



**BHARAT HEAVY ELECTRICALS LIMITED
CENTRALISED STAMPING UNIT & FABRICATION
PLANT
Jagdishpur**

**Tender for miscellaneous steel structural works of
Manufacturing Plant at Jagdishpur**

Tender Enquiry No: BHE/FP/CVL/006

SECTION V

TECHNICAL SPECIFICATION

SPECIFIC TECHNICAL REQUIREMENTS

**BHARAT HEAVY ELECTRICALS LIMITED
(A GOVERNMENT OF INDIA UNDERTAKING)
CSU & FP
Industrial Area
Jagdishpur (UP) 227817**

SECTION V**PART - A****SPECIFIC TECHNICAL REQUIREMENTS****1.0 GENERAL**

Part-A covers specific technical requirements of contract and should be read in conjunction with BOQ,. In case of any conflict between the contents of BOQ and TS BOQ will prevail over TS.

2.0 FREE ISSUE MATERIALS

Majority of steel members shall be supplied by BHEL as free issue material .

3.0 DISMANTLING OF EXISTING STRUCTURES

The contractor will have to carryout dismantling of buried/ semi buried structures, if any, encountered within the battery limit and disposal of it within plant boundary as directed by BHEL at no extra cost to BHEL.

4.0 STATUTORY REQUIREMENTS

Bidder shall comply with all the applicable statutory rules pertaining to Factories Act, Fire Safety Rules of Tariff Advisory Committee, Water Act for pollution control, Explosives Act, etc.

Provisions of safety, health and welfare according to Factories Act shall be complied with. These shall include provision of continuous walkway minimum 500 wide along the crane-girder level on both sides of building, comfortable approach to EOT crane cabin, railing, fire escape, locker room for workmen, pantry, toilets, rest room, etc.

Provisions for fire proof doors number of staircases, fire separation wall, lath plastering/encasing the structural members (in the fire prone areas), type of glazing etc. shall be made according to the recommendations of Tariff Advisory Committee.

Statutory clearances and norms of State Pollution Control Board shall be followed.

Bidder shall obtain approval of Structural/Architectural drawings from concerned authorities before taking up the construction work.

5.0 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 coordinate 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 be 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 lay outs 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 work correctly.

6.0 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. Fabrications shall be done in shops having proper equipment for accurate edge planning and milling of column shall ends, base late surfaces etc. 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 traders, 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 the owner, the services of the supervisors of the manufacturers to achieve that the work is being done according to the manufacturer's specifications.

7.0 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 as agreed, 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 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 discretion of the Engineer without any delay and any extra cost on this account shall be borne by the Contractor.

8.0 INTERFACE WITH STRUCTURES UNDER OTHER'S SCOPE

- a) In cases of interface e.g. structures under other's scope of supply being supported on structures under scope of this contractor, the same will be discussed and suitably addressed.
- b) 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.

c) Necessary engineering is to be done and provisions are to be kept accordingly by the Contractor to construct foundations/underground structures, etc. without disturbing/ endangering the constructions done under the scope of other contracts.

9.0 INSPECTION, TESTING AND QUALITY CONTROL FOR CIVIL WORKS

Sampling and testing for major items of civil works viz earthwork, concreting, structural steel work (including welding) etc. shall be carried out in accordance with the requirements of this specification and field quality plan (FQP).

The bidder shall submit for BHEL's approval a detailed field quality assurance programme for structural works before starting of the fabrication work. This shall include frequency of sampling and testing nature/type of test, method of test, setting of a testing laboratory, arrangement of testing apparatus/equipment, deployment of qualified/experienced manpower, preparation of format for record, Field Quality Plan, etc. Tests shall be done in the field and/or at a laboratory approved by the Engineer and the Bidder shall submit to the Engineer, the test results in triplicate. In addition, the bidder shall furnish the original test certificate from the manufacturer's of various materials to be used in the construction.

If any work found to be of inferior quality or sub-standard, the same shall be dismantled and shall be redone as per approved quality or relevant standard. BHEL reserve the rights to reject the work of inferior quality. All expenses on account of dismantling and rework shall be born by contractor.

