



**SPECIFIC TECHNICAL REQUIREMENT
FOR CIVIL, STRUCTURAL &
ARCHITECTURAL WORKS FOR 2X660
MW , STAGE-II MOUDA, SUPER
CRITICAL TPS**

SPECIFICATION NO. PE-TS-385-600-001

VOLUME - IIB

SECTION - C

REV.NO. 0 DATE 06.02.2013

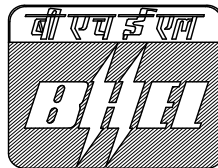
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**MOUDA, SUPER CRITICAL TPS
2X660 MW , STAGE-II**

VOLUME: IIB

SECTION - C

**SPECIFIC TECHNICAL REQUIREMENTS FOR CIVIL,
STRUCTURAL & ARCHITECTURAL WORKS**



**Bharat Heavy Electricals Limited
Project Engineering Management
Power Sector, BHEL**



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PART-I

GENERAL CIVIL REQUIREMENT



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1. GENERAL

Two Volumes-Section C & Section D of this specification covers design and construction of Civil, Structural and Architectural works. The scope of works covers complete Civil, Structural and Architectural Works **including** supply of all materials, labour, tools and plants as required for successful execution of the packages. This Part-I of Section-C lists Codes and Standards to be adopted and the principal structures of the plant, and briefly describes the basic concept, requirements and features pertinent to each. **If there is any ambiguity and/or contradiction between Section C and Section D, the provisions / requirements laid in Section C shall prevail. In case of ambiguity between BOQ and Part C former shall prevail.**

(Contractor shall read the parts of the specification relevant to the contract and shall ignore the other parts of the specification. Relevant clauses of this section as applicable for respective package to be followed.)

2. CODES AND STANDARDS

Following is a general listing of Codes and Standards to be used in the design of the Plant. Specific applicable codes and standards will be identified in System Design Descriptions/ Technical Specifications as appropriate. The latest editions/ revision of following codes and standards along with addendums/ amendments, if any, shall be followed :

2.1. Concrete

- a) IS-269 : Ordinary and low heat portland cement.
- b) IS-383 : Coarse and fine aggregate from natural sources for concrete.
- c) IS-432 : Mild Steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.
- d) IS-455 : Portland Slag Cement.
- e) IS-456 : Code of Practice for Plain and reinforced concrete.
- f) IS-460 : Test Sieves (all parts).
- g) IS-516 : Methods of test for strength of concrete.
- h) IS-1199 : Methods of sampling and analysis of concrete.
- i) IS-1566 : Hard drawn steel wire fabric for concrete Reinforcement.
- j) IS-1786 : High strength deformed steel bars and wires for concrete reinforcement.
- k) IS-1834 : Hot applied sealing compounds for joints in concrete.
- l) IS-2386 : Methods of test for aggregates for concrete (all parts).
- m) IS-2502 : Code of practice for bending and fixing of bars for concrete reinforcement.
- n) IS-3370 : Code of practice for concrete structures for storage of liquids (all parts).
- o) IS-3414 : Code of practice for design and installation of joints in buildings.
- p) IS-4948 : Welded steel wire fabrics for general use.
- q) IS-6452 : High Alumina Cement for Structural use.
- r) IS-7320 : Concrete slump test apparatus.
- s) IS-7861 : Code of practice for extreme weather concreting (all



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- parts).
- t) IS-8041 : Rapid Hardening Portland Cement.
 - u) IS-8112 : High strength ordinary Portland Cement.
 - v) IS-10262 : Recommended guidelines for concrete mix design.
 - w) IS-458 : Specification for precast concrete pipes.
 - x) IS-3935 : Code of practice for composite construction.
 - y) IS-4995 : Criteria for design of reinforced concrete bins for storage of granular (all parts) and powdery materials.
 - z) IS-5525 : Recommendation for detailing of reinforced concrete works.
 - aa) IS-11384 : Code of practice for composite construction in structural steel and concrete.
 - bb) IS-11682 : Criteria for design of RCC staging for overhead water tanks.
 - bb) IS-13920 : Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces.

2.2. Foundations

- a) IS-1904 : Code of practice for structural safety of buildings : Shallow foundations.
- b) IS-2950 : Code of practice for design and construction of raft foundations.
- c) IS-2974 : Code of practice for design and construction of Machine foundations (all parts).
- d) IS 2911 : Code of practice for Design and Construction of Pile foundations (all parts).
- e) IS 1080 : Code of practice for Design and Construction of shallow foundations on soils (other than raft, ring and shell)
- f) IS 4091 : Code of practice for Design and Construction of foundations for transmission line towers and poles
- g) IS 8009 : Code of practice for calculation of settlement of foundations: (all parts)
- h) IS 9556 : Code of practice for Design and Construction of diaphragm walls.
- i) IS 11089 : Code of practice for Design and Construction of ring foundation.
- j) IS 13301 : Guidelines for vibration isolation for machine foundation.

2.3. Loading

- a) IS-875 : Code of practice for Structural safety of buildings - loading standards.
- b) : Bridge Rules of Government of India, Ministry of Railways (Railway Board).
- c) IS-1911 : Schedule of unit weights of building materials.

2.4. Masonry

- a) IS-712 : Building limes.
- b) IS-1077 : Common Burnt Clay Building Bricks.
- c) IS-1127 : Recommendations for dimensions and workmanship of natural building stones for masonry work.
- d) IS-1528 : Methods of sampling and physical tests for refractory materials.
- e) IS-1597 : Code of practice for construction of stone masonry (all parts).
- f) IS-2212 : Code of practice for brickwork.
- g) IS-2116 : Sand for masonry mortars



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- h) IS-2185 : Concrete masonry units. (all parts - Hollow and Solid concrete blocks).
i) IS-2250 : Code of practice for preparation and use of masonry mortars.
j) IS-2572 : Code of practice for construction of hollow concrete block masonry.
k) IS-2691 : Burnt clay facing bricks.
l) IS-3414 : Code of practice for design and installation of joints in buildings.
m) IS-3495 : Methods of tests of burnt clay building bricks.
n) IS-4441 : Code of practice for use of Silicate type chemical resistant mortars.
o) IS-4860 : Acid Resistant Bricks.
p) IS-1905 : Code of practice for structural use of unreinforced masonry.
q) IS-10440 : Code of practice for construction of reinforced brick and reinforced brick concrete floors and roofs.

2.5.Doors, Windows and Ventilators

- a) IS-399 : Classification of commercial timbers and their zonal distribution.

b) IS-883 : Code of practice for design of structural timber in building.
c) IS-1003 : Timber panelled and glazed shutters (all parts).
d) IS-1038 : Steel doors, windows and ventilators.
e) IS-1081 : Code of practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators.
f) IS-1361 : Steel windows for industrial buildings.
g) IS-2835 : Transparent sheet glass for glazing and framing purposes.
h) IS-1948 : Aluminium doors windows and ventilators.
i) IS-1949 : Aluminium windows for industrial building.
j) IS-2191 : Wooden flush door shutters (Cellular and hollow core type).
k) IS-2202 : Wooden flush door shutters (solid core type).
l) IS-3103 : Code of practice for Industrial ventilation.
m) IS-3548 : Code of practice for glazing in buildings.
n) IS-3614 : Fire check doors.
o) IS-4021 : Timber door, windows and ventilator frames.
p) IS-4351 : Steel door frames.
q) IS-6248 : Metal rolling shutters and rolling grills.

2.6.Roof and Flooring

- a) IS-2204 : Code of practice for construction of reinforced concrete shell roof.
b) IS-3201 : Criteria for the design and construction of precast concrete trusses.
c) IS-2210 : Criteria for Design of R.C. shell structures and folded plates.
d) IS-809 : Rubber flooring materials for general purposes.
e) IS-1195 : Bitumen mastic for flooring.
f) IS-1196 : Code of practice for laying bitumen mastic flooring.
g) IS-1198 : Code of practice for laying, fixing and maintenance of linoleum floors.
h) IS-1237 : Cement concrete flooring tiles.
i) IS-1443 : Code of practice for laying and finishing of cement concrete flooring tiles.
j) IS-2114 : Code of practice for laying in situ terrazzo floor finish.
k) IS-2571 : Code of practice for laying in situ cement concrete flooring.
l) IS-5491 : Code of practice for laying in situ granolithic concrete floor topping.
m) IS-5766 : Code of practice for laying burnt clay brick flooring.
n) IS-1197 : Code of practice for laying of rubber floors.
o) IS-2441 : Code of practice for fixing ceiling coverings.

2.7.Waterproofing

- a) IS-1322 : Bitumen felts for waterproofing and damp proofing.



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- b) IS-1346 : Code of practice for waterproofing of roofs with bitumen felts.
- c) IS-1609 : Code of practice for laying damp proof treatment using bituminous felts.
- d) IS-3036 : Code of practice for laying lime concrete for a waterproofed roof finish.
- e) IS-3037 : Bitumen mastic for use in waterproofing of roofs.
- f) IS-3067 : Code of practice for general design, details and preparatory work for damp proofing and water proofing of buildings.
- g) IS-3384 : Bitumen primer for use in water proofing and damp proofing.
- h) IS-4365 : Code of practice for application of bitumen mastic for waterproofing of roofs.

2.8. Soil Engineering

- a) IS-1498 : Classification and identification of soils for general engineering purposes.
- b) IS-1892 : Code of practice for sub-surface investigation for foundations.
- c) IS-2131 : Method for standard penetration test for soils.
- d) IS-2720 : Methods of test for soils (all parts).

