TENDER SPECIFICATION
BHEL PSSR SCT 1893

FOR

Civil, Structural & Architectural works of 400 kV Switch Yard and Control Room of all units (i.e Unit 1 to 5) of 5 x 800MW Yadadri TPS, Veerlapalem Village, Dameracherla Mandal, Nalgonda District, Telangana State

VOLUME-I BOOK-I

TECHNOCOMMERCIAL BID - Consists of Book- I & Book- II

Book- I Consists of

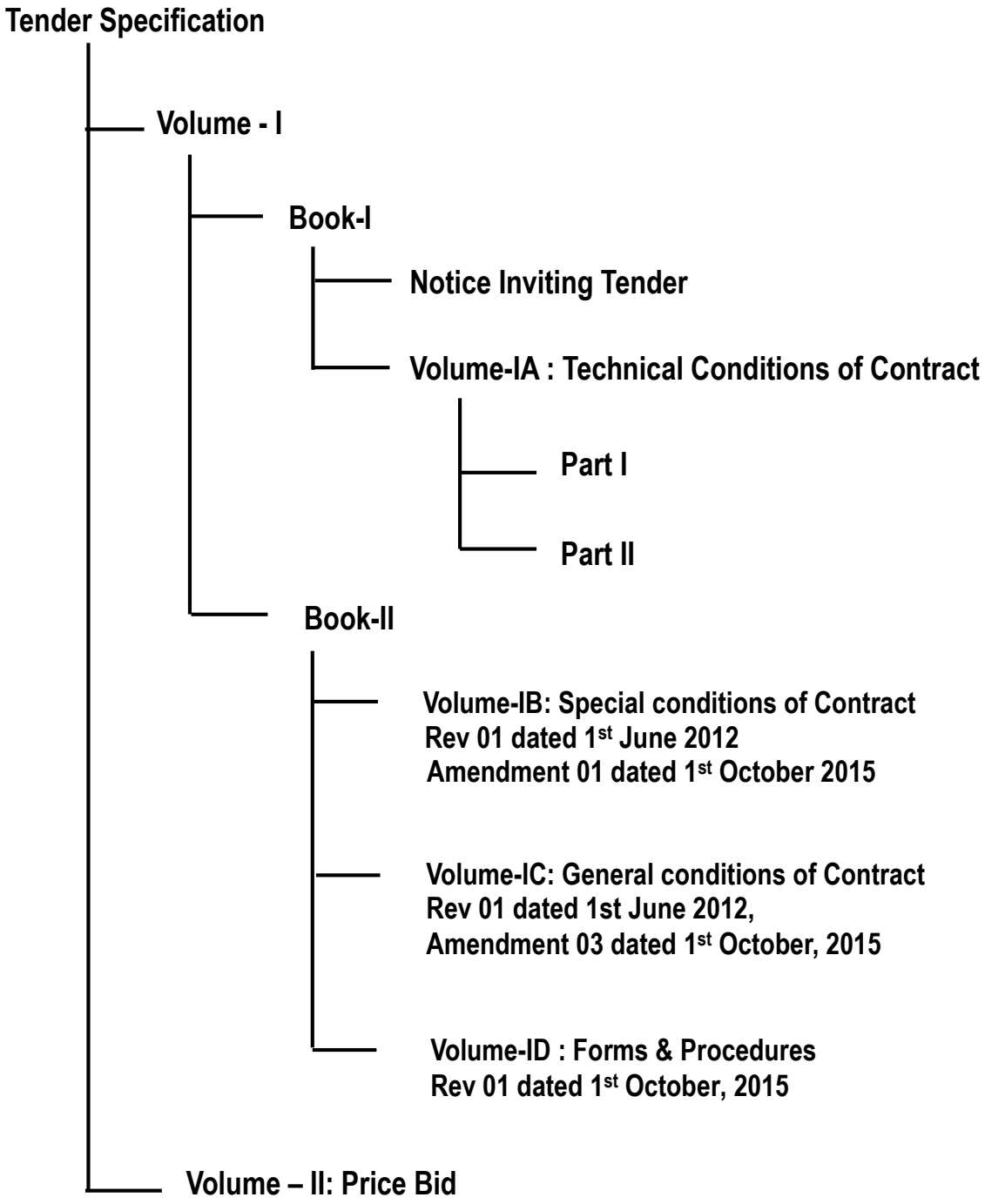
- **Notice Inviting Tender**
- **Volume-IA: Technical Conditions of Contract**

Book-II consists of

- **Volume-IB : Special conditions of Contract,**
  Rev 01 dated 1st June 2012
  Amendment 01 dated 1st October, 2015
- **Volume-IC : General conditions of Contract**
  Rev 01 dated 1st June 2012,
  Amendment 03 dated 1st October, 2015
- **Volume-ID : Forms & Procedures**
  Rev 01 dated 1st June 2012
  Amendment 01 dated 1st October, 2015

BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector – Southern Region
690, Anna Salai, Nandanam, Chennai – 600 035.

TENDER SPECIFICATION CONSISTS OF



NOTICE INVITING TENDER

Bharat Heavy Electricals Limited

Ref: BHEL: PSSR: SCT: 1893 **Date: March 23, 2020**

NOTICE INVITING TENDER (NIT)

Submission only through E-Procurement Portal

https://bhel.abcprocure.com

Note: Bidder may download Tender Documents from web sites

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To
Dear Sir / Madam

Sub: NOTICE INVITING TENDER

This Tender shall be under category of National Competitive Bidding (NCB)

Online Sealed offers in two part bid system are invited from reputed & experienced bidders (meeting PRE QUALIFICATION CRITERIA as mentioned in Annexure-I) **through E-Procurement Portal https://bhel.abcprocure.com only**, for the subject job by the undersigned on the behalf of BHARAT HEAVY ELECTRICALS LIMITED as per the tender document. Following points relevant to the tender may please be noted and complied with.

1.0 **Salient Features of NIT**

Sl. No.	ISSUE	DESCRIPTION	
i)	**Tender Number**	**BHEL: PSSR: SCT: 1893**	
ii)	**Broad Scope of job**	**Civil, Structural & Architectural works of 400 kV Switch Yard and Control Room of all units (i.e Unit 1 to 5) of 5 x 800MW Yadadri TPS, Veerlapalem Village, Dameracherla Mandal, Nalgonda District, Telangana State**	
iii)	**DETAILS OF TENDER DOCUMENT**		
A	Volume-IA	Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc	Applicable
B	Volume-IB	Special conditions of Contract, Rev 01 dated 1st June 2012, Amendment 01 dated October 01, 2015	Applicable
C	Volume-IC	General conditions of Contract Rev 01 dated 1st June 2012, Amendment 03 dated October 01, 2015	Applicable
D	Volume-ID	Forms & Procedures Rev 01 dated 1st June 2012 Amendment 01 dated October 01,2015	Applicable
E	Volume-II	Price Schedule (Absolute value)	Applicable

iv)	Issue of Tender Documents	**1. This is an E-tender floated online through our E-Procurement Portal https://bhel.abcprocure.com** **2. Sale:** **Start: March 24, 2020** **Close:** Tender documents can be downloaded till Closing time for offer submission. **3.** From BHEL website (http://www.bhel.com ---> Tender Notifications) Tender documents for bidder's reference can be downloaded till due date of submission.	Applicable
v)	Due Date & Time of Offer Submission	**Date : April 14, 2020, Time :15.00 Hrs** **Place: The bidder should submit their offer online in e-Procurement portal at https://bhel.abcprocure.com only.** **Offers are invited in two-parts only.** **Bidders are requested to upload their offer well in advance in order to avoid last minute congestion at this website.** **Hard copy bids or bids through E-mail / fax shall not be accepted.**	Applicable
vi)	Opening of Tender	**Date: April 14, 2020, Time :15.30 Hrs** Notes: 1) In case the due date of opening of tender becomes a non-working day, tenders shall be opened on next working day at the same time. 2) Bidder may record their presence online, during tender opening. However this being an e-tender it shall be opened online.	Applicable
vii)	EMD Amount	**Rs. 33,70,000/- (Rupees Thirty-Three Lakh and Seventy Thousand only).** - Refer Volume-I A Part-II Chapter-1 of Technical Conditions of Contract (Volume-I, Book-I) for mode of payment of Earnest Money Deposit (EMD) - Exemption from EMD for MSEs is not applicable for this tender. - One time EMD not applicable for this tender.	Applicable