10.0 CONSTRUCTION / ERECTION METHODOLOGY

- All fabrication and erection activities of structural steel shall be carried out using automatic submerged arc welding machines, cutting machine, gantry cranes, crawler / wheel mounted heavy cranes and other equipments like heavy plate bending machines, shearing machines, lathe, milling machines etc. Use of derricks shall not be permitted.
- All handling of materials shall be with cranes. Heavy tailors shall be used for transportation.
- Mechanized modular units of scaffolding 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 hoist for lifting of construction materials shall be deployed.
- Compressors for cleaning of foundations and other surfaces shall be used.
- Field laboratory shall be provided for testing of steel works, ultra sonic testing machines, radiographic testing machines, dye penetration test equipment, destruction testing equipment, etc shall be deployed.
- 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.
- Fabrication and Erection of all fabricated columns shall be done in single piece unless otherwise provided for in the approved drawings. Main columns of the power house building can have maximum of one number of the erection splice. All shop and site splice shall suitably staggered. The erection splice shall be provided with full strength splice cover plate over the butt weld. Contractor shall

submit the erection scheme for the erection of all type of structures and carryout the erection work only after approval of the scheme by the owner.

11.0 FIELD LABORATORY FACILITIES AT SITE FOR MATERIAL TESTING:

Contractor shall provide field testing facilities at site laboratory built by the contractor as per list of apparatus at annexure-A-1.

12.0 MAKE OF BOUGHT OUT MATERIAL:

Contractor shall supply bought out items as per the list attached at annexure-A-2 of this section.

13.0 SPECIFIC STRUCTURAL REQUIREMENTS FOR MANUFACTURING BLOCK

13.1 Superstructure

- R.C.C. columns in M-25 concrete up to Gantry level or (9.20m) and steel portal as per design above 9.20m.
- Steel structures shall be fabricated in shop in pieces and the pieces shall be welded/ assembled together at Site.

13.2 Roofing and wall cladding:

- TracDek Hi-rib steel sheeting (or equivalent) 1000mm wide, placed over A Z-section Purlin, fixed by galvanized hex head self – drilling fasteners. Sheeting thickness shall be 0.5/ 0.6 mm colour coated along with a sandwiched insulation thus making a composite panel thickness of 50mm comprising of an inner sheet, an outer sheet and a sandwiched insulation.
- 20m span Truss fabricated as per design with either of Tubular or Sections. The general entry gate in the centre of plant room shall be swing type 1.5m x 2.10m.

13.3 Testing Of Welds

- All welds shall be DP tested.
- Wherever required, welds shall be tested by Ultrasonic test method or by radiography method for which price shall be quoted separately.

14.0 GENERAL NOTES ON STRUCTURAL STEEL WORKS

A. General -

- All dimensions are in mm unless specified. Do not scale, only figure dimension be followed.
- All structural steel work shall be carried out as per IS: 800.
- All structural steel (ordinary) shall confirm to IS: 1977.
- All structural steel (standard) shall confirm to IS: 226.
- Controlled shop welding shall be carried out for all structural work. Reference be made If field welding is proposed.

B. Fabrication -

- All steel sections shall be straightened before fabrication and welding carried out, unless it is proposed to be curvilinear.

- Cutting of steel to be carried out by Shearing, Cropping, or Sawing. If permitted mechanically controlled gas torch can be used only for M.S. sheets.
- Shearing, Cropping and Gas cutting shall be clean and reasonably square, free from any distortion. If necessary, it shall be ground after cutting.
- Holes for Rivets/Bolts be drilled to specified diameter and in no case made by another method.
- Punching of holes may be permitted if hole are done before assembly. In that case it shall be 3mm less than the required size hole and reamed after assembly to the required diameter.
- When holes are drilled in one operation through two or more separate parts, they should be separated after drilling and burr removed.

C. Bolting -

- All bolts used shall confirm to IS: 1367
- At least two thread length of bolt shall project through the nuts.
- Washers if necessary shall be tapered. The size should be such that head and nuts of bolts have satisfactory bearing.

D. Welding -

- Arc welding shall be done as per IS: 823
- Welding test be performed before actual works is carried out.

E. Erection -

- Hoisting of members shall be carried out by Cranes or Hoisting mast suitable for lifting a member.
- Magnetic plate will be preferable for lifting. In case it is not available members be lifted with grips fixed at the points as specified in the drawing or as directed by the engineer-in charge.
- After erection of member it shall be securely bolted with stays or anchors as required.

F. Painting -

- All steel members shall be painted with RED OXIDE paint after thoroughly brushing, cleaning, the surface free of any scale, rusts or loose materials.
- The specified protective treatment shall be completed after erection, cleaning of all loose materials and de-slagging.
- Site painting shall not be carried out in frosty, foggy, or humid weather.