2.9. Water Supply, Drainage and Sewerage

- a) IS-404 : Lead pipes
 - b) IS-458 : Concrete pipes
 - c) IS-651 : Salt glazed stoneware pipes and fittings.
 - d) IS-771 : Glazed fire-clay sanitary appliances (all parts).
 - e) IS-774 : Flushing cisterns for water closets and urinals other than plastic cisterns.
 - f) IS-783 : Code of practice for laying of concrete pipes.
 - g) IS-1172 : Code of basic requirements for water supply, drainage and sanitation.
 - h) IS-1626 : Asbestos cement building pipes, gutters and fittings (all parts).
 - i) IS-1742 : Code of practice for building drainage.
 - j) IS-2064 : Code of practice for selection, installation and maintenance of sanitary appliances.
 - k) IS-2065 : Code of practice for water supply in buildings.
 - l) IS-2470 : Code of practice for installation of septic tanks (all parts).
 - m) IS-3114 : Code of practice for laying of Cast Iron pipes.
 - n) IS-4127 : Code of practice for laying of glazed stoneware pipes.
 - o) IS-12251 : Code of practice for Drainage of Building Basement.
 - p) IS-1200 : Method of measurement : Laying of water and [Part- XVI] sewer lines including appurtenant items.
 - q) IS-1536 : Centrifugally cast (spun) iron pressure pipes for water, gas and sewage.
 - r) IS-1537 : Vertically cast iron pressure pipe for water, gas and sewage.
 - s) IS-3486 : Cast iron spigot and socket drain pipes .
 - t) IS-5329 : Code of practice for sanitary pipe work above ground for buildings.
 - u) IS-3076 : Low density polyethylene pipes for potable water supplies.
 - v) IS-1538 : Cast iron fittings for pressure pipes for water, gas and sewage.
 - w) IS-1230 : Cast iron rainwater pipes and fittings.
 - x) IS-1729 : Sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
 - y) IS-784 : Prestressed concrete pipes.
 - z) IS-1726 : Cast iron manhole covers and frames.
 - aa) IS-5961 : Cast iron grating for drainage purposes.
 - bb) IS-5219 : "P" and "S" traps.
- [Part-I]
- cc) IS-772 : General requirements for enamelled cast iron sanitary appliances.
 - dd) IS-775 : Cast iron brackets and supports for wash basins and sinks.



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- ee) IS-777 : Glazed earthenware wall tiles.
ff) IS-2548 : Plastic water closet seats and covers (all parts).
gg) IS-2527 : Code of practice for fixing rainwater gutters and downpipes for roof drainage.

2.10. Paving and Road works

- a) IS-73 : Paving bitumen
b) IS-702 : Industrial Bitumen
c) IS-1201 : Method of testing tar and bituminous materials. thru' 1220
d) : Practice followed by Indian Road Congress (all parts).

2.11. Earthquake Resistant Design

- a) IS-1893 : Criteria for earthquake resistant design of structures.
b) IS-4326 : Code of practice for earthquake resistant design and construction of buildings.

2.12. Structural Steelwork

- a) IS-800 : Code of practice for general construction in steel.
b) IS-802 : Code of practice for use of structural steel in Overhead Transmission Line (All Parts).
c) IS-806 : Code of practice for use of steel tubes in general building construction.
d) IS-808 : Rolled steel beams, channels and angle sections.
e) IS-813 : Scheme of symbols for welding.
f) IS-814 : Covered electrodes for manual metal arc welding of carbon and carbon manganese steel.
g) IS-816 : Code of practice for use of metal arc welding for general construction in mild steel.
h) IS-817 : Code of practice for training and testing of metal arc welders.
i) IS-818 : Code of practice for safety and health requirements in electric and gas welding and cutting operation.
j) IS-819 : Code of practice for Resistance spot welding for light assemblies in Mild Steel.
k) IS-919 : Recommendations for limits and fits for engineering.
l) IS-1024 : Code of practice for use of welding in Bridges and Structures subjected to Dynamic loading.
m) IS-1161 : Steel tubes for structural purposes.
n) IS-1182 : Recommended practice for Radiographic Examination of Fusion Welded Butt joints in steel plates.
o) IS-1200 : Method of measurement of steelwork and ironwork.
[Part-VIII]
p) IS-1239 : Mild steel tubes, tubulars and other wrought steel fittings (all parts).

q) IS-1363 : Black hexagonal bolts, nuts and locknuts (dia. 6 to 39 mm) and black hexagon screws (dia.6 to 24 mm). [all parts]

r) IS-1364 : Precision and semi-precision hexagon bolts, screws, nuts and locknuts (dia. range 6 to 39 mm). [all parts]
s) IS-1365 : Slotted counter sunk head screws (dia range 1.6 to 20 mm).
t) IS-1367 : Technical supply conditions for threaded steel fasteners.
u) IS-1443 : Code of practice for laying and finishing of cement concrete flooring tiles.



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v) IS-1608 : Method for tensile testing of steel products.

- w) IS-1730 : Dimensions for steel plate, sheet and strip for structural and general engineering purpose.
- x) IS-1731 : Dimensions for steel flats for structural and general engineering purposes.
- y) IS-1852 : Rolling and cutting tolerances for hot rolled steel products.
- z) IS-1977 : Structural steel (Ordinary quality)
- aa) IS-2016 : Plain Washers
- bb) IS-2062 : Steel for General structural purposes.
- cc) IS-2074 : Ready mixed paint, air drying, red oxide zinc-chrome, priming.
- dd) IS-2633 : Methods of testing uniformity of coating of zinc coated articles.
- ee) IS-3613 : Acceptance tests for wire-flux combinations for submerged-arc welding of structural steels.
- ff) IS-3664 : Code of practice for Ultrasonic Pulse echo testing by contact and immersions methods.
- gg) IS-3757 : High strength structural bolts.
- hh) IS-4000 : High strength bolts in steel structures.
- ii) IS-4759 : Hot dip zinc coatings on structural steel and other allied products.
- jj) IS-5334 : Code of practice for Magnetic Particle Flaw detection of welds.
- kk) IS-7215 : Tolerances for fabrication of steel structures.
- ll) IS-7280 : Base-wire electrodes for sub-merged arc welding of structural steels.
- mm) IS-7318 : Approval test for welders when welding procedure approval is not required.
[Part-I]
- nn) IS-8500 : Structural steel - microalloyed (medium and high strength qualities).
- oo) IS-9595 : Recommendation for metal arc welding of carbon and carbon manganese steels.
- pp) AWS D.1.1 : Structural Welding Code.
- qq) IS-8640 : Recommendations for dimensional parameters for industrial building.
- rr) IS-9178 : Criteria for design of steel bins for storage of bulk material (all parts).
- ss) IS-12843 : Tolerances for erection of steel structures.

2.13. Painting

- a) IS-348 : Specification for French Polish.
- b) IS-427 : Specification for Distemper, dry colour as required.
- c) IS-428 : Specification for Distemper, oil emulsion, colour as required.
- d) IS-1477 : Code of practice for painting of ferrous metal in buildings.
[I & II]
- e) IS-2338 : Code of practice for finishing of wood and wood based materials.
[I & II]
- f) IS-2339 : Specification for Aluminium Paints for general purposes in dual containers.
- g) IS-2395 : Code of practice for painting concrete, masonry and plaster surface.
- h) IS-2932 : Specification for enamel, synthetic, exterior - a) undercoating, b) finishing.
- i) IS-2933 : Specification for enamel, exterior - a) undercoating, b) finishing.
- j) IS-5410 : Specification for cement paint.

2.14. Other

- a) Indian Road Congress (IRC) Bridge Codes
- b) Indian Railway Standard Bridge Rules

3. General



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All the quality standards, tolerances, welding standards and other technical requirements shall be strictly adhered to. The Bidder shall fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, soil conditions, local conditions and site specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may not have been specifically brought out in the specifications. In case of any conflict between stipulations in various portions of the specification, most stringent stipulation would be applicable for implementation by the Bidder without any extra cost to the Employer.

4. LAYOUT

Before starting the work, the Contractor shall carry out the setting out of foundation and structures and provide levels, with reference to general existing grid and bench mark. **If the Contractor uses the grid, bench mark and reference pillar made by other Contractors, he shall co ordinate with the Contractor and shall satisfy himself of the accuracy of the reference marks.** If he is required to set out the foundation afresh, he shall do so independently with reference to the one existing grid and bench

mark which has been followed by other agency at the instruction of the Engineer. In case any discrepancy is found, it shall be immediately brought to the notice of the Engineer for any rectification/modification necessary. No complaint shall be entertained at a later stage. The Contractor shall accurately set out the position for holding down bolts and inserts.

If required, in the opinion of the Engineer, he shall construct and maintain pillars for grid, references and bench marks and maintain them till the completion of the construction. He shall also help the Engineer with instruments, materials and labours for checking the detailed layouts and levels. The Contractor shall be solely responsible for the correctness of the layout and levels, and Engineer's approval shall not be deemed to imply any warranty in carrying out the works correctly. The Tenderer's shall take into account the cost of these in quoting their price.

5. WORKMANSHIP

Workmanship shall be of the best possible quality and all work shall be carried out by skilled workmen except for those which normally require unskilled persons. Welding shall be done by experienced and certified welders in proper sequence using necessary jigs and fixtures. Fabrication shall be done in shops having proper equipment for accurate edge and shaping and dimensioning of anchor bolt assembly, inserts and other misc. items. In addition to the requirement specified above, if the bye laws of the local Govt., Municipal or other authorities require the employment of licensed or registered workmen for various trades, the Contractor shall arrange to have the work done by such registered or licensed personnel. In case of manufactured materials, the Contractor shall have, with no additional cost to the Owner, the services of the supervisors of the manufacturers to ensure that the work is being done according to the manufacturer's specifications.

6. TEMPORARY WORK

All scaffoldings, staging, temporary bracing and other necessary temporary work required for proper execution of the Contract shall be provided by the Contractor at his own cost and inclusive of all materials, labour, supervision and other facilities.

The layout and details of such Temporary work shall have the prior approval of the Engineer, but the Contractor shall be responsible for proper strength and safety of the same. All Temporary work shall be so constructed as not to interfere with any permanent work or with the work by other agencies. If it



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is necessary to remove any of the temporary work at any time to facilitate execution of the work or with the work of other agencies, such removal and re erection, if required, shall be carried out by the Contractor at the direction of the Engineer without any delay and any extra cost on this account shall be borne by the Contractor.

