

# **TENDER SPECIFICATION**

## **BHEL PSSR SCT 1305**

**CONSTRUCTION OF PILING AND PILE CAP  
FOUNDATIONS FOR BOILER, ESP, MILL, MILL BAY, TG  
Etc.**

**FOR**

**1 X 600 MW TPS**

**FOR**

**TNEB, NCTPS – UNIT 1 – STAGE 2**

**NORTH CHENNAI, TAMIL NADU**

**VOLUME – II  
BOOK 1**

**TECHNICAL SPECIFICATION**

**BOOK NO .....**



**BHARAT HEAVY ELECTRICALS LIMITED**

**( A GOVERNMENT OF INDIA UNDERTAKING)**

**POWER SECTOR – SOUTHERN REGION**

**690, ANNA SALAI, NANDANAM, CHENNAI – 600 035**

**CONSTRUCTION OF FOUNDATIONS FOR BOILER, ESP,  
MILL, MILL BAY, TG Etc.**

**FOR**

**1X600 MW NORTH CHENNAI TPS – UNIT 1**

**VOLUME: II**

**CUSTOMER SPECIFICATION**



**TITLE: 1 X 600 MW NORTH CHENNAI  
TPS –UNIT 1- STAGE II  
TECHNICAL SPECIFICATION  
FOR CIVIL WORKS (PILING & PILE  
CAP)**

SPECIFICATION NO. PE-TS-307-600-C002

VOLUME II

SECTION

REV.NO. 0 DATE 14/05/2008

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**TAMIL NADU ELECTRICITY BOARD**

**1 X 600 MW NORTH CHENNAI TPS – UNIT 1- STAGE II**

**VOLUME: II**

**TECHNICAL SPECIFICATIONS  
FOR  
PILING & PILE CAP (CIVIL WORKS )**

**SPECIFICATION NO. PE-TS-307-600-C002**



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



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**PROJECT TITLE :NORTH CHENNAI TPS STAGE II**

**NO. OF UNITS : ONE**

**LOCATION : ATHIPATTU , TAMIL NADU**



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**PROJECT SYNOPSIS**

<b>OWNER</b>	TAMIL NADU ELECTRICITY BOARD
<b>NAME OF PROJECT</b>	NORTH CHENNAI TPS STAGE II
<b>SITE LOCATION</b>	ATHIPATTU, POONERI TALUK, 35 KMS NORTH OF CHENNAI .
<b>NEAREST RAILWAY STATION</b>	ATHIPATTU PUDUNAGAR ON CHENNAI HOWRAH MAIN LINE , 3 KM FROM SITE
<b>NEAREST AIRPORT</b>	CHENNAI—35 KMS FROM SITE
<b>INSTALLED CAPACITY STAGE II</b>	2 X 600 MW



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**SECTION A**

**SCOPE OF WORK**



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**SCOPE OF WORK**

- 1.0 The Scope of Work consists of the following  
Civil Works for Construction of Pile Caps in the entire Plant Area of Unit - 1 excluding Chimney, CHP,AHP & Switchyard.
- 2.0 The works to be performed under this contract consist of providing all labour, supervision, material, scaffolding, construction equipments, tools and plants, temporary works, supplies including POL, transportation and all incidental items not shown or specified but reasonably implied or necessary for the proper completion of work in all respects. Testing of all materials, concrete, earthwork, other allied works, preparation of bar bending schedules on the basis of construction drawings etc. are included in the rates of items of work.
- 3.0 The area of work shall be cleared of all vegetation, rubbish and other objectionable matter, and materials removed, shall be burnt or otherwise disposed of as directed by the Engineer-in-Charge.
- 4.0 All gold, silver, oil or other minerals of any description and all precious stones, coins, treasures, relics, antiques, and other similar things which may be found in or upon the site shall be the property of BHEL. The contractor shall duly preserve the same and from time to time deliver the same to such person or persons as BHEL may from time to time appoint to receive the same.
- 5.0 All the works areas shall be adequately flood lighted to the satisfaction of the Engineer-in-Charge when the work is in progress during the night shifts.
- 6.0 Layout and Levels  
Before start of the work, one reference line and two bench marks will be established by BHEL. Permanent base lines and cross lines shall be established by the Contractor at sufficiently close intervals as may be directed by the Engineer with bench marks at all end points to serve as 'Reference Grid'.