viii)	Cost of Tender	**Rs. 2,000/-** (Rupees Two Thousand Only) - Cost of tender shall be remitted through, Electronic Fund Transfer credited in BHEL account or Banker's cheque or Pay order or Demand draft, in favour of BHEL. - Exemption of Cost of Tender for MSEs is not applicable for this tender.	Applicable
ix)	Last Date for Seeking Clarification	Bidders may submit their queries in https://bhel.abcprocure.com at least 7 days before the due date of offer submission or two days before the scheduled date of pre-bid meeting whichever is earlier along with soft version also, addressing to undersigned & to others as per contact address given above.	Applicable
x)	Schedule of Pre Bid Discussion (PBD)	**Date: April 06, 2020 Time: 11.00 AM** at BHEL:PSSR:Chennai-35	Applicable
xi)	Integrity Pact & Details of Independent External Monitor (IEM)	a. Integrity Pact (IP) is a tool to ensure that activities and transactions between the company and its Bidders / Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL. 1) Shri. Arun Chandra Verma, IPS (Retd.) Email: acverma1@gmail.com 2) Shri. Virendra Bahadur Singh, IPS (Retd.) Email: vbsinghips@gmail.com b. The IP as per format given at Volume IA Part II of this tender is to be submitted (duly signed by the authorized signatory) along with Techno Commercial Bid (Part-I, in case of two/ three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification. c. Please refer section- 8 of IP (refer the format given at Volume IA Part II of this tender) for Role	Applicable

		and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondences with the IEMs shall be done through email only. **Note:** No routine correspondence shall be addressed to the IEM (Phone / Post / E mail) regarding the clarifications, time extensions or any other administrative queries, etc. on the tender issued. All such clarification / issued shall be addressed directly to the tender issuing (Procurement) department's officials whose contact details are provided below: For all clarifications/ issues related to the Tender, please contact: 1) Name: Gurupriya.L Dept.: Subcontracts Address: BHEL, PSSR, 690, Anna Salai, Nandanam, Chennai-600035 Phone: 044-28286790 Email: gurupriya@bhel.in 2) Name: Vinod Jaseja Dept.: Subcontracts Address: BHEL, PSSR, 690, Anna Salai, Nandanam, Chennai-600035 Phone: 044-28286734 Email: jaseja@bhel.in 3) Name: Sandipan Biswas Dept.: Subcontracts Address: BHEL, PSSR, 690, Anna Salai, Nandanam, Chennai-600035 Phone: 044-28286757/044-24348943 Email: bsandipan@bhel.in	
xii)	Latest updates	Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc to Tender Specifications will be	

		hosted in BHEL webpage (http://www.bhel.com → Tender Notifications) & portal https://bhel.abcprocure.com. Bidders to keep themselves updated with all such information. This also form part of tender hence the same shall be enclosed with their offer.	

2.0 The offer shall be submitted as per the instructions of tender document and as detailed in this NIT. Bidders to note specifically that all pages of tender document, including these NIT pages of this particular tender together with subsequent correspondences shall be submitted by them, duly signed & stamped on each page, as part of offer. **Rates / Price including discounts / rebates, if any, mentioned anywhere/ in any form in the techno-commercial offer other than the Price Bid, shall not be entertained.**

3.0 Bidder shall remit cost of tender through Electronic Fund Transfer credited in BHEL account or Banker's cheque or Pay order or Demand draft, in favour of BHEL.

4.0 Unless specifically stated otherwise, bidder shall deposit **Earnest Money Deposit (EMD) as mentioned in Volume IA, Part-II, Chapter-1** of Technical Conditions of Contract (Volume-I Book-I) under the heading 'Mode of Payment of EMD'. Please note that 'One Time EMD' shall not be considered. **It is to be noted that proof of remittance for EMD shall be made available at BHEL PSSR Office prior to tender opening. One time EMD is not applicable.**

5.0 **Procedure for Submission of Tenders**: This is an E-tender floated online through our E-Procurement portal **https://bhel.abcprocure.com**. The bidder should respond by submitting their offer online only in our e-Procurement portal at **https://bhel.abcprocure.com**. Hard copy bid or bids through email/ fax shall not be accepted.

I. Pre-requisite for Offer Submission:-

Digital Certificate: To participate in an e-Tender, you need to have a Class-II/III Digital Signature Certificate (DSC) for Signing & Encryption (Required both digital signature certificate: Signing & Encryption) of bids issued by any of the valid Certifying Authorities (approved by Controller of Certifying Authorities) in India. Valid Digital Signature Certificate (DSC) must be installed in a computer system from where you want to access the website.

MINIMUM REQUIREMENT: (Mandatory)

- Computer with good Internet Connection (Minimum 256 kbps).
- Operating System should be Windows Vista / Windows 7 and above.
- Web Browsers: Internet Explorer 9.0 (32-bit Browser only) & above.
- System Access with Administrator Rights.

At first time login, to verity and approve your login profile & DSC, you are requested to contact e-Procurement Service Provider.

Also please Refer "Bidder Manual for BHEL Bidders" and "Minimum System Requirements and Settings Document for BHEL user & Bidders" available at https://bhel.abcprocure.com.

II. Digital Signing of e-Tender

Tenders shall be uploaded with all relevant documents in PDF/zip format. The relevant tender documents should be uploaded by an authorized person having Class-II/III Digital Signature Certificate (DSC) for Signing & Encryption.

i) The Requirement:

a.A PC with Internet connectivity &
b. DSC (Digital Signature Certificate) Class-II/III Digital Signature Certificate (DSC) for Signing & Encryption)

III. E-procurement service Provider-:

Address:
e-Procurement Technologies Limited (abcProcure),
Head Office: B-704/705, Wall Street - II, Opp. Orient Club,
Nr. Gujarat College, Ellis Bridge, Ahmedabad - 380 006, Gujarat (India)

Timing:
Refer webpage: **https://bhel.abcprocure.com/EPROC/contactus**

Contact details of the service provider are given below:
Phone: +91-79-68136819/ 809/ 862/ 867/ 823/ 872/ 842/861/871
E-Mail: bhel.support@abcprocure.com

Further contact details can be obtained by visiting the following webpage:
https://bhel.abcprocure.com/EPROC/contactus

IV. Documents Comprising the e-Tender

The tender shall be submitted online - only except Tender Cost & EMD (in physical form) as mentioned below:

i) Technical Tender (Un priced Tender)

Bidders shall furnish the following information along with technical tender (preferably in pdf format):

i). Tender Cost and Earnest Money Deposit (EMD) furnished in accordance with **NIT Clause 3.0 & 4.0.**

ii). All Technical details (eg. Eligibility Criteria requested, Technical Conditions

of Contract) should be attached in e-tendering module **(As detailed in Clause 6.0 below),** failing which the tender stands invalid & may be REJECTED.

ii) Price Bid:

a. Prices are to be quoted as per the Price Bid format attached online on e-tender portal.

b. The price should be quoted for the accounting unit indicated in the e-tender document.

c. The item description, Quantity and Unit of measurement, as mentioned in Price bid uploaded by BHEL and subsequent revisions issued by BHEL, shall be binding on the bidder.