7. INTERFACE WITH STRUCTURES UNDER OTHER'S SCOPE

Modification in layout of foundation/structure during detail engineering stage may be necessary to avoid fouling with those under other's scope. Necessary changes on this account will be made without any extra cost to Owner.

8. SEQUENCE OF WORK AND PROGRESS REPORT

The sequence in which the works are to be carried out shall be as approved by the Engineer in accordance with the construction method accepted by the Engineer and to be followed by the Contractor. A programme of work is to be submitted for the Engineer's review and approval and this has to be periodically updated and modified as per actual progress to enable timely completion.

The Contractor shall regularly submit to the Engineer progress reports for periods of working as specified by the Engineer showing up to date progress on all important items of work.

9. CONSTRUCTION METHODOLOGY

Construction and erection activities shall be fully mechanized from the start of the work. All excavation and backfilling work shall be done using excavators, loaders, dumpers, dozers, poclains, excavator mounted rock breakers, rollers, sprinklers, water tankers, etc. Manual excavation can be done only on isolated places with specific approval of engineer.

Dewatering shall be done using the combination of electrical and standby diesel pumps.

For concreting, weigh batching plants, transit mixers, concrete pumps, hoists, etc. shall be used.

All handling of materials shall be with cranes.

Heavy trailers shall be used for transportation.

Mechanized modular units of scaffolding and shuttering shall be used.

Grouting shall be carried out using hydraulically controlled grouting equipment.

All finishing items shall be installed using appropriate modern mechanical tools. Manual punching etc. shall not be permitted.

Heavy duty hoists for lifting of construction materials shall be deployed.

Compressors for cleaning of foundations and other surfaces shall be used.

Field laboratory shall be provided with all modern equipment for survey, testing of soil, aggregates, concrete, welding, etc.



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All persons working at site shall be provided with necessary safety equipment and all safety aspects shall be duly considered for each construction/ erection activity. Moreover, only the persons who are trained in the respective trade shall be employed for executing that particular work.



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PART-II

SPECIFIC TECHNICAL REQUIREMENT



SUB-SECTION-V

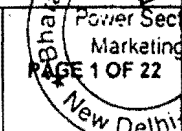
CIVIL WORKS

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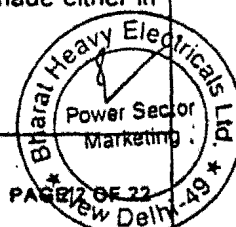


MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) /
NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW)
/RAGHUNATHPUR TPP PHASE-II (2 x 660MW)
STEAM GENERATOR PACKAGE

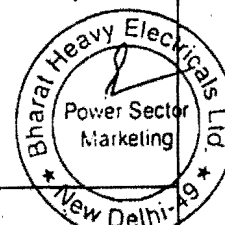
TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2

CLAUSE NO.	TECHNICAL REQUIREMENTS
1.00.00	GENERAL
1.01.01	This section of the Technical Specification covers the technical requirements for Design, preparation of General Arrangement Drawings, Design Drawings, Civil task drawings (for engineering by Employer for areas covered under Employer's scope), Supply of Labour, Materials, plant & equipment, Construction, fabrication and Erection of Civil and Structural works included in Contractor's scope.
1.01.02	Description of various items of work under this Specification and nature of work in detail are given hereinafter. The complete works under this Specification is referred to as "Civil Works". Various Structures, Plant, Systems, Facilities, etc., covered under the Scope of this Specification is given in Part - A and herein.
1.01.03	The work to be performed under this Specification shall also include Design, Engineering and providing of all Labour, Materials, Plant & Equipment, Consumables, Construction Facilities and all Incidental Items though not shown or specified but are reasonably implied and / or are necessary for the completion and proper functioning of the Plant, Systems and Facilities, all in strict accordance with the Specifications, including revisions and amendments thereto.
1.01.04	All Materials required for works under the Contractor's scope shall be arranged and supplied by the Contractor.
1.01.05	All support structures (as covered under the Scope) including those for pipes/cables/ducts above Foundation Level or Grade Level, whichever is lower shall be of Steel and shall be supplied and provided by the Contractor.
1.01.06	All interconnecting platforms shall be supplied and provided by the Contractor.
1.01.07	All mono-rails, monorail beams required for equipment handling, etc. shall be supplied and provided by the Contractor.
1.01.08	Foundation Bolts along with templates, inserts and embedments along with lugs, pipe sleeves, etc. whatsoever required in concrete/masonry for supporting Equipment and Structures shall be supplied by the Contractor and placed by Employer. However the accuracy of these fixtures shall be checked and ensured by the Contractor during placement. Any modification required on these fixtures subsequent to their placement shall be done by Contractor.
1.01.09	Steam Generator, mill bunker building, coal handling transfer points, coal conveyor galleries and its supporting trestles shall be supported by Contractor on Foundation through Foundation Bolt assemblies and shear keys installed at the time of first stage concreting.
1.01.10	All other Structures shall be supported by Contractor on Foundation through Anchor Fasteners. For such Structures, Employer shall provide the Foundation, on which the Contractor shall supply and install, the Anchor Fasteners of requisite capacity to support his Structures.
1.01.11	Anchor Fasteners shall be used for supporting all such Equipment, where the Static and Dynamic Load due to Equipment is within the safe Load carrying capacity of the Anchor Fasteners. For such Equipment, Employer shall provide the Foundation, on which the Contractor shall supply and install the Anchor Fasteners of requisite capacity to support his Equipment.
1.01.12	The Employer shall provide the pockets only for those Equipment Foundations where the Load to be transferred is beyond the safe Load carrying capacity of Anchor Fasteners. For such Equipment, subsequent supply and installation of Foundation Bolts including steeling
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2
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CLAUSE NO.	TECHNICAL REQUIREMENTS	
	of pockets shall be done by Contractor. In case, it is required that Foundation Bolts are required to be embedded during the first stage of concreting, then the Contractor shall make the Bolts available at site (before casting of foundation) for installation by Employer at the time of the concreting stage itself. During concreting, Contractor shall depute his engineers to verify that all foundation bolts/sleeves/embedments etc. are installed correct to layout and levels as per their design drawings. Any modification required on these fixtures subsequent to their placement shall be done by Contractor.	
1.01.13	All inserts and embedments whatsoever required by the Contractor over the Concrete, masonry and other similar surfaces, for supporting their Structures / Equipment etc. shall be installed by the Contractor using Anchors Fasteners. All small size Openings having size (within 150 mm x 150 mm area) which are required on Floors, Walls, Cladding, Roof etc. shall be neatly created and finished by the Contractor using appropriate tools. The Employer shall however provide larger size Openings.	
1.01.14	All Grouting of pockets, Underpinning of Base Plates, filling and finishing of Openings etc. shall be done by the Contractor. The Employer shall do encasement of Base Plates. Anchor Fasteners shall be fixed in position by Contractor as recommended by the manufacturer and approved by the Employer.	
1.01.15	The work shall be carried out according to the Design / Drawings, to be developed by the Contractor and got approved by the Employer. For all Plant, Systems, Facilities, Structures, etc., necessary Layout and details are to be developed by the Contractor keeping in view the statutory and functional requirements and providing enough space and access for Operation, use and Maintenance. The Contractor's work shall cover satisfying the complete requirements as per IS Codes, requirements of various Statutory Bodies, International Standards, best prevailing practices and to the complete satisfaction of the Employer.	
1.01.16	The Contractor shall make the Layout and Levels of all Structures from the general grid of the plot and the nearest GSI Benchmark or other acceptable Benchmark of Government Department, as per the directions of the Employer. The Contractor shall be solely responsible for the correctness of the Layout and Levels and shall also provide necessary instruments, manpower, materials, access to works, etc., to the Employer for general checking of the correctness of the Civil works.	
1.01.17	All the quality standards, tolerances, Welding standards and other technical requirements shall be strictly adhered to.	
1.01.18	The Contractor shall fully appraise himself of the prevailing conditions at the proposed Site, climatic conditions including monsoon pattern, soil conditions, local conditions and Site specific parameters and shall provide for all such conditions and contingent measures, including those which may not have been specifically brought out in the Specifications but required for successful execution of work.	
1.01.19	In case of any conflict between stipulations in various portions of the Specification, most stringent stipulation would be applicable for implementation by the Contractor without any extra cost to the Employer.	
2.00.00	SUBMISSIONS	
2.01.01	Commencement of Fabrication, Erection and Construction shall be done after approval of the relevant Design Documents and Drawings. All Drawings shall be of standard sizes (Metric System) and shall be made under AutoCAD, whereas all Documents shall be made either in MS Excel or in MS Word.	
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (2x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART-B SUB-SECTION-V CIVIL WORKS



CLAUSE NO.	TECHNICAL REQUIREMENTS
2.01.02	The Design Documents and Drawings for the following areas shall be submitted for approval of the Employer. (a) Steam Generator and Auxiliaries (b) Power Cycle Piping consisting of MS, HRH, CRH and Auxiliary Steam Piping. (c) Mill Reject Handling System. (d) Mill Bunker Building, Transfer points, conveyor galleries and its supporting trestles.
2.01.03	The Design Documents and Drawings submitted by the Contractor shall contain at least the following Minimum information : (a) General Arrangement for Equipment, Piping / Cables / Ducts. (b) Loading Plans indicating Floor Imposed Loads, Equipment Loads, Piping / Cables / Ducts Loads. (c) Openings in Floor/ Walls / Cladding / Roof. (d) Equipment Mounting Details (where Supporting Structures are provided by the Employer). (e) General Arrangement of Foundations including Loading Data, Bolt Details, Pocket Details, etc. (f) Insert Details, Anchor Fastener Details along with their General Arrangements. (g) Project Design Intent Document covering Design Criteria including Loading assumptions, references, structural idealisation / Mathematical Model, Load Cases, Load Combinations, etc. (h) Analysis and structural Design Calculations. (i) 3-D Analytical Model of Structure. (j) Details of Corrosion Protection Measures. (k) Any other submission, as indicated elsewhere in this Specification and / or as required by the Employer.
3.00.00	DESIGN CRITERIA
3.01.00	General
3.01.01	The Design criteria given herein are applicable for all Structures.
3.01.02	Structures shall be Designed for the most critical Combinations of Dead Loads, Imposed Loads, Equipment Loads, Crane Loads (if any), Pipe Loads (Static, Friction and Dynamic), Cable / Ducts Loads, Ash Loads, Dust Loads, Wind Loads, Seismic Loads, Temperature Loads, Erection Loads, Loads due to Differential Settlement, etc.
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2 PART-B SUB-SECTION-V CIVIL WORKS Bharat Heavy Elec Power Secto Marketing New Delhi PAGE 3 OF 22	



