											
Shaper M/C	3.7-4.5 kW		S	1		D	S		I											
Pipe Bending M/C	1.5-2 kW		S	2		D	S		I											
Tool and Cutter Grinding M/C	0.75-1.5 kW		S	2		D	S		I											
Power Hacksaw M/C	1.5-2.5 kW		S	2		D	S		I											
Welding Generator- Supergen M/C	13.5-15 kW		S	1		D	S		I											
Welding Transformer M/C	15-17 kW		S	3		D	S		I											
Battery operated trolley-1	14-20 kW		S	1		D	S		I											
Battery operated trolley-2	14-20 kW		S	1		D	S		I											
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.		434				ORIGINATING AGENCY				PEM (ELECTRICAL)								
		PROJECT TITLE		3X800 MW PATRATU STPS				NAME					DATA FILLED UP ON							
		SYSTEM						SIGN.					DATA ENTERED ON							
		DEPTT. / SECTION		MAX				SHEET 2 OF 2		REV. 00		DE'S SIGN. & DATE								