Note:

i). It is the responsibility of tenderer to go through the Tender document to ensure furnishing all required documents in addition to above, if any. Any deviation would result in REJECTION of tender and would not be considered at a later stage at any cost by BHEL.

ii). A person signing (manually or digitally) the tender form or any documents forming part of the contract on behalf of another shall be deemed to warrantee that he has authority to bind such other persons and if, on enquiry, it appears that the persons so signing had no authority to do so, the purchaser may, without prejudice to other civil and criminal remedies, cancel the contract and hold the signatory liable for all cost and damages.

iii). A tender, which does not fulfil any of the above requirements and/or gives evasive information / reply against any such requirement, shall be liable to be ignored and rejected.

iv). In case offer is sent through hard copy / fax / telex / cable / electronically in place of e-tender, same shall not be considered.

v). **Vendors are also requested to go through Bidder manual available on https://bhel.abcprocure.com**

V. DO NOT'S (Don'ts)

Bidders are requested NOT to submit the hard copy of the Bid. In case offer is sent through hard copy / fax / telex / cable / electronically in place of e-tender, the same shall not be considered.

6.0 **DOCUMENTS TO BE UPLOADED & MODALITY OF UPLOADING in E-PROCUREMENT PORTAL https://bhel.abcprocure.com SHALL BE AS DETAILED BELOW:**

Sl No.	Description	Remarks
	Techno-Commercial Bid CONTAINING THE FOLLOWING:-	
i.	Covering letter / Offer forwarding letter of Tenderer.	To be uploaded under the form Techno-commercial Bid.
ii.	Duly filled-in `No Deviation Certificate' as per prescribed format to be placed after document under Sl No (i) above. **Note:** 1. In case of any deviation, the same should be submitted separately for technical & commercial parts, indicating respective clauses of tender against which deviation is taken by bidder. The list of such deviation shall be attached along with document under sl no (i) above. It shall be specifically noted that deviation recorded elsewhere shall not be entertained. 2. BHEL reserves the right to accept / reject the deviations without assigning any reasons, and BHEL decision is final and binding. (i) In case of acceptance of the deviations, appropriate loading shall be done by BHEL (ii) In case of unacceptable deviations, BHEL reserves the right to reject the tender.	To be uploaded under the form Techno-commercial Bid.
iii.	Supporting documents/ annexure/ schedules/ drawing etc. as required in line with Pre-Qualification criteria. (Technical & Financial) As detailed in Clause No. 25 of NIT, It shall be specifically noted that all documents as per above shall be indexed properly and credential certificates issued by clients shall distinctly bear the name of organization, contact Phone no, FAX no, etc.	To be uploaded under the form Techno-commercial Bid.

iv.	All Amendments / Correspondences / Corrigenda / Clarifications / Changes / Errata etc. pertinent to this NIT.	To be uploaded under the form Techno-commercial Bid.
v.	Integrity Pact Agreement (Duly signed by the authorized signatory) (As applicable)	To be uploaded under the form Techno-commercial Bid.
vi.	Duly filled-in annexures, formats etc. as required under this Tender Specification/ NIT	To be uploaded under the form Techno-commercial Bid.
vii.	Notice inviting Tender (NIT)	To be uploaded under the form Techno-commercial Bid.
viii.	Volume – I A : Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc	
ix.	Volume – I B : Special Conditions of Contract (SCC)	To be uploaded under the form Techno-commercial Bid.
x.	Volume – I C : General Conditions of Contract (GCC)	
xi.	Volume – I D : Forms & Procedures	
xii.	Volume – II (UNPRICED – without disclosing rates/price, but mentioning only 'QUOTED' or 'UNQUOTED' against each item	To be uploaded under the form Techno-commercial Bid.
xiii.	Any other details preferred by bidder with proper indexing.	To be uploaded under the form Techno-commercial Bid.

Caution to Bidders: -
The duly signed & stamped copies of Volume – I Book I & Volume I Book-II are to be attached under the form Techno-commercial Bid. For any further queries, Refer "Bidder Manual for BHEL Bidders" available at **https://bhel.abcprocure.com**.

Sl No	**Description**	**Remarks**
	PRICE BID consisting of the following shall be provided as mentioned below	
I	**Price/ Total Amount corresponding to the total works as specified in "Part C: Bill of Quantities" available in "Volume II – PRICE BID (latest Revision)" shall be quoted in the Price Bid Form available in e-Procurement portal.** **Bidders to note that total amount quoted by the bidder in Price Bid – "Bidding Forms" of e-Procurement Portal shall be considered for evaluation of offer.**	Refer "Bidder Manual for BHEL Bidders" available at **https://bhel.abcprocure.com**

SPECIAL NOTE:

i. All documents / annexures submitted with the offer shall be properly attached / entered / uploaded in the respective sections. BHEL shall not be responsible for any missing documents.

ii. Your offer & documents submitted along with offer shall be signed & stamped in each page by your authorized representative. No overwriting/ correction in tender documents by bidders shall be allowed. However, if correction is unavoidable, the same may be signed by authorized signatory.

7.0 Deviation with respect to tender clauses and additional clauses / suggestions / in Techno-commercial bid / Price bid shall NOT be considered by BHEL. Bidders are requested to positively comply with the same.

8.0 BHEL reserves the right to accept or reject any or all Offers without assigning any reasons thereof. BHEL also reserves the right to cancel the Tender wholly or partly without assigning any reason thereof. Also BHEL shall not entertain any correspondence from bidders in this matter (except for the refund of EMD).

9.0 **ASSESSMENT OF CAPACITY OF BIDDERS:**

Bidder's capacity for executing the job under tender shall be assessed 'LOAD' wise and 'PERFORMANCE' wise as per the following:

I. LOAD: Load takes into consideration ALL the contracts of the Bidder under execution with BHEL Regions, irrespective of whether they are similar to the tendered scope or not. The cut off month for reckoning 'Load' shall be the third month preceding the month corresponding to the 'latest date of bid submission', in the following manner –

(**Note**: For example, if latest bid submission is in Jan 2017, then the 'load' shall be calculated up to and inclusive of Oct 2016)

Total number of Packages in hand = Load (P)

Where 'P' is the sum of all unit wise identified packages (refer table-1) under execution with BHEL Regions as of the cut off month defined above, including packages yet to be commenced, excepting packages which are on Long Hold.

II. PERFORMANCE: Here 'Monthly Performance' of the bidder for all the packages (under execution/ executed during the 'Period of Assessment' in all Power Sector Regions of BHEL) **SIMILAR** to the packages covered under the tendered scope, excepting packages not commenced shall be taken into consideration. The 'Period of Assessment' shall be 6 months preceding and including the cut off month. The cut off month for reckoning 'Period of Assessment' shall be the third month preceding the month corresponding to

'latest date of bid submission', in the following manner:

(Note: For example, if 'latest date of bid submission' is in Jan 2017, then the 'performance' shall be assessed for a 'six months' period up to and inclusive of Oct 2016 (i.e. from May 2016 to Oct 2016), for all the unit wise identified packages (refer Table I))

i). Calculation of Overall 'Performance Rating' for 'Similar Package / Packages' for the tendered scope under execution at Power Sector Regions for the 'Period of Assessment