CLAUSE NO.	TECHNICAL REQUIREMENTS
3.02.00	Material Structural Steel (including embedded Steel) shall be straight, sound, free from twists, cracks, flaw, laminations and all other defects.
3.02.01	Mild Steel a) Rolled sections and plates up to and including 20mm thickness shall conform to grade designation E250A semi killed of IS: 2062. Plates beyond 20mm thickness and up to 40mm thickness shall conform to grade designation E250B killed and controlled rolling conforming to IS:2062. Plates beyond 40mm thickness, shall conform to grade designation E250B killed, normalizing rolling as per IS:2062. Plates beyond 40mm shall be ultrasonically tested as per ASTM-A578 level B. b) Pipes shall conform to IS: 1161. c) Hollow (square and rectangular) steel sections shall be hot formed conforming to IS: 4923 and shall be of minimum Grade Yst 240. d) Chequered plate shall conform to IS 3502 and shall be minimum 6 mm thick excluding projection. Steel for chequered plate shall conform to grade E250A semi killed of IS: 2062.
3.02.02	Medium and High Tensile Steel a) Rolled sections and plates up to and including 20mm thickness shall conform to grade designation E350 semi killed of IS: 2062. Plates beyond 20mm thickness and up to 40mm thickness shall conform to grade designation E350 killed and controlled rolling conforming to IS:2062. Plates beyond 40mm thickness, shall conform to grade designation E350 killed, normalizing rolling as per IS:2062. Plates beyond 40mm shall be ultrasonically tested as per ASTM-A578 level B.
3.02.03	All other Materials shall be as per applicable Standards and Codes.
3.02.04	All Materials brought for incorporation in works shall be of best quality as per IS, unless specified otherwise.
3.03.00	Loading
3.03.01	Dead Loads Dead Loads are permanent Loads which shall include the weight of Structure complete with finishes, fixtures, partitions, etc. and shall be taken as per IS:875 (Part-I).
3.03.02	Imposed Loads (a) Imposed Loads in different areas shall include Live Loads, Erection, Operation and Maintenance Loads. (b) Equipment Loads (which constitute all Loads of Equipment to be supported, as given by Equipment Supplier), Pipe Loads (Static, Friction and Dynamic), Cable / Ducts Loads, Ash Loads, Dust Load, wherever applicable, are not included in the Imposed Loads as furnished below and these Loads shall be considered in addition to Imposed Loads.
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2 PART-B SUB-SECTION-V CIVIL WORKS Bharat Heavy Electricals Ltd. Power Sector Marketing PAGE 4 OF 22 New Delhi-49	

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- (c) For consideration of Imposed Loads on Structures, IS : 875 (Part 2) in general shall be followed. However, for the following areas, minimum imposed loads as indicated below shall be considered for the design. If the actual expected Imposed Load is more than the specified Minimum Imposed Load, then actual Imposed Load shall be considered.

Sl.No.	Description	Minimum specified Imposed Loads (T /Sq. M.)
--------	-------------	---

1. Floors

- | | | |
|------|--|------|
| i) | Operating Floors | 1.00 |
| ii) | Separator Floor | 1.00 |
| iii) | Elevator Machine Room | 1.00 |
| iv) | Maintenance Platforms | 1.00 |
| v) | Feeder & Tripper Floor in mill & bunker building, Floors in TPs and any other Floors | 0.50 |

2. Roof / Penthouse

- | | | |
|------|------------------------------------|------------------------------------|
| i) | Non Accessible (with no Equipment) | 0.075 |
| ii) | Accessible | 0.150 |
| iii) | Dust Loads | Equivalent to 0.30M of Ash Deposit |

3. Equipment Laydown Loads. As per Equipment supplier or 1.00, whichever is more.

4. Lift Structure As per Equipment supplier with 100 % Impact Factor.

5. Cable/Pipes/Ducts Supports 0.40 for walkway (in addition to friction loads as applicable)

Note : Additionally Load for Cable/Piping/Ducting, shall be considered, as applicable

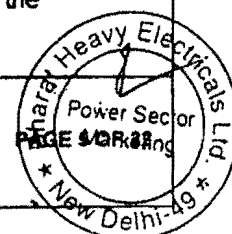
6. Walkways (in conveyor galleries) 0.30

7. Conveyor galleries In addition to the live loads, loads due to cable trays, fire fighting/service water/ coal handling plant pipes shall also be considered @ 250Kgs./m (minimum) on each of the longitudinal girder.

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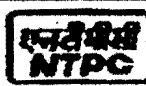
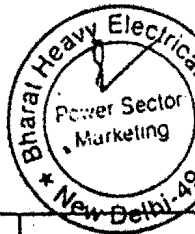
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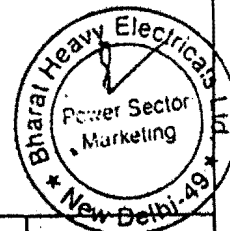
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CLAUSE NO.	TECHNICAL REQUIREMENTS
	Roof-truss members are to be checked for supporting fire fighting pipes / Service water pipes. Tentative locations and diameter for pipes are shown in Tender Drawing. 8. General i) Stairs and Landings 0.50 ii) Walkways 0.50 iii) Balconies 0.50 iv) Chequered plate floors. 0.40
3.03.03	Equipment, Piping / Cables / Ducts and associated Loads The Equipment, Piping / Cables / Ducts and associated Loads shall be considered as given by the supplier. Equipment Loads; which are of permanent nature, shall be treated as Dead Loads. For mill bunker building, TPs & conveyor galleries tentative loads are indicated in the tender drawings. Detailed load data including equipment loads, belt tension, etc. shall be furnished by the employer during detailed engineering stage.
3.03.04	Seismic Loads All Structures shall be Designed for Seismic forces adopting the Site Specific Seismic information, as specified in Annexure-V to Sub-Section-II, Part-A of section-VI of Technical specification.
3.03.05	Wind Loads All Structures shall be Designed for Wind forces adopting the Site Specific Wind parameters, as specified in Annexure-VI to Sub-Section-II, Part-A of section-VI of Technical specification.
3.03.06	Temperature Loads (a) For temperature Loading, the total temperature variation shall be considered as 2 / 3 of the average maximum annual variation in temperature. The average maximum annual variation in temperature for this purpose shall be taken as the difference between the mean of the daily Minimum ambient temperature during the coldest month of the year and mean of daily maximum ambient temperature during the hottest month of the year. The Structure shall be Designed to withstand Stresses due to 50% of the total temperature variation. (b) Suitable expansion joints shall be provided in the Longitudinal direction wherever necessary with provision of twin columns. The maximum distance of the expansion joint shall be as per the provisions of IS : 800 for Steel Structures. (c) Frictional forces due to temperature variation shall be considered between the Pipes and the supporting Structures along Longitudinal direction.
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9578/ 9571/ 0370/ 0360/ 9686-102(R)-2 PART-B SUB-SECTION-V CIVIL WORKS Bharat Heavy Electricals Ltd. Power Sector Marketing PAGE 6 OF 22 New Delhi	

CLAUSE NO.	TECHNICAL REQUIREMENTS																		
3.03.07	Ash Density (a) Following Ash density shall be considered for the Design : <table><tr><th>Sl.No.</th><th>Description</th><th>Density (Kg/Cu. M.)</th></tr><tr><td>a)</td><td>Bottom Ash for volume calculations</td><td>650</td></tr><tr><td>b)</td><td>Bottom Ash for Load calculations</td><td>1600</td></tr><tr><td>c)</td><td>Fly Ash for volume calculations</td><td>750</td></tr><tr><td>d)</td><td>Fly Ash for Load calculations</td><td>1300</td></tr><tr><td>e)</td><td>Dry Fly Ash for dry fly ash Pipeline supporting Structures (Pipe to be considered full)</td><td>1000</td></tr></table>	Sl.No.	Description	Density (Kg/Cu. M.)	a)	Bottom Ash for volume calculations	650	b)	Bottom Ash for Load calculations	1600	c)	Fly Ash for volume calculations	750	d)	Fly Ash for Load calculations	1300	e)	Dry Fly Ash for dry fly ash Pipeline supporting Structures (Pipe to be considered full)	1000
Sl.No.	Description	Density (Kg/Cu. M.)																	
a)	Bottom Ash for volume calculations	650																	
b)	Bottom Ash for Load calculations	1600																	
c)	Fly Ash for volume calculations	750																	
d)	Fly Ash for Load calculations	1300																	
e)	Dry Fly Ash for dry fly ash Pipeline supporting Structures (Pipe to be considered full)	1000																	
3.03.08	Ash Loads (a) Ash Load over Penthouse / Roof of Steam Generator shall be considered. (b) Ash Load in the flue gas Duct shall be as per clause no.15.01.02 section VI Part B sub-section-II:M1 of technical specification.																		
3.03.09	Differential settlement Loads Structures shall be Designed considering an additional Load on account of differential settlement of 1 in 1000 between any two adjacent columns, subject to a maximum differential settlement of 8 mm.																		
3.03.10	Additional Loads due to Employer Facilities Following Minimum additional Loads supporting the Employers Facilities shall be considered in the Design of Steam generator Structures, Mill & Bunker Building, Coal handling Transfer points and Trestles for the supporting of the Employers Facilities. (a) Cantilever Loads of not less than 500 Kg / M at a distance of 1200 mm from the external face of the columns, on both sides of the Steam Generator, for Cable trays and Walkways. (b) Cantilever Loads of not less than 2000 Kg / M at a distance of 2500 mm from the external face of the Mill & Bunker Building columns, CHP transfer point columns/ VGTU columns & conveyor gallery trestles (on one side) for Cable trays and Walkways. (c) Dry Fly Ash Piping Loads. (d) Ash Water Piping Loads. (e) Supply Air and Instrument Air Piping. (f) Service Water Piping																		
-MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 95711-0370/ 0360/ 9586-102(R)-2 PART-B SUB-SECTION-V CIVIL WORKS Bharat Heavy Electricals Power Sector Marketing New Delhi-49 PAGE 7 OF 22																			