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The contractor shall provide at his expense all templates, pillars and stakes, equipment, materials and labour for establishing the Grid lines and Pillars and shall be responsible for their maintenance during the entire period of construction. The contractor shall maintain a certified copy of drawing showing such approved reference lines, marks and levels and shall not remove any of them without the prior approval of the Engineer-in-Charge. The reference points and pillars already established by BHEL in the works area shall be fully protected and maintained by the contractor. He shall repair and rebuild the same in case of any damage.

The contractor shall layout the work from these reference base lines in consultation with the Engineer-in-Charge and shall be responsible for the correctness of all measurements and any connection therein, notwithstanding the fact that the same might have been checked by the staff of the Engineer-in-Charge.

The contractor shall be responsible for the proper execution of the work to such lines and grades as may be specified in the drawing or established or indicated by the Engineer-in-Charge from time to time.

7.0

Setting of laboratory :

The contractor shall set up his own laboratory in the very close vicinity of the work site as per the directions of Engineer-in-charge at his cost.

The laboratory shall be equipped with latest testing equipment in sufficient numbers to carry out all the tests as required under the contract. The contractor shall ensure that the equipment is available well in advance of starting of the work to avoid stoppage of work on this account.

All the tests shall be carried out by the contractor in presence of Engineer's representative and a joint record of all observations and results thereof shall be maintained, and available with the Engineer.

No separate payment for these operations/tests and for setting of laboratory shall be made. The cost of these operations shall be deemed to have been included in the unit rates tendered for the different items under bill of quantities.



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- 8.0 The unit rates shall include all tools, tackles, material, equipment, fixtures, labour, temporary works and everything whether of permanent or temporary nature necessary for the completion of the job in all respects..
- 9.0 In case of any conflict, the requirements stipulated by Vol. III BOQ shall prevail and will be binding. In case of any conflict between the requirements of Section 'C' and those of Section 'D' the requirements as stipulated in Section 'C' shall prevail and will be binding.
- 10.0 The unit rates quoted for various items of B.O.Q shall include all the stipulations mentioned in Section C and specifications and nothing extra shall be paid except in B.O.Q rates.
- 11.0 No separate payment for dewatering of sub-soil or surface water (if required during the execution of work including monsoon period ) would be made by the Employer and the rates in the B.O.Q for various items would be deemed to be inclusive of all such dewatering, if necessary.
- 12.0 Purchaser reserves the unilateral right to split the package in whatsoever manner he thinks fit, to facilitate the ease of handling of the package. Decision shall be final and binding on the bidder. The same shall need explicit concurrence of the Bidder.
- 13.0 The Contractor must visit the site prior to submitting his quotations to acquaint himself fully with the nature, type and scope of work and involvement therein. The rates quoted shall remain firm during entire period of execution till completion of the work and any additional claim for lack of knowledge shall not be entertained.



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**VOLUME-II B**

**SECTION C**

**SPECIFIC TECHNICAL REQUIREMENTS**

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### **SPECIFIC TECHNICAL REQUIREMENTS**

These Specific Technical Requirements are **over and above** the specifications furnished by Customer vide specifications for Civil Structural & Architectural works – Vol V-- Sec C 3--Cl. 3 and 4 (annexed herewith) .

#### 1.00 Materials

##### 1.01 Cement

Generally cement shall be 33 Grade Ordinary Portland Cement conforming to IS-1269.Type of Cement to be used in special cases shall be in line with Customer's Specifications.

a/ Structures requiring grade of concrete of M25 and above.

The cement shall have an optimum percentage of C3A.

For underground structures cement shall have C3A content between 5 and 8%.

##### 1.02 Aggregates

Shall be in line with Customer's Specifications

1.03 Sand shall be hard durable clean and free from adherent coatings of organic matter and clay balls or pellets. Sand when used as fine aggregate in concrete shall conform to IS 383.

##### 1.04 Reinforcement Steel

Reinforced steel shall be of High strength deformed Steel bars of Grade Fe 415 and/or Fe-500 and shall confirm to IS: 1786. Mild Steel and Medium Tensile steel bars and hard drawn steel wires shall confirm to Grade-1 of IS: 432 (Part I). Welded wire fabric shall confirm to IS: 1566

#### 2.00 R.C.C Members

2.01 All requirements for general use of Plain and Reinforced Cement Concrete in Structures and Locations , cast-in-situ or Precast shall be as per Customer's Specifications.