This shall be obtained by summing up the 'Monthly Performance Evaluation' scores obtained by the bidder in all Regions for all the similar Package / packages', divided by the total number of Package months for which evaluation should have been done, as per procedure below:

a) P_1, P_2, P_3, P_4, P_5 , …. P_N etc. be the packages (under execution / executed during the 'Period of Assessment' in all Regions of BHEL) **SIMILAR** to the packages covered under the tendered scope, excepting packages not commenced. Total number of similar packages for all Regions = $\mathbf{P_T}$ (i.e. $P_T = P_1 + P_2 + P_3 + P_4 + \ldots P_N$)

b) Number of Months 'T_1' for which 'Monthly Performance Evaluation' as per relevant formats, should have been done in the 'Period of Assessment' for the corresponding similar package P_1. Similarly T_2 for package P_2, T_3 for package P_3, etc. for the tendered scope. Now calculate cumulative total months '$\mathbf{T_T}$' for total similar Packages '$\mathbf{P_T}$' for all Regions (i.e. $\mathbf{T_T} = T_1 + T_2 + T_3 + T_4 + .. T_N$)

c) Sum 'S_1 'of 'Monthly Performance Evaluation' Scores ($S_{1\text{-}1}$, $S_{1\text{-}2}$, $S_{1\text{-}3}$, $S_{1\text{-}4}$, $S_{1\text{-}5}$…. $S_{1\text{-}T1}$) for similar package P1, for the 'period of assessment' 'T_1' (i.e. $S_1 = S_{1\text{-}1} + S_{1\text{-}2} + S_{1\text{-}3} + S_{1\text{-}4} + S_{1\text{-}5} + \ldots S_{1\text{-}T1}$). Similarly, S_2 for package P_2 for period T_2, S_3 for package P_3 for period T_3 etc. for the tendered scope for all Regions. Now calculate cumulative sum 'S_T' of 'Monthly Performance Evaluation' Scores for total similar Packages '$\mathbf{P_T}$' for all Regions (i.e. 'S_T' = $S_1 + S_2 + S_3 + S_4 + S_5 + \ldots S_N$.)

d) **Overall Performance Rating** '$\mathbf{R_{BHEL}}$' **for the Similar Package / Packages** (under execution / executed during the 'Period of Assessment') in all the Power Sector Regions of BHEL

$$= \frac{\text{Aggregate of Performance scores for all similar packages in all the Regions}}{\text{Aggregate of months for each of the similar packages for which performance should have been evaluated in all the Regions.}}$$

$$= \frac{S_T}{T_T}$$

e) **Bidders to note that the risk of non-evaluation or non-availability of the 'Monthly Performance Evaluation' reports as per relevant formats is to be borne by the Bidder.**

f) **Table showing methodology for calculating 'a', 'b' and 'c' above**

Sl.No.	Item Description	Details for all Regions							Total
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
1	Similar Packages for all Regions → (under execution/ executed during period of assessment)	P_1	P_2	P_3	P_4	P_5	…	P_N	Total No of similar packages for all Regions = $\mathbf{P_T}$ ie Sum (Σ) of columns (iii) to (ix)
2	Number of Months for which 'Monthly Performance Evaluation' as per relevant formats should have been done in the 'period of assessment for corresponding similar Package (as in row 1)	T_1	T_2	T_3	T_4	T_5	…	T_N	Sum (Σ) of columns (iii) to (ix) = $\mathbf{T_T}$
3	Monthly performance scores for the corresponding period (as in Row 2)	S_{1-1}, S_{1-2}, S_{1-3}, S_{1-4}, … S_{1-T1}	S_{2-1}, S_{2-2}, S_{2-3}, S_{2-4},… S_{2-T2}	S_{3-1}, S_{3-2}, S_{3-3}, S_{3-4}, … S_{3-T3}	S_{4-1}, S_{4-2}, S_{4-3}, S_{4-4}, … S_{4-T4}	S_{5-1}, S_{5-2}, S_{5-3}, S_{5-4}, … S_{5-T5}	.. … … … …	S_{N-1}, S_{N-2}, S_{N-3}, S_{N-4}, … S_{N-TN}	---
4	Sum of Monthly Performance scores of the corresponding Package for the corresponding period (as in row-3)	S_1	S_2	S_3	S_4	S_5	…	S_N	Sum (Σ) of columns (iii) to (ix) = $\mathbf{S_T}$

ii.) Calculation of Overall 'Performance Rating' (R_{BHEL}) in case at least six

evaluation scores for 'similar Package / Packages' for the tendered scope ARE NOT AVAILABLE during the 'Period of Assessment'.

This shall be obtained by summing up the 'Monthly Performance Evaluation' scores obtained by the bidder in all Regions for ALL the packages, divided by the total number of Package months for which evaluation should have been done. '$\mathbf{R_{BHEL}}$' shall be calculated subject to availability of 'performance scores' for at least six 'package months' in the order of precedence below:

a) 'Period of Assessment' i.e. six months preceding and including the cut-off month
b) 12 months preceding and including the cut-off month
c) 24 months preceding and including the cut-off month

In case, '$\mathbf{R_{BHEL}}$' cannot be calculated as above, then Bidder shall be treated as 'NEW VENDOR'. Further eligibility and qualification of this bidder shall be as per definition of 'NEW VENDOR' described in 'Explanatory Notes'.

iii) Factor "L" assigned based on Overall Performance Rating (R_{BHEL}) at Power Sector Regions:

Sl. No.	Overall Performance Rating (R_{BHEL})	Corresponding value of 'L'
1	=60	NA
2	> 60 and ≤ 65	0.4
3	> 65 and ≤ 70	0.35
4	> 70 and ≤ 75	0.25
5	> 75 and < 80	0.2
6	≥ 80	NA

III. Assessment of Capacity of Bidder':

'Assessment of Capacity of Bidder' is based on the Maximum number of packages for which a vendor is eligible, considering the performance scores of similar packages, as below:

Max number of packages P_{Max}= (R_{BHEL}- 60) divided by corresponding value of 'L' i.e. (R_{BHEL}- 60)/L

Note:

i. In case the value of P_{Max} results in a fraction, the value of P_{Max} is to be rounded off to next whole number
ii. For R_{BHEL} = 60, P_{Max} = '1'
iii. For R_{BHEL} ≥ 80, there will be no upper limit on P_{Max}

The Bidder shall be considered 'Qualified' as per 'Assessment of Capacity of Bidder' for the subject Tender if $P \leq P_{Max}$

(Where P is calculated as per clause 'I' above.)

Note: For the transition period of 1 year (i.e. for all the NITs floated between 11th May 2019 to 10th May 2020), in addition to above, 'Assessment of Capacity of Bidder' shall also be calculated considering 'performance scores' till 36 months as per Sl. no II ii).
Higher of the results obtained out of both shall be considered for 'Assessment of Capacity of Bidder'.

IV. Explanatory note:

i). Similar package means Boiler or ESP or Piping or Turbine or Civil or Structure or Electrical or C&I etc. at the individual level irrespective of rating of Plant and irrespective of whether the subject tender is a single package or as part of combined / composite packages. Normally Boiler, ESP, Piping, Turbine, Electrical, C&I, Civil, Structure etc. is considered individual level of package. For example, in case the tendered scope is a Boiler Vertical Package comprising of Boiler, ESP and Power Cycle Piping (i.e. the 'identified packages as per Table-1 below), the 'PERFORMANCE' part against Sl. No. II above, needs to be evaluated considering all the identified packages (i.e. Boiler, ESP and Power Cycle Piping) and finally the Bidder's capacity to execute the tendered scope is assessed in line with III above.

ii). Identified Packages (Unit wise)

Table-1

Civil	Electrical & CI	Mechanical
i). Enabling works ii). Pile and Pile Caps iii). Civil Works including foundations iv). Structural Steel Fabrication & Erection v). Chimney	i).Electrical ii). CI iii). Others (Elec & CI)	i). Boiler & Aux (All types including CW Piping if applicable) ii). Power Cycle Piping / Critical Piping iii). ESP iv). LP Piping v). Steam Turbine Generator set & Aux vi). Gas Turbine Generator set & Aux vii). Hydro Turbine Generator set & Aux viii). Turbo Blower (including Steam Turbine) ix). Material Management

Civil	Electrical & CI	Mechanical
vi). Cooling Tower vii). Others (Civil)		x). Others (Mechanical)

iii). Bidders who have not been evaluated for at least six package months in the last 24 months preceding and including the Cut-off month in the online BHEL system for contractor performance evaluation in BHEL PS Regions, shall be considered "NEW VENDOR".

A 'NEW VENDOR' shall be considered qualified subject to satisfying all other tender conditions

A 'NEW VENDOR' if awarded a job (of package / packages identified under this clause) shall be tagged as "FIRST TIMER" on the date of first LOI from BHEL.