CLAUSE NO.	TECHNICAL REQUIREMENTS		
3.04.00	(g) Loads associated with Coal Handling Plant equipment		
	Design Concepts		
3.04.01	Individual members of the frame shall be Designed for the worst Combination of forces such as bending moment, axial force, shear force, torsion, etc.		
3.04.02	The different Load Combinations shall be taken as per IS : 875 (Part - 5) and other relevant IS Codes.		
	(a) Wind and Seismic forces shall not be considered to act simultaneously.		
	(b) The Structures shall be Designed for most unfavorable Combination of Dead Loads, Imposed Loads, Equipment Loads, Piping / Cables / Ducts Loads, Wind / Seismic Loads, Temperature Loads, Ash Loads, and other applicable Loads without exceeding the Permissible Stresses.		
	(c) Permissible Stresses for different Load Combinations shall be taken as per IS 800.		
	(d) For checking against uplift / tension case, 75% of Dead Loads with no Imposed Loads shall be considered along with other Loads.		
	(e) In all Loading Combinations, the Loads that have reduction effect on design condition shall not be taken into account in the Combination concerned.		
	(f) Where Wind is the main Load acting on the Structure, no increase in Stresses is to be considered for Design of Structures and Foundation Bolts.		
	(g) Dynamic Piping Loads need not be considered acting simultaneously with Wind or Seismic Loads. Increase in Permissible Stresses shall be allowed in Load Combinations where Dynamic Piping Loads are considered and shall be as permitted under Seismic Load conditions.		
3.04.03	The Design of Steel Structures shall be done by Working Stress Method. Design shall be as per the provisions of IS : 800 and other relevant IS standards. For Design of Hoppers IS : 9178 Parts - I, II & III shall be followed.		
3.04.04	Deflection Criteria		
	The maximum Deflection for various Structures shall not exceed and be limited to the following:		
	Sl. No.	Description	Maximum value of
	1.	For all Structures	Span / 325 or Height / 325, as the case may be unless noted otherwise.
	2.	For all beams directly supporting Equipment, drive machinery	Span / 500
	3.	For all Purlin, Cladding Runners, Roofing / Cladding Sheets	Span / 250
			
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- | | | |
|----|--|---|
| 4. | For all Grating / Chequered Plates | Span / 250 |
| 5. | For Trestles and Transfer Points
(Transverse deflection at Conveyor gallery supporting level) | Height / 1000
(For Wind load by Peak Wind Speed Method / Seismic Load) |
| 6. | For Mill Bunker Building# | Height / 500
(For Wind load by Gust Factor Method / Seismic Load) |

(However, the maximum vertical Deflection of Grating / Chequered Plate shall be limited to 6 mm).

Note: Stresses under wind load condition for all structures shall be checked for the higher of the forces obtained from gust factor method and peak wind method.

- In case this building is integrated with boiler supporting structure, deflection criteria for mill bunker building portion shall be same as that for boiler supporting structure.

3.04.05

All Structures of the Contractor shall be independent of Employer's Structures. In case any vertical Loads from the Contractor's Structures are required to be transferred to the Employer's Structures, the same shall be through PTFE bearings. In no case shall any horizontal Loads be transferred to the Employer's Structures from the Contractor's Structures.

3.04.06

Welding shall be used for fabrication and Erection. Site connections shall be with Welding / Bolts. For Bolt connection, IS : 4000, IS : 3757, IS : 6623 and IS : 6649 shall be followed. For Welding of Structures IS : 814, IS : 816, IS : 1024, IS : 4353 and IS : 9595 shall be followed. Other requirements pertaining to welding mentioned elsewhere in the specification shall also be satisfied by the Contractor.

3.04.07

Fans (ID, FD and PA) shall be supported on spring supported RCC foundation. The steel helical springs and viscous dampers shall be provided by the Contractor. However the RCC deck shall be provided by the Employer. The equipment supplied by Contractor shall be compatible for supporting on steel helical springs and viscous dampers.

3.04.08

Pipes, Cables and Ducts Supports

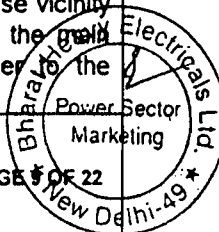
- (a) All Pipes, Cables and Ducts shall generally be routed above ground.
- (b) A Minimum clearance (clear Headroom) of 8 m shall be kept for all over-ground Pipes / Cables / Ducts for all road / rail crossings. For other areas, the requirement of Minimum clearance shall be as specified elsewhere in the Specifications. All Pipes / Cables / Ducts supports shall be provided with continuous walkway of Minimum 600 mm Width with handrails and toe-guards, all along the length with approach ladders near roads, passageways, etc. Before and after the road / rail crossings, a barrier of suitable Height shall be constructed so as to prevent the approach of Cranes (having Height more than 8 m) etc., upto the Pipes / Cables / Ducts supports.
- (c) In case any main Steel framed Structure of the Employer is existing in close vicinity of the Contractor's Pipes / Cables / Ducts supports, support only from the main framing Structure of the Employer may be permitted by the Employer.