G. Foundation Bolts -

- Foundation bolts shall be made of Mild steel confirming to IS: of diameter and length as specified in the drawing, 120x120mm Anchor plate made of 6mm thick plate shall be provided at the head of foundation bolt.
- Foundation bolts shall be embedded to concrete at the time of casting of columns. Subsequent grounding of bolts shall be avoided.

H. Tolerances -**(i) Sections:**

- Tolerances in dimensions of individual components shall be as per IS: 7215.
- Tolerance in length and depth of web of flange of girders fabricated or rolled shall be $\pm 3.0\text{mm}$.
- Deviation in straightness of girder or members shall be not be greater than $\pm 0.001 \times (\text{length in meter})$ to a maximum of 10mm.

- Buckling in webs of plate girders measured between top and bottom flanges or between flanges shall not be greater than $\pm 0.5\text{mm}$ up to 500mm depth of web, $\pm 1.0\text{mm}$ for 500 to 1000mm depth and $\pm 2.0\text{mm}$ for over 1000mm depth.

(ii) Columns:

- Deviation in longitudinal and transverse plane of a built-up column shall not exceed $\pm 3.0\text{mm}$.

J. Beams/ Purlins/Bracings etc. –

(i) Beams:

- Deviation in alignment of nodal points of lattice beams perpendicular to axial plane shall not exceed $\pm 0.001 \times \text{length of members}$, to a maximum $\pm 10.0\text{mm}$.

(ii) Gantry Girder:

- The curvature of EOT Gantry Girder beams in horizontal plane shall not exceed 3.0mm.
- Up to 500mm distance from the end of the gantry girder, the flange shall be free from any curvature. It shall be normal to web.

15.0 WORK INCLUDED IN STRUCTURES

- Procurement of structural steel, shop fabrication, alignment, erection at site, welding, primer painting (primer coat consisting of 2 coats of redoxide zinc-chromate as per IS: 2074 & IS: 1477 (Parts I & II) - one coat to be applied at shop and the other after erection - of structural steel made from mild steel conforming to IS:2062, pipes conforming to IS:1161/ IS:1239, chequered plate conforming to IS: 3052 and mild steel rounds, at all elevations involving rolled sections (including mild steel rounds), built up sections fabricated out of plates, rolled sections and combination of plates and rolled sections, in columns, beams, gantry girders, bunkers, silos, hoppers, roof trusses, portals, laced purlins, space frames, shear connectors, hangers, struts, monorails, galleries, stiffeners, wall beams, sheeting runners, brackets, stub columns, bracings, cleats, trestles, base plates, splice plates, chequered plate flooring, decking and seal plates, diaphragm, steel frame grid over false ceiling, walkway platforms, ladders, stairs, stringers, treads, landings, hand-rails, toeplates, MS Rungs, insert plates, edge angles, embedment, lugs, posts, stays, louvers, lacings, gusset plates, safety chains for walkways adjacent to crane girders etc.
- Work shall also include procurement of steel from supplier, transportation, straightening, making cutting plan, cutting, bending, rolling, grinding, drilling, bolting, supply of erection bolts & nuts (weight of erection bolts & nuts not payable), supply of permanent bolt of grade C mild steel bolts & nuts, assembly, edge preparation, preheating (& use of low hydrogen/ radiogenic electrodes as per specification), post heating, testing of welders, inspection of welds, visual inspection, non destructive and special testing, rectification and correction of defective welding works, production test plate, inspection and testing, erection scheme, protection against damage in transit, stability of structures, installation of temporary structures (Scaffolding, Access ladders, Working Platforms etc.), setting column bases, surface preparation, touch-up painting, dismantling and removal of all temporary structures.

ANNEXURE – “A-1”**BIDDER SHALL PROVIDE MINIMUM FOLLOWING FACILITIES AT SITE IN THE FIELD LABORATORY FOR MATERIAL TESTING**

Tests equipment for conducting the following tests on welds for fabricated structural steel members:

- Dye penetration test
- Ultrasonic test
- Field radiography tests

ANNEXURE-“A-2”**INDICATIVE LIST OF APPROVED MAKE OF BOUGHT OUT MATERIAL TO BE ARRANGED BY THE CONTRACTOR AT HIS OWN COST**

The following list may be read in conjunction with the relevant make/ makes of materials mentioned in the BOQ or elsewhere in this tender document.

S.NO.	MATERIAL NAME	MAKE
1	STRUCTURAL STEEL	TATA, SAIL , JINDAL
2	FINISH PAINT & PRIMER	BERGER, ASIAN