The "FIRST TIMER" tag shall remain till completion of all the contracts against which vendor has been tagged as First Timer or availability of 6 evaluation scores within the last 24 months preceeding and including the Cut-off month in the online BHEL system for contractor performance evaluation in BHEL PS Regions.

A Bidder shall not be eligible for the next job as long as the Bidder is tagged as "FIRST TIMER" excepting for the Tenders which have been opened on or before the date of the bidder being tagged as 'FIRST TIMER'.

After removal of 'FIRST TIMER' tag, the Bidder shall be considered 'QUALIFIED' for the future tenders subject to satisfying all other tender conditions including 'Assessment of Capacity of Bidders'.

iv). Consequent upon applying the criteria of 'Assessment of Capacity of Bidders' detailed above on all the bidders qualified against Technical and Financial Qualification criteria, if the number of qualified bidders reduces to less than four, then for further processing of the Tender, BHEL at its discretion reserves the right to also consider the bidders who are "not qualified" as per criteria of 'Assessment of Capacity of Bidders' and for this, procedure described in following three options shall be followed:

a) All the bidders having Overall Performance Rating ('RBHEL') ≥60 shall be considered qualified against criteria of 'Assessment of Capacity of Bidders'.

b) If even after using option "a", the number of qualified bidders remains less than four, then in addition to bidders considered as per option "a", "First timer" bidders having average of available performance scores ≥60 upto and including the Cut Off month shall also be considered qualified against criteria of 'Assessment of Capacity of Bidders'.

c) If even after using option “a” and “b”, the number of qualified bidders remains less than four, then in addition to bidders considered as per option “a” and “b”, “First timer” bidders for whom no performance score is available in the system upto and including the Cut Off month, shall also be considered qualified against criteria of ‘Assessment of Capacity of Bidders’.

Note:- In case, the number of bidders qualified against Technical and Financial Qualification criteria itself is less than four, then all bidders (a)- having Overall Performance Rating (‘RBHEL’) ≥60, (b)- First timer” bidders having average of available performance scores ≥60 upto and including the Cut Off month, (c)- “First timer” bidders for whom no performance score is available in the system upto and including the Cut Off month, shall be considered qualified against criteria of ‘Assessment of Capacity of Bidders’ for further processing of tender.

v). ‘Under execution’ shall mean works in progress as per the following:

(a). Up to execution of 90% of anticipated Contract Value in case of Civil, MM, Structural and Turbo Blower Packages

(b). Up to Steam Blowing in case of Boiler / ESP / Piping Packages

(c). Up to Synchronization in all Balance Packages

Note: BHEL at its discretion can extend (or reduce in exceptional cases in line with Contract conditions) the period defined against (a), (b) and (c) above, depending upon the balance scope of work to be completed.

vi). Contractor shall provide the latest contact details i.e. mail-ID and Correspondence Address to SCT Department, so that same can be entered in the Contractor Performance Evaluation System, and in case of any change / discrepancy same shall be informed immediately. Login Details for viewing scores in Contractor Performance Evaluation System shall be provided to the Contractor by SCT Department.

vii). Performance Evaluation for Activity Month shall be completed in Evaluation Month (i.e. month next to Activity Month) or in rare cases in Post Evaluation Month (i.e. month next to Evaluation Month) after approval from Competent Authority. In case scores are not acceptable, Contractor can submit Review Request to GM Site / GM Project latest by 25th of Evaluation Month or 3 days after approval of score, whichever is later. However, acceptance / rejection of ‘Review Request’ solely depends on the discretion of GM Site / GM Project. After acceptance of Review Request, evaluation score shall be reviewed at site and the score after completion of review process shall be acceptable and binding on the contractor.

viii). Project on Hold due to reasons not attributable to bidder -

a. **Short hold:** Evaluation shall not be applicable for this period, however loading will be considered.

b. **Long hold:** Short hold for continuous six months and beyond or hold on account of Force Majeure shall be considered as Long Hold. Evaluation as well as Loading shall not be considered for this period.

10.0 Performance evaluation in Clause 9 above is applicable to Prime bidder and consortium partner (or Technical tie up partner) for their respective scope of work.

11.0 Since the job shall be executed at site, bidders must visit site/ work area and study the job content, facilities available, availability of materials, prevailing site conditions including law & order situation, applicable wage structure, wage rules, etc., before quoting for this tender. They may also consult this office before submitting their offers, for any clarifications regarding scope of work, facilities available at sites or on terms and conditions.

12.0 For any clarification on the tender document, the bidder may seek the same in clarification provision available in e-procurement portal https://bhel.abcprocure.com or writing or through e-mail, as per specified format, within the scheduled date for seeking clarification, from the office of the undersigned. BHEL shall not be responsible for receipt of queries after due date of seeking clarification due to postal delay or any other delays. Any clarification / query received after last date for seeking clarification may not be normally entertained by BHEL and no time extension will be given.

13.0 BHEL may decide holding pre-bid discussion (PBD) with all intending bidders as per date indicated in the NIT. The bidder shall ensure participation for the same at the appointed time, date and place as may be decided by BHEL. Bidders shall plan their visit accordingly. The outcome of pre-bid discussion (PBD) shall also form part of tender.

14.0 In the event of any conflict between requirement of any clause of this specification / documents / drawings / data sheets etc., or requirements of different codes / standards specified, the same to be brought to the knowledge of BHEL in writing for clarification before due date of seeking clarification (whichever is applicable), otherwise, interpretation by BHEL shall prevail. Any typing error / missing pages / other clerical errors in the tender documents, noticed must be pointed out before pre-bid meeting / submission of offer, else BHEL's interpretation shall prevail.

15.0 Unless specifically mentioned otherwise, bidder's quoted price shall deemed to be in compliance with tender including PBD.

16.0 Bidders shall submit Integrity Pact Agreement (Duly signed by authorized signatory who signs in the offer), **if applicable**, along with techno-commercial bid. This pact shall be considered as a preliminary qualification for further participation. The

Integrity Pact is to be submitted by Prime Bidder & Consortium/ Technical Tie up partner jointly in case Consortium bidding is permitted, otherwise by the sole bidder. **The names and other details of Independent External Monitor (IEM) for the subject tender is as given at point (1) above.**

17.0 The Bidder has to satisfy the Pre-Qualifying Requirements stipulated for this Tender in order to be qualified. The Price Bids of only those bidders will be opened who will be qualified for the subject job on the basis of satisfying the pre-qualification criteria specified in this NIT as per Annexure-1(as applicable) past performance etc., and date of opening of price bids shall be intimated to only such bidders. BHEL reserves the right NOT to consider offers of parties under HOLD.

18.0 In case BHEL decides on a `Public Opening', the date & time of opening of the sealed PRICE BID shall be intimated to the qualified bidders and in such a case, bidder may depute one authorized representative to witness the price bid opening. BHEL reserves the right to open 'in-camera' the 'PRICE BID' of any or all Unsuccessful / Disqualified bidders under intimation to the respective bidders.

19.0 Validity of the offer shall be for **six months** from the latest due date of offer submission (including extension, if any) unless specified otherwise.

20.0 Void

21.0 On submission of offer, further consideration will be subject to compliance to tender & qualifying requirement and customer's acceptance, as applicable.

22.0 In case the bidder is an "Indian Agent of Foreign Principals", 'Agency agreement has to be submitted along with Bid, detailing the role of the agent along with the terms of payment for agency commission in INR, along with supporting documents.

23.0 Void

24.0 The bidders shall not enter into any undisclosed M.O.U. or any understanding amongst themselves with respect to tender.

25.0 The bidder shall submit documents in support of possession of 'Qualifying Requirements' duly self-certified and stamped by the authorized signatory, indexed and properly linked in the format for PQR. In case BHEL requires any other documents / proofs, these shall be submitted immediately.

26.0 The bidder may have to produce original document for verification if so decided by BHEL.

27.0 The offers of the bidders who are under suspension as also the offer of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site "http://www.bhel.com → tender notification".