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PHASE-II (2 x 660MW)
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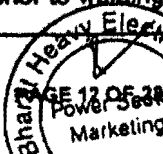
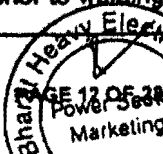
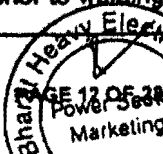
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	Contractor, for supporting his Pipes / Cables / Ducts. Levels and detail of such supports shall be finalised by the Contractor in consultation with the Employer during his detailed Engineering stage. The Contractor shall supply and provide all such supports.
3.04.09	Whenever Contractor is taking any support from any of the Employer's Structures, the Contractor shall ensure that no damage is done, to the Employer's Structures including Painting thereof. In case of any damage to the Employers Structure and / or Painting, then the Contractor shall rectify the same to the complete satisfaction of the Employer.
3.04.10	Supporting Structures shall be so configured that the temperature of Steel does not exceed 60°C unless specified otherwise.
3.04.11	The bracing in Structures shall be provided such that under no circumstances normal / convenient access to any points is blocked or obstructed.
3.04.12	Finished Floor Level of Steam Generator/ESP/ ID fan area/CHP Transfer Points shall be kept 200 mm lower than the finished Floor Level of Main Plant Building. Finished floor level of Mill Bunker building & Chimney (by employer) shall match with the finished floor level of Main Plant Building.
3.04.13	The Employer proposes to encase all Base Plates. Top of the encasement Concrete shall match with the surrounding finish Paving Level. All stiffeners provided with Base Plate shall also be fully encased and for this purpose the top Level of stiffeners shall be kept by Contractor at least 200 mm below the surrounding finish Paving Level.
3.04.14	Propping / supporting of any Beam on the bracing members shall not be permitted.
3.04.15	All Structures close to railway line shall have clearance conforming to Railway norms.
3.04.16	Penthouse / Roof shall be covered with troughed profile permanently colour coated Sheet. Site Cladding / Canopy shall also be with troughed profile permanently colour coated sheet.
3.04.17	All Stairs shall have a maximum Riser Height of 180 mm and a Minimum Tread Width of 250 mm. Minimum clear Width of Stairs shall be 1200 mm, unless specified otherwise..
3.04.18	Minimum headroom (free Height) under all Floors, walkways and Stairs shall be 2.30 M
3.04.19	All Foundation Bolts shall conform to IS : 5624.
3.04.20	Design Requirements
3.04.20.1	Overhead Conveyor Galleries and Trestles Overhead conveyors shall be located in a suitably enclosed gallery of structural steel. The overhead gallery shall consist of two vertical latticed girders having rigid jointed portal frame at both ends. Cross beams at floor level supporting conveyor stringer beams shall be made of rolled steel beam or plate girder. Horizontal bracings are to be provided at top & bottom plan of the gallery (latticed girders shall be braced together in plan at the top and bottom). Common end portal frame shall not be used for adjacent conveyor spans. Roof truss shall be provided at upper node points of latticed girders to form an enclosure. Maximum span of gallery shall preferably be 25M. The gallery should as far as possible be erected as a box section keeping all the vertical and horizontal bracing tied in proper position. The gallery should be checked for all erection stresses that are likely to develop during handling and erection and if required, temporary strengthening of gallery members during erection shall be made.
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2
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	For double stream conveyor gallery, two side and one central walkway of clear width 800 mm and 1100 mm respectively shall be provided. The clear width of two side walkways for single stream conveyor gallery shall be 800 mm and 1100 mm respectively. Both sides of central and side walkways shall be provided with pipe handrails all along the conveyor gallery. Hand railing should not be supported on conveyor supporting stringers. The walkways shall be chequered plate construction with anti - skid arrangement. The anti - skid arrangement will consist of welding of 10 mm square steel bars at a maximum spacing of 500 mm along the length of the gallery. Conveyor gallery shall have permanently colour coated steel sheet covers on roof and both sides. However in roof, a panel of minimum 1.5 m x 1.5 m area at about 6.0 m center shall be provided with translucent sheets of polycarbonate material for natural lighting. A continuous slit opening of 500 mm shall be provided on both sides just below the roof sheeting. Windows of size 1.2mx1.5m shall be provided at a spacing of 25m on each side in staggered pattern. Windows shall be provided with wire mesh. Conveyor Gallery structure shall be designed considering both conveyors operating simultaneously. All gallery supporting trestles shall be four legged type only. One end of each gallery span shall be hinged to the supporting trestle and the other end shall be slide type. Slide type support shall be with P. T. F. E. bearings to allow both rotation & longitudinal movements.	
3.04.21	Transfer Houses The over ground portion of the transfer house shall be framed structure of structural steel work. The floors shall be of R. C. C. over structural beams. Floor beams are to be designed with no lateral resistant by RCC slab. Plan bracings are to be provided in all floors to transfer horizontal loads to columns. In some areas like MCC floors etc., one brick thick wall cladding shall be provided. Brick wall cladding shall be supported on encased wall beams and suitably anchored to adjoining columns and beams. Adequate steel doors and windows for proper natural lighting and ventilation shall be provided. In addition to steel windows, panels of suitable size to suit the architectural treatment and made of translucent sheets of polycarbonate material shall also be provided on the side cladding for natural lighting. The size of transfer house shall be 14mx14m (excluding Vertical Gravity Takeup structure) with four corner columns only. Side cladding and roof shall be as specified elsewhere in the specifications.	
3.04.22	Mill Bunker Building The mill bunker building shall house coal mills, feeders, coal silo, conveyors, tripper, mono rails etc. The silo shall have a cylindrical top portion with a conical hopper. The cylindrical part shall be constructed from mild steel and conical portion shall be constructed from mild steel plates with stainless steel SS304 grade liner of 4mm thickness for the entire hopper region. The unit weight of coal shall be taken as 1.05 Tonne/Cu.M. and 0.8 Tonne/Cu.M. for Weight/Load calculation and Volume/Capacity calculation respectively. The live storage capacity of each bunker (one for each mill) shall be maximum of the following: a) Total 14 hours coal requirement of the boiler for BMCR duty with worst coal firing, equally distributed over the number of bunkers (i.e. the coal mills) required in service for this duty condition as specified elsewhere.	
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2
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	b) Total 14 hours coal requirement of the boiler for BMCR duty with design coal firing, equally distributed over the number of bunkers (i.e. the coal mills) required in service for this duty condition as specified elsewhere. c) Total 14 hours coal requirement of the boiler for TMCR duty with worst coal firing, equally distributed over the number of bunkers (i.e. the coal mills) required in service for this duty condition as specified elsewhere. Side cladding and roof shall be as specified elsewhere in the specifications. RCC slab at feeder locations and tripper locations shall be provided (by the employer). Plan bracings are to be provided in all floors to transfer horizontal loads to columns.				
3.05.00	Electrodes				
3.05.01	The electrodes used for welding shall be of suitable type and size depending upon specifications of the parent material, the method of welding, the position of welding and quality of welds desired. Only low hydrogen electrodes shall be used for welding of medium / high tensile steel and for mild steel plate thickness above 20 mm.				
3.05.02	All low hydrogen electrodes shall be baked and stored before use as per manufacturer's recommendation. The electrodes shall be re-baked at 250°C - 300°C for one hour and later on cooled in the same oven to 100° C. It shall be transferred to a holding oven maintained at 60°C - 70°C. The electrodes shall be drawn from this oven for use.				
3.05.03	Where coated electrodes are used they shall meet the requirements of IS: 814 and relevant ASME - Sec. II. Covering shall be heavy to withstand normal conditions of handling and storage.				
3.05.04	Only those electrodes that give radiographic quality welds shall be used for welds, which are subjected to radiographic testing.				
3.05.05	Where bare electrodes are used these shall correspond to specification of the parent material. The type of flux-wire combination for submerged arc welding shall conform to the requirements of F-60 class of AWSA-5-17-69 and IS: 3613. The electrodes shall be stored properly and the flux shall be baked before use in an oven in accordance with the manufacturer's requirements as stipulated.				
3.05.06	The contractor shall take specific approval of the weld for the various electrodes proposed to be used on the works before any welding is started.				
3.06.00	Edge Preparation for Welding				
3.06.01	Suitable edge as per weld joint detail shall be prepared either by machines or by automatic gas cutting. All edges cut by flame shall be ground before they are welded.				
3.07.00	Pre Heating and Post Heating				
3.07.01	Mild steel and medium / high tensile steel plates thicker than 20mm, will require Pre-Heating of the parent plate prior to welding as mentioned in Table - 1 for mild steel and Table - 2 for medium / high tensile steel, however, higher pre heat temperature may be required as per approved welding procedure and it shall be followed. In welding materials of unequal thickness, the thicker part shall be taken for this purpose.				
3.07.02	Base metal shall be preheated, notwithstanding provisions of IS: 9595 to the temperature given in Table - 1 for mild steel and Table - 2 for medium / high tensile steel, prior to welding				
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE		<table><tr><td>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2</td><td>PART-B SUB-SECTION-V CIVIL WORKS</td><td></td></tr></table>	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART-B SUB-SECTION-V CIVIL WORKS	
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or tack welding. When base metal not otherwise required to be pre heated is at a temperature below 0°C it shall be pre heated to atleast 20°C., prior to tack welding or welding. Pre heating shall bring the surface of the base metal to the specified pre heat temperature and this temperature shall be maintained as minimum inter-pass temperature while welding is in progress.

TABLE - 1

**MINIMUM PREHEAT AND INTERPASS TEMPERATURE FOR
WELDING MILD STEEL**

Thickness of thicker part at Point of welding	Welding Using	
	Low hydrogen electrode or submerged arc welding	Other than low hydrogen electrode
Upto and including 20mm	None	None
Over 20mm and up to and including 40mm	20°C	Not allowed
Over 40mm and up to and including 63mm	66°C	Not allowed
Over 63mm	110°C	Not allowed

Note: Type of electrode and the preheating requirements for welding shall be as per approved welding procedure.

TABLE - 2

**MINIMUM PREHEAT AND INTERPASS TEMPERATURE FOR
WELDING MEDIUM / HIGH TENSILE STEEL**

Thickness of thicker part at Point of welding	Welding Using	
	Low hydrogen electrode or submerged arc welding	Other than low hydrogen electrode
Upto and including 20mm	None	Not Allowed
Over 20mm	120°C - 140°C	Not Allowed

Note: Type of electrode and the preheating requirements for welding of medium and high tensile steel shall be as per approved welding procedure.

3.07.03

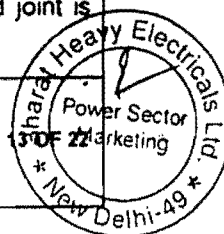
Pre heating may be applied by external flame which is non-carbonizing like LPG, by electric resistance or electric induction process such that uniform heating of the surface extending up to a distance of four times the thickness of the plate on either side of the welded joint is obtained.

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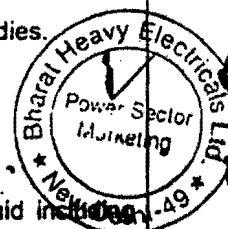
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3.07.04	Thermo-chalk, thermo-couple or other approved methods shall be used for measuring the plate temperature.
3.07.05	All butt welds with plates thicker than 50mm and all site butt welds of main framing beam supporting the bunker shall require post weld heat treatment as per procedure given in AWS D-1.1. Post heating shall be done up to 600°C and rate of application shall be 200°C per hour.
3.07.06	The post heat temperature shall be maintained for 60 minutes per 2.5cm thickness. For maintaining slow and uniform cooling, asbestos pads shall be used for covering the heated areas.
4.00.00	STEEL HELICAL SPRINGS AND VISCOUS DAMPERS
4.01.01	General Requirement
4.01.02	This part of the specification covers the requirement for the manufacturing, testing, supply, transport to site, pre-stressing, erection, supervision of erection, release of pre-stress, alignment, commissioning, etc. of steel helical springs and viscous dampers.
4.01.03	The steel helical springs and viscous dampers supplied should be of proven make. The qualifying requirements for sub-vendor/ supplier for steel helical springs and viscous dampers is specified elsewhere in the specification.
4.01.04	The information about the entire range of spring units, damper units and spring-damper units manufactured by sub vendor shall be furnished to enable the Employer to do the engineering of the foundations along with appropriate type of spring units for different machines. The information to be furnished should include the load carrying capacity, stiffness (vertical & horizontal), damping resistance, dimensions of spring and damper units.
	Codes and Standards Some of the relevant applicable Indian standards and codes, etc. applicable to this section of the specification are listed below :
	DIN : 4024 Machine foundations; Flexible supporting structures for machine with rotating masses.
	DIN : 2089 Helical compression springs out of round wire and rod : calculation & design.
	DIN : 2096 Helical compression springs out of round wire and rod; quality requirements for hot formed compression springs.
	VDI : 2056 Criteria for assessing mechanical vibrations of machine.
	VDI : 2060 Criteria for assessing the state of balance of rotating rigid bodies.
4.03.00	Material (Design & Supply)
4.03.01	Steel helical springs and viscous dampers shall consist of: (a) Steel helical spring units and viscous dampers along with viscous liquid including associated auxiliaries for installation of the spring units and dampers like steel shirts, adhesive pads, etc.
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	(b) Frames for pre-stressing of spring elements. (c) Suitable hydraulic jack system including electric pumps, high-pressure tubes etc. required for the erection, alignment etc., of the spring units. One set of extra hydraulic jacks, and hand operated pumps shall also be provided. (d) Any other items which may be required for the pre-stressing, erection, release of pre-stress, alignment, and commissioning of the steel helical springs.
4.03.02	The design of the supporting arrangement for the equipment supported on steel helical springs and viscous dampers shall be done by Employer. The supporting arrangement shall consist of an RCC deck supported on steel helical spring units and viscous dampers which in turn shall be supported on RCC substructure. The RCC deck shall be provided by the Employer.
4.03.03	The spring units should have stiffness in both vertical and horizontal directions with the horizontal stiffness not less than 50% of vertical stiffness. The stiffness should be such that the vertical natural frequency of any spring unit at its rated load carrying capacity is not more than 3 Hz.
4.03.04	The damper units or spring-cum-damper units should be of viscous type offering velocity proportional damping. The damper units should be suitable for temperatures ranging from 0 to 50°C. The damping resistance of individual damper units should be such that the designed damping can be provided using reasonable number of Units. Damper Units shall have damping resistance ranging from 40 KN Sec / M to 300 KN Sec / M.
4.03.05	The sizes of the spring units, damper units and spring-cum-damper units should be such that groups of such units can be accommodated on column heads in case of elevated foundations and on pedestals / walls in case of foundations at ground level.
4.03.06	The steel helical springs and viscous dampers shall be designed for a minimum operating life of 30 years.
4.04.00	Manufacturing & Testing
4.04.01	Complete manufacturing and testing of the steel helical springs and viscous dampers shall be done at the manufacturing shop of the approved sub vendor / supplier. For this purpose the contractor / sub vendor shall submit the detailed programme for approval of employer and take up the manufacturing / testing after approval of such programme. The programme shall include (a) Manufacturing schedule and quality check exercised during manufacturing. (b) Detail of test to be carried out at the manufacturing shop with their schedule. (c) Special requirements, if any, regarding concreting of top deck. (d) Complete step-by-step procedure covering the installation and commissioning of the spring system. (e) Manuals for erection, commissioning, testing and maintenance of the steel helical springs and viscous dampers.