#### 3.00 STATUTORY REQUIREMENTS



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- 3.01 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.
- 3.02 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.
- 3.03 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.
- 3.04 Statutory clearances and norms of State Pollution Control Board shall be followed.
- 3.05 Bidder shall obtain approval of Civil/Architectural drawings from concerned authorities before taking up the construction work.
- 4.00 LAYOUT
- 4.01 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.
- 4.02 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.
- 5.00 WORKMANSHIP
- 5.01 Workmanship shall be of the best possible quality and all work shall be carried out by skilled workmen except for those which normally requires 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



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equipment for accurate edge planing and milling of column shell ends, base plate 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 trades, the contractor shall arrange to have the work done by such registered or licensed personnel. In case of manufactured materials, the Contractor shall, with no additional cost to the owner, arrange the services of the supervisors of the manufacturers to ensure that the work is being done according to the manufacturer's specifications.

**6.00 TEMPORARY WORK**

6.01 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.

6.02 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 constructed so 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 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.

**7.00 INTERFACE WITH STRUCTURES UNDER OTHER'S SCOPE**

7.01 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.

7.02 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.

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

**8.00 INSPECTION, TESTING AND QUALITY CONTROL FOR CIVIL WORKS**

8.01 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. Wherever nothing is specified relevant Indian



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Standards may be used, in absence of Indian Standards, equivalent International standards may be used.

8.02 The bidder shall submit for BHEL's approval a detailed field quality assurance programme for Civil Works before starting of the construction 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 manufacturers of various materials to be used in the construction.

8.03 If any work is 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 reserves the right to reject work of inferior quality. All expenses on account of dismantling and rework shall be born by contractor.

8.04 Workmanship and dimensional tolerances shall be checked as stipulated below.

9.00 PERMISSIBLE TOLERANCE FOR CIVIL WORKS

9.01 Cast-in-situ concrete works

The dimensions of concrete as cast when compared with those on the drawings shall be within the tolerances given below:

<b>Description of item</b>	<b>Permissible Deviation in mm</b>	
<b>Structural element</b>		
Faces of concrete in foundations and structural members against which backfill is placed	+25	-10
Location of footing (for RCC framed structures only)	+25	-25
Eccentricity of footing	2% of footing width in direction of misplacement but limiting to 50 mm	
Top surfaces of slabs and of concrete to receive base plates to be grouted	+5	-5
Alignment of beams, lintels, columns, walls, slabs and similar structural elements	+5	-5
Cross sectional dimensions of walls, slabs and similar structural elements	+5	-5
Deviation from specified dimensions of cross-	+12	-6



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section of columns and beams

Alignment of holding down bolts without sleeves +1.5 -1.5

Alignment of holding down bolts with sleeves +5 -5

Level of holding down bolt assemblies +10 -10

Embedded parts (in any direction) +5 -5

Centers of pockets or holes with greatest lateral  
dimension not exceeding 150 mm +10 -10

Variation in steps:

Riser +1.5 -1.5

Tread +3.0 -3.0

Plumb 3 mm for every meter  
subject to a maximum  
of 10 mm

#### 9.02 Form work

Levels and heights  $\pm 6$  mm

Plumb 3 mm for every meter  
subject to a maximum  
of 10 mm

Unevenness of any surface  $\pm 3$  mm

Length or breadth  $\pm 12$  mm

Diagonals  $\pm 15$  mm

#### 9.03 Masonry

All masonry shall be built true and plumb within the tolerances prescribed as below  
Care shall be taken to keep the perpend properly aligned.

- i. Deviation in verticality in total height of any wall of a building more than one storey in height shall not exceed  $\pm 12.5$  mm
- ii. Deviation from vertical within a storey shall not exceed  $\pm 6$  mm for 3 m. height.
- iii. Deviation from the position shown on the plan of any brickwork more than one storey in height shall not exceed 12.5 mm.
- iv. Relative displacement between load bearing walls in adjacent storeys intended to be in vertical alignment shall not exceed 6 mm.