28.0 It may be noted that guidelines / rules in respect of 'Suspension of Business dealings' available on BHEL web site "http://www.bhel.com → Supplier Registration", 'Vendor

evaluation format', Quality, Safey & HSE guidelines', etc. may undergo change from time to time and the latest one shall be followed.

29.0 The Bidder along with its associate/ collaborators/ sub-contractors/ sub-vendors/ consultants / service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.

30.0 Integrity commitment, performance of the contract and punitive action thereof:

30.1 Commitment by BHEL:

BHEL commits to take all measures necessary to prevent corruption in connection with the tender process and execution of the contract. BHEL will during the tender process treat all Bidder(s) in a transparent and fair manner, and with equity.

30.2 Commitment by Bidder / Supplier / Contractor:

30.2.1 The bidder / supplier / contractor commit to take all measures to prevent corruption and will not directly or indirectly influence any decision or benefit which he is not legally entitled to nor will act or omit in any manner which tantamount to an offence punishable under any provision of the Indian Penal Code, 1860 or any other law in force in India.

30.2.2 The bidder / supplier / contractor will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and shall adhere to relevant guidelines issued from time to time by Govt. of India/ BHEL.

30.2.3 The bidder / supplier / contractor will perform / execute the contract as per the contract terms & conditions and will not default without any reasonable cause, which causes loss of business / money / reputation, to BHEL.

30.3 If any bidder / supplier / contractor during pre-tendering / tendering / post tendering / award / execution / post-execution stage indulges in mal-practices, cheating, bribery, fraud or and other misconduct or formation of cartel so as to influence the bidding process or influence the price or acts or omits in any manner which tantamount to an offence punishable under any provision of the Indian Penal Code, 1860 or any other law in force in India, then, action may be taken against such bidder / supplier / contractor as per extant guidelines of the company available on http://www.bhel.com and / or under applicable legal provisions.

31.0 Bid should be free from correction, overwriting, using corrective fluid, etc. Any interlineation, cutting, erasure or overwriting shall be valid only if they are attested under full signature(s) of person(s) signing the bid else bid shall be liable for rejection.

32.0 For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 15.06.2017, 28.05.2018 & 29.05.2019 and subsequent Orders issued by the respective Nodal Ministry shall be applicable even if issued after issue of this NIT but before finalization of contract/ PO/ WO against this NIT.

In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and/ or local content in respect of this procurement, same shall be applicable.

33.0 In the course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective L-1 bidders.

In case more than one bidder happens to occupy the L-1 status even after soliciting discounts, the L-1 bidder shall be decided by a toss/ draw of lots, in the presence of the respective L-1 bidder(s) or their representative(s).

Ranking will be done accordingly. BHEL's decision in such situations shall be final and binding.

34.0 **Order of Precedence:**
In the event of any ambiguity or conflict between the Tender Documents, the order of precedence shall be in the order below:

a. Amendments / Clarifications / Corrigenda / Errata etc. issued in respect of the tender documents by BHEL
b. Notice Inviting Tender (NIT)
c. Price Bid
d. Technical Conditions of Contract (TCC)—Volume-1A
e. Special Conditions of Contract (SCC) —Volume-1B
Rev. 01 Dt. 01 Jun 2012; Amendment: 01 Dt. 1st October 2015
f. General Conditions of Contract (GCC) —Volume-1C
Rev. 01 Dt. 01 Jun 2012; Amendment: 03 Dt. 1st October 2015
g. Forms and Procedures —Volume-1D
Rev. 01 Dt. 01 Jun 2012; Amendment: 01 Dt. 1st October 2015

For and on behalf of BHARAT HEAVY ELECTRICALS LTD

Additional General Manager / SCT

Enclosure

1. Annexure-1: Pre Qualifying criteria.
2. Annexure-2: Check List.
3. Annexure-3 Technical Pre Qualification Criteria.
4. Annexure-4 Annexure to Pre-Qualifying Criteria.
5. Annexure-5 Tender Schedule.
6. Annexure-6 Void.
7. Other documents as per this NIT.

ANNEXURE - 1

PRE QUALIFYING CRITERIA

JOB	**Civil, Structural & Architectural works of 400 kV Switch Yard and Control Room of all units (i.e Unit 1 to 5) of 5 x 800MW Yadadri TPS, Veerlapalem Village, Dameracherla Mandal, Nalgonda District, Telangana State**
Tender No.	**BHEL PSSR SCT 1893**

Sl. No.	**PRE QUALIFICATION CRITERIA**	**Bidders claim in respect of fulfilling the PQR Criteria**	
		Name and Description of qualifying criteria	**Page no of supporting document. Bidder must fill up this column as per applicability**
A	**Submission of Integrity Pact duly signed (if applicable)** (**Note**: To be submitted by Prime Bidder & Consortium / Technical Tie up partner jointly in case Consortium bidding is permitted, otherwise by the sole bidder)	Applicable	
B	**Technical** **Refer Annexure 3**	Applicable	To be filled in Annexure-4
C: C-1	**FINANCIAL** **Turnover** Bidders must have achieved an average annual financial turnover (Audited) of **Rs. 7,11,00,000/- (Rs. Seven Crore and Eleven Lakh only)** or more over last three Financial Years (FY) i.e 2016-17, 2017-18 and 2018-19.	Applicable	To be filled in Annexure-4
C-2	**Networth** (only in case of Companies) Net worth of the Bidder based on the latest Audited Accounts as furnished for 'C-1' above should be positive	Applicable	To be filled in Annexure-4
C-3	**Profit** Bidder must have earned profit in any one of the three Financial Years as applicable in the last three Financial Years defined in 'C-1 above based on latest Audited Accounts.	Applicable	To be filled in Annexure-4

C-4	Bidder must not be under Bankruptcy Code Proceedings (IBC) by NCLT or under liquidation / BIFR, which will render him illegible for participation in this tender, and shall submit undertaking to this effect.	Applicable	Undertaking to be enclosed with the offer
D	Assessment of Capacity of Bidder to execute the work as per Sl. No 9 of NIT (if applicable)	Applicable	By BHEL
E	**Approval of Customer (if applicable)** **Note:** Names of bidders (including consortium / Technical Tie up partners in case consortium bidding is permitted) who stand qualified after compliance of criteria A to D shall be forwarded to customer for their approval.	Applicable	By BHEL
F	**Price Bid Opening** **Note:** Price Bids of only those bidders shall be opened who stand qualified after compliance of criteria A to E	Applicable	By BHEL
G	**Consortium criteria (if applicable)**	Not Applicable	

Explanatory Notes for the PQR (unless otherwise specified in the PQR):

1. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as indicated against C-1 above along with all annexures.
2. In case audited financial statements have not been submitted for all the three years as indicated against C-1 above, then the applicable audited statements submitted by the bidders against the requisite three years, will be averaged for three years i.e. total divided by three.
3. If Financial Statements are not required to be audited statutorily, then instead of audited financial statements, financial statements are required to be certified by Chartered Accountant.
4. C-2:-NETWORTH: Shall be calculated based on the latest Audited Accounts as furnished for C-1 above. Net worth = Paid up share capital* + Reserves. (Net worth is required to be evaluated in case of companies)

   Note:- (*:Share Capital OR Partnership Capital OR Proprietor Capital as the case may be).
5. C-3:- PROFIT : shall be PBT earned during any one of the three financial years as in C-1 above.
6. For evaluation of PQR, the credentials of the Bidder alone, and not that of the Group Company shall be considered.