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	 (f) A checklist for confirming the readiness of the civil fronts for erection of steel helical springs and viscous dampers. (g) Checklist for equipment required at each stage of erection. (h) Bill of materials (data sheet) of various elements such as spring units, viscous dampers, with their rating, stiffness etc. included in the supply. (i) Bill of material (data sheet) for frames for pre stressing, hydraulic jack including electric pump, high pressure tubes, hand operated pump etc., with their rating and numbers. (j) Any other details which may be necessary to facilitate design and construction of the foundations / structures.
4.04.02	The Springs shall conform to codes DIN 2089 and DIN 2096. The quality assurance and inspection procedure shall be finalised on the basis of the above codes and the quality plans be drawn accordingly.
4.05.00	Transportation
4.05.01	Steel helical springs and viscous dampers shall be suitably protected, coated, covered, boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection.
4.05.02	The contractor shall be responsible for any loss or damage during transportation, handling and storage.
4.06.00	Erection and Commissioning
4.06.01	Complete erection and commissioning of the steel helical springs and viscous dampers including pre-stressing of elements, placing of elements in position, checking clearances on the shuttering of the RCC top deck, releasing of pre-stress in spring elements, making final adjustments and alignments etc. all by a specialist supervisor.
4.06.02	The scope of work shall be deemed to include all activities, which may not have been explicitly mentioned but are reasonably implied for the successful commissioning of steel helical springs and viscous dampers.
4.06.03	The contractor shall guarantee the performance of the steel helical springs and viscous dampers for 24 months from the date of commissioning of each machine which shall be termed as "Guarantee Period".
4.07.00	Supervision The supervision of installation of steel helical springs and viscous dampers including pre-stressing, placing, releasing and alignment of spring units shall be done by a specialist supervisor of sub vendor / supplier, trained for this purpose.
4.08.00	Realignment of Spring System If any realignment of the steel helical springs and viscous dampers is required to be done for aligning the shaft or for any other reasons during the first one year of operation from the date of commissioning of the machine, the same shall be done by the contractor.
MOUDA STPP-4 (2x980MW) / SOLAPUR STPP (2x980MW) / NABINAGAR STPP (3x660MW) / MEJA TPP-1 (2x980MW) / RAGHUNATHPUR TPP PHASE-II (2x980MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9576/ 9571/ 0370 0360/ 9586-102(R)-2
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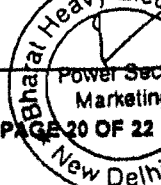
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4.09.00	Acceptance Criteria Stiffness values shall be checked. The permissible deviations shall be as per DIN 2096. Following acceptance criteria shall be followed: a) General workmanship is being good and as recommended by the manufacturer and approved by the Engineer. b) Tolerances are within the specified limit. c) Material test certificate (MTC) is in compliance with the applicable codes/standards. d) Bought out material is from the approved manufacturer / vendor. e) Bought out material is matching with the approved sample.	
5.00.00	MISCELLANEOUS REQUIREMENTS	
5.01.00	Corrosion Protection	
5.01.01	General (a) All equipments, pipes, etc. shall be painted as per the requirements specified in the relevant section of the specification. (b) All Steel structures (except those embedded in Concrete) shall be provided with Painting as given below which is designed for a minimum maintenance free life of Ten (10) years (expected life, long range Ten (10) to Twenty (20) years, as per BS : 5493. (c) All Paints shall be of high build constitution. (d) All Painting shall be done as per approved Painting scheme of the Vendors / Manufacturers, which shall be submitted by the Bidder and as approved by the Employer. Painting scheme shall also include Item codification / Description of all Coats of Paints for manufacturer's, from whom the Paint is intended to be procured.	
5.01.02	Painting of Steel Surfaces embedded in Concrete. (a) For the portion of Steel surfaces embedded in Concrete, the surface shall be prepared by Manual Cleaning and provided with Primer Coat of Chlorinated Rubber based Zinc Phosphate Primer of Minimum 50 Micron Dry Film Thickness (DFT). (b) All threaded and other surfaces of foundation bolts and its materials, insulation pins, Anchor channels, sleeves, etc. shall be coated with temporary rust preventive fluid and during execution of civil works, the dried film of coating shall be removed using organic solvents.	
5.01.03	Painting of Steel Surfaces (other than those embedded in Concrete) (a) All Steel surfaces shall be provided with self curing Inorganic Zinc Silicate Primer Coat (Solid by Volume Minimum 60%) of Minimum 75 Micron Dry Film Thickness (DFT) applied over blast cleaned surface to near white metal conforming to Sa 2 ½ finish of Swedish standard SIS-05-5900. The Primer Coat shall be applied in Shop immediately after blast cleaning by Airless spray technique.	
MOUDA STPP-II (2x660MW) / SOLARUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2 PART-B SUB-SECTION-V CIVIL WORKS		

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	(b.) Primer Coat shall be followed with the application of Intermediate Coat of Polyamide Cured pigmented Titanium Dioxide (TiO₂) or Micaceous Iron Oxide (MIO) Epoxy based Paint (Solid by Volume Minimum 60%) of Minimum 75 Micron DFT. This Coat shall be applied in Shop after an interval of Minimum overnight (from the application of Primer Coat) by Airless spray technique. (c) Intermediate Coat shall be followed with the application of Finish Coat of Polyamide Cured colour pigmented Epoxy based Paint (Solid by Volume Minimum 60%) of Minimum 75 Micron DFT. This Coat shall be applied after an interval of Minimum overnight and maximum indefinite (from the application of Intermediate Coat) either before Erection by Airless spray technique or after Erection by brush and / or spray. Colour and shade of the Coat shall be as approved by the Employer. The Finish Coat thickness of 75 Micron can be built up either in Single application at Shop or in two applications one at Shop and the other at Site. (d) Finish Coat shall be followed with the application of Final Finish Coat of Polyurethane based colour pigmented Paint (Solid by Volume Minimum 40%) of Minimum 25 Micron DFT. This Coat shall be applied within Seven (7) days (from the completion of Finish Coat), after Erection by brush and / or spray. Colour and shade of the Coat shall be as approved by the Employer.	
5.01.04	Touch-up Painting on damaged areas (a) For Coatings damaged up to metal surface Surface preparation shall be carried out by Manual Cleaning. Minimum 6 inches adjoining area with existing Coating shall be roughened by Wire brushing, emery paper rubbing etc., for best adhesion of patch Primer. Primer Coat of self-priming Epoxy Touch-up Primer applied by brush immediately after the surface preparation. (Minimum DFT 100 Microns). Over this Primer Coat, Intermediate Coat, Finish Coat and Final Finish Coat shall be applied as covered above by brush with Intermediate Coat applied within maximum seven (7) days of application of touch up Primer. (b) For Coatings damaged upto Intermediate Coatings (i.e. where Primer Coat is intact). Damaged area including Minimum 6 inches adjoining area with existing Coating should be roughened by wire brushing, emery paper rubbing etc., for best adhesion of patch Primer without damaging the Primer Coat. Touch-up Primer, Intermediate, Finish and Final Finish Coats shall be applied as specified above for Coatings damaged up to metal surface.	
5.01.05	Painting of Welded areas / Painting of areas exposed after removal of temporary supports / Touch-up Painting on damaged areas of Employer's Structures, where inter-connection, Welding / modification etc. has been carried out by the Contractor. (a) Clean the surface to remove flux spatters and loose rust, loose Coatings in the adjoining areas of Weld seams by wire brush and emery paper. (b) Painting procedure to be followed as mentioned above for Touch-up Painting on damaged areas.	
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / HABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2
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5.01.06	Dry film thickness of each coat shall be checked and measured as per the procedure specified in paint application standard no. 2 by SSPC: The Society for Protective Coating. The thickness as measured shall not be less than the minimum thickness specified for the coat of paint under relevant clauses of technical specification.	
5.01.07	Coating for Mild Steel parts in contact with Water. (a) All mild Steel parts coming in contact with water or water vapour shall be hot dip galvanised. The Minimum Coating of Zinc shall be 610 Gms / Sq. M. for galvanised Structures and shall comply with IS : 4759 and other relevant Codes. Galvanising shall be checked and tested in accordance with IS : 2629. (b) The galvanising shall be followed by the application of an etching Primer and dipping in black bitumen in accordance with BS : 3416, unless otherwise specified.	
5.01.08	Gratings All gratings shall be blast cleaned to Sa 2 ½ finish of Swedish standard SIS-Q5-5900 and shall be hot dip galvanised at the rate of 610 Gms / Sq. M.	
5.01.09	Hand Railings and Ladders All handrails and ladders shall be galvanised at the rate of 610 Gms / Sq. as per IS : 4736.	
5.01.10	Sea Worthiness All Steel Sections and fabricated Structures, which are required to be transported on sea, shall be provided with anti corrosive Paint before shipment to take care of sea worthiness.	
5.02.00	Hand Railing	
5.02.01	Minimum 1000 mm high hand railing shall be provided around all Openings, projections / balconies, walkways, platforms, Steel Stairs, etc., All handrails and ladder Pipes shall be 32 mm nominal bore MS Pipes (medium class).	
5.02.02	Handrails shall have top and middle rails at a height of 1000 mm and 500 mm and the vertical post spacing shall not exceed 1.50 M, with provision of kick Plates (100 mm high and 6 mm thick).	
5.03.00	GRATING	
5.03.01	All gratings shall be Electro-forged type. Minimum thickness of the grating shall be 40 mm for in door installation and 32 mm for outdoor installation.	
5.03.02	The Opening size shall not be more than 30 mm X 100 mm. The Minimum thickness of the main bearing bar shall be 5 mm.	
5.03.03	Cutting of gratings shall not be carried out at Site. Any cutting of gratings required to provide passage for Columns / Pipes / Cables / Ducts etc shall be done by the Contractor in Shop and cut edges of Grating shall be suitably reinforced with binding strips.	
5.04.00	FIRE EXITS	
5.04.01	All fire exits shall be Painted with P O Red / signal Red colour shade, which shall not be used anywhere except to indicate the emergency or safety measures. Fire safety norms shall be	
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2 PART-B SUB-SECTION-V CIVIL WORKS PAGE 19 OF 22 Power Sector Marketing