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- v. Deviation of bed joint from horizontal in any length upto 12 m shall not exceed 6 mm and in any length over 12 m it shall not exceed 12.5 mm total.
- vi. Deviation from the specified thickness of bed-joints or perpendis shall not exceed  $\pm 3$  mm.

**9.04 Plastering work**

The finished plastered surface shall not show any deviation more than 4 mm when checked with a straight edge of 2 meter length placed against the surface.

The thickness of the plaster shall be measured exclusive of the thickness of key i.e. grooves or open joints in brickwork. The average thickness of plaster shall not be less than the specified thickness. The minimum thickness over any portion of the surface shall not be less than the specified thickness by more than 3 mm for plaster thickness above 12 mm and 1 mm for ceiling plaster. Extra thickness required in dubbing behind rounding of the corners at junctions of wall or in plastering of masonry cornices etc. shall be ignored.

**9.05 Pre-cast concrete work**

Length  $\pm 0.1$  percent subject to minimum of -5 mm and maximum of +10 mm.

Cross-sectional dimensions  $\pm 3$  mm or  $\pm 0.1$  percent which ever is greater

Straightness of Bow : 1/750 of the length subject to minimum of - 5 mm and maximum of + 10 mm

Squareness : When considering the squareness of the corner, the length of the two adjacent sides being checked shall be taken as the base line. The shorter side shall not vary in length from the perpendicular by more than 5 mm

Flatness : The maximum deviation from a 1.5 m straight edge placed in any position on a nominal plane surface shall not exceed 5 mm.

**9.06 Reinforcement work**

Description of item Structural element	Permissible Deviation in mm (Max.)	
<b>Placing of reinforcement</b>		
For effective depth 200 mm or less	+10	-5
For effective depth more than 200 mm or	+15	-10
Cover to reinforcement	-	-5
<b>Cutting of reinforcement</b>		
When minimum length specified	+75	-
When maximum or minimum length not specified	+75	-25

**10.00 CONSTRUCTION / ERECTION METHODOLOGY**

10.01 Construction excavation activities shall be fully mechanized from the start of the work.



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- 10.02 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 in isolated places with specific approval of engineer.
- 10.03 For controlled rock blasting, specialized agency equipped with sensors to assess the impact of the blast on the adjoining existing structures, shall be employed.
- 10.04 Dewatering shall be done using the combination of electrical and stand-by diesel pumps.
- 10.05 Deleted.
- 10.06 For concreting, weigh batching plants, transit mixers, concrete pumps, hoists, etc. shall be used.
- 10.07 All handling of materials shall be with cranes. Heavy trailers shall be used for transportation.
- 10.08 Mechanized modular units of scaffolding and shuttering shall be used.
- 10.09 Heavy duty hoist for lifting of construction materials shall be deployed. Compressors for cleaning of foundations and other surfaces shall be used.
- 10.10 Field laboratory shall be provided with all modern equipment for survey, testing of soil, aggregates, concrete, welding etc.
- 10.11 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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**ANNEXURE – I**

**BIDDER SHALL PROVIDE MINIMUM FOLLOWING FACILITIES IN THE FIELD  
LABORATORY FOR MATERIAL TESTING**

**General Equipment**

Sl.No.	Description	Sl.No.	Description
1.	Balances	10.	Burette stand
2.	Drier	11.	Pipette
3.	Thermometer	12.	Wooden mallet
4.	Hydrometer	13.	Hair brush
5.	Hand-scoop	14.	Wire Brush
6.	Glass beakers	15.	Buckets
7.	Measuring Cylinder	16.	Test Tubes
8.	Desiccator	17.	Working platforms
9.	Burette	18.	Alcometer

**Soil testing apparatus for conducting the following tests:**

Particle size analysis and index properties of soil  
Moisture-density relations of soil  
Specific gravity of soil  
Density of soil in place by sand replacement method

**Testing Equipment for conducting the following tests on concrete samples:**

Compressive strength of concrete  
Slump of concrete  
Specific gravity and absorption and bulking of fine aggregates  
Sieve analysis of fine aggregates and coarse aggregates  
Tests equipment for conducting the following tests on welds for fabricated structural steel members:  
Dye penetration test  
Ultrasonic test