	7. Completion date for achievement of the technical criteria specified in the 'Technical' criteria of PQR (as in 'B' above) should be in the last 7 years ending on the 'latest date of Bid submission' of Tender irrespective of date of the start of work. 8. Boiler means HRSG or WHRB or any other types of Steam Generator. 9. Power Cycle piping means Main Steam, Hot Reheat, Cold Reheat, HP Bypass. 10. For the purpose of evaluation of the PQR, one MW shall be considered equivalent to 3.5TPH where ever rating of HRSG / BOILER is mentioned in MW. Similarly, where ever rating of Gas Turbine is mentioned in terms of Frame size, ISO rating in terms of MW shall be considered for evaluation. 11. Scope for capital overhaul of STG shall cover Bearing Inspection work and overhauling of all cylinders of the Turbine unless otherwise specifically indicated in the PQR. 12. In case the Experience/PO/WO certificate enclosed by bidders do not have separate break up of prices for the E&C portion for Electrical and C&I works (i.e. the certificates enclosed are for composite order for supply and erection of Electrical and C&I and other works if any), then value of Erection & Commissioning for the Electrical and C&I portion shall be considered as 15% of the price for supply & erection of Electrical and C&I. 13. In case the tendered scope is not a Pulverized Fuel Boiler, experience of Oil/ Gas Fired Boilers also can be considered unless otherwise specifically indicated in the PQR.

Note:

BIDDER SHALL SUBMIT PRE-QUALIFICATION CRITERIA FORMAT (Refer Annexure-4), DULY FILLED-IN, SPECIFYING RESPECTIVE ANNEXURE NUMBER AGAINST EACH CRITERIA AND FURNISH RELEVANT DOCUMENT INCLUSIVE OF WORK ORDER AND WORK COMPLETION CERTIFICATE ETC. IN THE RESPECTIVE ANNEXURES IN THEIR OFFER.

Authenticity of Credentials submitted by the Bidder against 'Pre-Qualifying Criteria' shall be verified from the Issuing Authority, by BHEL. In case, any credential(s) is / are found to be unauthentic, offer of the bidder is liable to be rejected. BHEL reserves the Right to Initiate any further action as per the "Guidelines for Suspension of Business Dealings with Suppliers / Contractors" (Published in http://www.bhel.com/index.php/vender) and "Fraud Prevention Policy" (Published in http://www.bhel.com/home.php) as applicable.

ANNEXURE - 2

CHECK LIST

NOTE: - Tenderers are required to either fill in or submit separately the following details. No column should be left blank.

<table>
<tr><td>1</td><td>Name and Address of the Tenderer</td><td colspan="3"></td></tr>
<tr><td>2</td><td>Details about type of the Firm / Company</td><td colspan="3"></td></tr>
<tr><td>3a</td><td colspan="4">Details of Contact person for this Tender:
Name : Mr. / Ms.
Designation:
Telephone No:
Mobile No:
Fax No:
E-mail ID:</td></tr>
<tr><td>3b</td><td colspan="4">Details of alternate Contact person for this Tender:
Name : Mr. / Ms.
Designation:
Telephone No:
Mobile No:
Fax No:
E-mail ID:</td></tr>
<tr><td>4</td><td>EMD DETAILS
(Remittance of EMD should be in line with Mode of Deposit as detailed in Volume-1A, Part-2, Chapter-1 of Technical Conditions of Contract (Volume-I Book-I)</td><td colspan="3"><table><tr><td>Sl. No</td><td>Ref No.</td><td>Detail</td><td>Amount</td><td>Remarks</td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>5</td><td>Validity of Offer</td><td colspan="3">To be valid for six months from due date</td></tr>
<tr><td></td><td></td><td>Applicability (By BHEL)</td><td>Bidder Reply</td></tr>
<tr><td>6</td><td>Whether the format for compliance with PRE QUALIFICATION CRITERIA (ANNEXURE-I & ANNEXURE-IV) is understood and filled with proper supporting documents referenced in the specified format</td><td>Applicable</td><td>Yes / No</td></tr>
<tr><td>7</td><td>Submission of Copy of Balance sheet and Audited profit and Loss Account for the last three years</td><td>Applicable</td><td>Yes / No</td></tr>
<tr><td>8</td><td>Submission of Copy of PAN Card</td><td>Applicable</td><td>Yes / No</td></tr>
<tr><td>9</td><td>Whether all pages of the offer documents are signed by the person authorized to sign this offer</td><td>Applicable</td><td>Yes / No</td></tr>
</table>

10	Whether all pages of the Tender documents including annexures, appendices etc., are read understood and signed	Applicable	Yes / No
11	Submission of Integrity Pact	Applicable	Yes / No
12	Submission of Declaration by Authorized Signatory	Applicable	Yes / No
13	Submission of No Deviation Certificate	Applicable	Yes / No
14	Submission of Declaration confirming knowledge about Site Conditions	Applicable	Yes / No
15	Submission of Declaration for relation in BHEL	Applicable	Yes / No
16	Submission of Non-Disclosure Certificate	Applicable	Yes / No
17	Submission of Copy Bank Account Details for E-Payment	Applicable	Yes / No
18	Submission of Capacity Evaluation of Bidder for current Tender	Applicable	Yes / No
19	Submission of Tie Ups / Consortium Agreement are submitted as per format	Not Applicable	Yes / No
20	Submission of Power of Attorney for Submission of Tender / Signing Contract Agreement	Applicable	Yes / No
21	Submission of Analysis of Unit rates	Applicable	Yes / No
22	Submission of Unquoted price bid	Applicable	Yes / No
23	Tabular column showing Category- wise, month wise, man power deployment sub package wise planned for the execution of the scope of works.	Applicable	Yes / No
24	Declaration by bidder for price opening through reverse auction (Refer Annexure-6 of Notice Inviting Tender)	Not Applicable	Yes / No
25	Copy of Organization Chart	Applicable	Yes / No
26	Copy of Registration/ Incorporation certificate, Partnership Deed (Certified by Notary Public) as applicable for firm	Applicable	Yes / No

NOTE:

1. STRIKE OFF 'YES' OR 'NO', AS APPLICABLE.
2. TENDER NOT ACCOMPANIED BY THE PRESCRIBED ABOVE APPLICABLE DOCUMENTS ARE LIABLE TO BE SUMMARILY REJECTED.
3. For Sl. No.11 to 21 above,- the applicable formats are available in "Volume ID of Volume I Book-II – Forms and Procedures" and Part-II Volume IA of Volume I Book I of this tender specification.

DATE:

AUTHORISED SIGNATORY
(With Name, Designation and Company seal)

Annexure 3

PRE QUALIFICATION CRITERIA – Technical

B. Technical PQR

Bidder should have executed the following (B.1 and B.2) in the last seven years from the latest date of bid submission:

B.1 Bidder should have executed "similar works" for any one of the following (clause B.1.1 or B.1.2 or B.1.3) in the last seven years from the latest date of bid submission.

B.1.1 One (1) work of value not less than **Rs. 18.96 crore**.

(OR)

B.1.2 Two (2) works each of value not less than **Rs. 11.85 crore**.

(OR)

B.1.3 Three (3) works each of value not less than **Rs. 9.48 crore**.

Notes for B.1.1 to B.1.3

- "Similar works'' Means 'Piling' or 'civil' or 'structure' or 'civil & structural works' or 'RCC chimney' or 'RCC cooling tower' or 'RCC silo' or 'Mill bunker' or 'any combination of these'.
- The Value of work is to be updated with indices for "All India Avg. Consumer Price index for industrial workers" and "Monthly Whole Sale Price Index for All Commodities" with base month as per last month of work execution and indexed up to three (3) months prior to the month of latest due date of bid submission.

  $P = R + \{0.425 \times R \times (XN-X0)/X0\} + \{0.425 \times R \times (YN-Y0)/Y0\}$

  Where P= Updated value of work

  R= Value of executed work

  XN= All India Avg. Consumer Price index for industrial workers for the month, three months prior to the month of latest date of bid submission (eg. If latest bid submission date is 03-Apr-17, then bid submission month shall be reckoned as April '17 and index for Jan '17 shall be considered).

  X0= All India Avg. Consumer Price index for industrial workers for last month of work execution.

  YN= Monthly Whole Sale Price Index for All Commodities for the month, three months prior to the month of latest date of bid submission (eg. If latest bid submission date is 03-Apr-17, then bid submission month

shall be reckoned as April '17 and index for Jan '17 shall be considered).