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	followed as per National Building Code and requirements of various statutory bodies shall be followed for providing Fire Exits, Escape Stairs and Fire Fighting Equipment.
5.05.00	OPENINGS
5.05.01	Details / Data of all Openings required by the Contractor in Floors / Walls / Cladding / Roof to be provided by the Employer shall be given by the Contractor, who shall also furnish all Foundation Loads to be considered by the Employer for the Design of Foundations to support the Contractor's Structures / Equipment. Accordingly, the same shall be listed in Engineering Information Flow Schedule to be furnished by the Contractor.
5.05.02	If the details / data of all Openings required by the Contractor in Floors / Walls / Cladding / Roof are not furnished by the Contractor, as per the Engineering Information Flow Schedule then all such required Openings shall be created by the Contractor himself, at a later date in Floors / Walls / Cladding / Roof by using special tools, as required. In this case edge protection to the Openings shall also be provided by the Contractor using Anchor-Fasteners.
5.05.03	For routing of Pipes / Cables / Ducts, Employer shall only provide suitable passage / Opening in Floors / Walls / Cladding. Any Pipe sleeves or embedments required by the Contractor in these passages / Openings shall be provided by the Contractor himself. These passage / Openings shall be suitably sealed by the Contractor after completion of Erection works.
5.06.00	GROUTING
5.06.01	Non-shrink cementitious flowable grout shall be used for Grouting of pockets and underpinning work below Base Plate of columns. Nominal thickness of grout shall be 50 mm. Non-shrink cum plasticizer admixture shall be added in the grout. Crushing Strength of the grout shall generally be one grade higher than that of the base Concrete. Minimum grade of grout shall be M30.
5.06.02	However, for Equipment Foundations, high Strength (Minimum Characteristic Compressive Strength of 60 N / mm ² at 28 days) ready mixed non-shrink, Chloride free, Cement based, free flowing, non-metallic grout as recommended by Equipment manufacturer shall be used. The ready mix grout shall be of reputed make as approved by the Employer.
5.06.03	The surface to be grouted shall be properly cleaned by using compressed air. Contractor shall provide the required shim plates.
5.06.04	The top surface of Foundation as constructed by the Employer may vary by + 25 mm. The same shall be suitably corrected by the Bidder by chipping before the Erection of his Structures / Equipment or subsequently during Grouting / Under Pinning, as the case may be.
5.07.00	ROOFING / CLADDING / DECKING SHEETS
5.07.01	Galvanised / Zinc Aluminium alloy coated Sheet having Trough Profile and permanently colour Coated shall be used for Roofing / Cladding / Decking.
5.07.02	Minimum bare metal thickness of Decking Sheet shall be 0.8 mm. These sheets shall be either galvanised at a Minimum rate of 275 Gm / Sq. M. or Coated with Zinc Aluminium alloy (Zincalume) at a Minimum rate of 150 Gm./ Sq. M. Silicon modified polyester Paint having DFT of Minimum 20 Microns or Super Polyester Paint having Minimum DFT of 25 Microns shall be used for permanent Coating on exposed surfaces.





MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2x660MW) / KANINAGAR STPP (3x660MW) / MEJA TPP-I (2x660MW) / RAGHUNATHPUR TPP PHASE-II (2x660MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2	PART-B SUB-SECTION-V CIVIL WORKS
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CLAUSE NO.	TECHNICAL REQUIREMENTS
5.07.03	Single Skin Sheeting for Side Cladding / Roofing / Canopy shall have Minimum base metal thickness of 0.5 mm for High Tensile Steel (having Minimum Yield Strength 550 MPa) Coated with Zinc Aluminium alloy (45 % Zn : 55% Al) at the rate of 150 Gms / Sq. M. (Minimum) or Minimum bare metal thickness of 0.6 mm for galvanised Mild Steel Sheets (as per IS : 513) of grade 275 (Minimum) (as per IS : 277). The Sheets shall be finished with Silicon modified Paint (SMP) of Minimum 20 Microns (DFT) on external face and 7 Microns Coating on internal face. Alternately, Sheets can also be finished with Super Polyester quality Paint having total Coating thickness of 35 Microns, comprising of 20 Microns Coating on external face and 5 Microns on inner face over 5 Microns Primer Coat on both faces.
5.07.04	Moment of Inertia of Sheet, Section Modulus of Sheet, thickness of Sheet and spacing of runners / Purlin shall be compatible to satisfy the specified Deflection criteria.
5.07.05	The Sheets shall meet the general requirement of IS : 14246 and shall conform to class 3 for the durability.
5.07.06	Z spacers if required shall be made out of at least 2 mm thick galvanised Steel Sheet of grade 275 as per IS : 277.
5.07.07	The Sheets shall be fixed by means of Stainless Steel / High performance Steel, fasteners of self-tapping / self drilling type provided with neoprene cap and washer of matching colour. Fasteners shall pass Salt Spray test for 1000 hours (Minimum).
5.07.08	The Insulation shall be bonded mineral wool conforming to IS : 8183, having a density of 32 Kg / Cu. M. for glass wool or 48 Kg / Cu. M. for rock wool.
5.07.09	All flashing, trim closures, caps etc. required for the metal Cladding System shall be made out of plain Sheets having same Material and Coating Specification as mentioned above for the Single Skin Sheets.
5.07.10	Overlap shall be as specified by the manufacturer.
5.07.11	Steam Generator Roof (Penthouse) / Canopy / Side Cladding shall have Single Skin troughed profile permanently colour coated sheets.
5.07.12	Cladding for Boiler Elevator enclosure except its Machine Room shall be with Single Skin troughed profile permanently colour coated sheets.
5.07.13	Side Cladding for Mill Bunker Building, Transfer points and conveyor galleries (including roof) shall have Single Skin troughed profile permanently colour coated sheets. However, roof of Mill Bunker Building and transfer points shall be provided with troughed profile permanently colour coated sheet on outside and plain permanently colour coated sheet on inside with 50mm thick mineral wool insulation in between the two sheets.
5.08.00	MACHINE ROOM
5.08.01	Floor / Roof of the machine room shall be of reinforced cement concrete supported on structural steel beams. The side walls shall be of brick work. Civil works including RCC floors, roof slab, door and windows (excluding trap door) flooring etc. shall be in the Employer's scope. However the structural steel members e.g. floor/roof beams, wall beams, etc. shall be supplied and erected by the Contractor.
5.09.00	NUTS AND BOLTS
5.09.01	M. S. Nuts and Bolts shall conform to IS:1363, IS:1364, IS:1367.

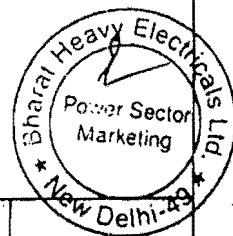
MOUDA STPP-II (2x660MW) / SOLAPUR STPP
(2 x 660MW) / NABINAGAR STPP (3x 660MW) /
MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP
PHASE-II (2 x 660MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
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CLAUSE NO.	TECHNICAL REQUIREMENTS
5.09.02	High Tensile fixing with Bolts and nuts shall respectively be as per IS:3757 and IS:6623.
5.09.03	Washers shall conform to IS 5369, IS : 5370, IS : 5372, IS 5374, IS : 6610, IS : 6649, as appropriate.
6.00.00	STATUTORY REQUIREMENTS
6.01.00	Contractor shall comply with all the applicable statutory rules pertaining to Factories Act, Fire Safety Rules, Water Act for pollution control, Explosives Acts, etc.
6.02.00	Provisions of safety, health and welfare according to Factories Act shall be complied with. These shall include railing, fire escape, etc.
6.03.00	Provisions for Fireproof Doors, number of Staircases, etc. shall be made according to the requirements of Statutory Bodies.
6.04.00	Statutory clearances and norms of State Pollution Control Board shall be followed.
7.00.00	PERMISSIBLE TOLERANCES
7.01.00	All Structural Steel work shall be Shop fabricated outside the Plant area.
7.01.01	Tolerances on dimensions for fabrication of Steel Structures shall be according to IS : 7215.
7.01.02	Tolerances on dimensions for Erection of Steel Structures shall be according to IS : 12843.
7.01.03	Tests on Welds shall be as per ASTM standards, IS : 816 and IS : 9595.
7.01.04	Dimensional and weight tolerance of Rolled Steel shapes shall be as per IS : 1852.
8.00.00	LIST OF CODES AND STANDARDS
8.01.00	All applicable standards, references, Specifications, Codes of practice, etc., shall be the latest edition including all applicable official amendments and revisions. A complete set of all these documents shall be available at Site with Contractor. For Criteria for earthquake resistant design of structures & equipment, site specific design parameters, & horizontal seismic acceleration spectral co-efficients in units 'g' of respective projects, Please refer project information, Sub-section-II, Part-A, section-VI of Technical specification.
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102(R)-2 PART-B SUB-SECTION-V CIVIL WORKS Bharat Heavy Electricals Ltd. Water Sector Marketing New Delhi-49 PAGE 22 OF 22	