Y0= Monthly Whole Sale Price Index for All Commodities for last month of work execution.

AND

B.2 Bidder should have executed the following (clause B.2.1 and clause B.2.2) in the last seven years from the latest date of bid submission.

B.2.1 <u>RCC WORKS</u>

B.2.1.1 Executed at least **3,450 CUM** RCC quantities within a period of twelve consecutive months in one running/ completed contract.

(OR)

B.2.1.2 Executed at least **5,180 CUM** RCC quantities within a common period of twelve consecutive months in cumulative of two running/ completed contracts

Notes to clause B1 and B2

1. The term "Executed" in clauses PQR B.1 & B.2 above means, the bidder should have achieved the criteria specified even if the contract has not been completed or closed.

2. Consortium bid is not allowed for this Tender. However, for the purpose of qualification, after successful execution of one similar works with a consortium partner under direct orders of BHEL, the prime bidder shall be eligible for becoming a standalone bidder for works similar to that for which consortium partner was engaged.

ANNEXURE - 4

Additional Format to be submitted by Bidders separately as "Annexure to Pre-Qualifying Criteria".

Non submission of this additional format will make the bid liable for rejection

Name of the Bidder: M/s.....

Sl. No.	PQR Ref	PQR (Reproduced from Annexure – 1)	Qualifying Experience	Work order Ref with page no in Offer for supporting documents	Completion certificate ref for the referred Work with page no in Offer for supporting documents	Details of work with Project, Unit, Quantity / rating & Period	Remarks
1	**Technical B.1**	Bidder should have executed "similar works" for any one of the following (clause B.1.1 or B.1.2 or B.1.3) in the last seven years from the latest date of bid submission. B.1.1 One (1) work of value not less than **Rs. 18.96 crore**. (OR) B.1.2 Two (2) works each of value not less than **Rs. 11.85 crore**. (OR)					

		B.1.3 Three (3) works each of value not less than **Rs. 9.48 crore**. **Note:** "Similar works'' Means 'Piling' or 'civil' or 'structure' or 'civil & structural works' or 'RCC chimney' or 'RCC cooling tower' or 'RCC silo' or 'Mill bunker' or 'any combination of these'.					
	Technical B.2 B.2.1	Bidder should have executed the following (clause B.2.1 and clause B.2.2) in the last seven years from the latest date of bid submission. <u>RCC WORKS</u> B.2.1.1 Executed at least **3,450 CUM** RCC quantities within a period of twelve consecutive months in one running/ completed contract. (OR) B.2.1.2 Executed at least **5,180 CUM** RCC quantities within a common period of twelve consecutive months in cumulative of two running/ completed contracts					
2	**<u>Financial</u>** **C-1**	TURNOVER Bidders must have achieved an average annual financial turnover (Audited) of **Rs. 7,11,00,000/- (Rs. Seven Crore and Eleven**					

		Lakh only) or more over last three Financial Years (FY) i.e 2016-17, 2017-18 and 2018-19.					
3	**Financial C-2**	NETWORTH (only in case of Companies) Net worth of the Bidder based on the latest Audited Accounts as furnished for 'C-1' above should be positive					
4	**Financial C-3**	PROFIT Bidder must have earned profit in any one of the three Financial Years as applicable in the last three Financial Years defined in 'C-1 above based on latest Audited Accounts.					
	C-4	Bidder must not be under Bankruptcy Code Proceedings (IBC) by NCLT or under liquidation / BIFR, which will render him illegible for participation in this tender, and shall submit undertaking to this effect.					

Note:

BIDDER SHALL SUBMIT PRE-QUALIFICATION CRITERIA FORMAT (Refer Annexure-4), DULY FILLED-IN, SPECIFYING RESPECTIVE ANNEXURE NUMBER AGAINST EACH CRITERIA AND FURNISH RELEVANT DOCUMENT INCLUSIVE OF WORK ORDER AND WORK COMPLETION CERTIFICATE ETC. IN THE RESPECTIVE ANNEXURES IN THEIR OFFER.

ANNEXURE-5

Tender Schedule

Description	Schedule	Remarks
Technical Bid Opening	As mentioned in Notice Inviting Tender.	
Communication from BHEL for Clarifications, if any, required by BHEL	On or before fifth day of tender opening	
Last date for Bidders to submit the clarifications / documents required	On or before tenth day of tender opening	Bidders to note that their competent representative to be readily available in this week for offering clarifications / submitting the further documents, if any, required.
Price Bid Opening	Twenty first day of tender opening	Exact date and time of price bid opening shall be informed to the bidders

Note:

1. Bidders to note that the above schedule should be adhered to and no further extension will be given. To adhere to the schedule indicated below, Bidders should ensure the adequacy of the documents submitted in their offer, with proper validation.

Annexure 6

VOID

VOLUME – IA
Part I & II

TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED

CONTENTS

VOLUME-IA PART-I CHAPTER-I
PROJECT INFORMATION

5 x 800 MW Yadadri Thermal power station is being set up by **TELANGANA STATE GENERATION CORPORATION** at a site in Veerlapalem village, Dameracherla Mandal, NALGONDA DISTRICT, TELANGANA STATE, India. The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on BHEL/Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder.

A. PROJECT INFORMATION

1	Name of the Project	YADADRI Thermal Power Station
2	Station Capacity	5X800 MW (Coal based)
3	Owner	Telangana State Power Generation Corporation Limited (TSGENCO)
4	Site Location	Site is located 7 km from the SH 2 Miryalaguda - Vadapalle Highway.
5	Latitude	*16° 42'*20.40 N
6	Longitude	79° 34'41.56 E
7	Nearest Town	30 Km Miryalaguda
8	Nearest Railway Station	6.5 Km Damercherla
9	Nearest Airport	130 Kms (Vijayawada)
10	Site Conditions	
	Ambient Temperature	
	Daily minimum (average)	10°C
	Daily maximum (average)	47°C
	Design Ambient Temperature	50°C
	Ambient temperature (performance)	38°C
	Relative Humidity for design / efficiency	48-84 %
	Annual rainfall, mm	600 mm
	Plant Elevation above MSL	85 m above MSL
	Mean Wind Speed	8 km/h
	Wind Pressure	As per the latest revision of IS 875/1987
	Seismic co-efficient	Zone-II as per IS- 1893 (Part-IV)

VOLUME-IA PART-I CHAPTER-II
SCOPE OF WORKS

1.2.1 The scope of works covers Civil, Structural & Architectural works of 400 kV Switch Yard and Control Room of all units (i.e Unit 1 to 5) of 5 x 800MW Yadadri TPS as mentioned below, including supply of all materials (excluding free issue materials mentioned in clause 1.2.2), labour, tools and plants. The scope of work is indicative but not limited to the given below.

1.2.2 Free issue Materials by BHEL for incorporation in the permanent work are Cement, Reinforcement steel, MS round for Earthing, Structural steel for structural works (as specified in BOQ), structural steel for embedment / inserts from the scraps generated (if available) and foundation bolts & inserts / embedment supplied by manufacturing units of BHEL.

The list of structures and buildings are mentioned below.

AREAS OF WORK

1. Control room building
2. Tower Foundations
3. Equipment Foundations, Transformer Foundations
4. Reactor Foundation including rail cum road
5. Cable trenches including precast covers & cable trench crossings
6. Fencing and gates
7. Stone spreading including anti weed treatment
8. Roads & Drains
9. Fire Trenches

Note: The above provided list is indicative only for the bidder's guideline. **Any other building / structure / foundation not mentioned above, but required for completion of the work in total, deemed to have been included in the bidder's scope under this contract.** Such work will be executed under this contract by bidder as per the direction of Engineer in charge. If any item of work not available in the rate schedule of this contract, the rate will be fixed in line with clause 2.15.7 of GCC.

Cement & Reinforcement steel for civil works & MS round for below ground earthing shall be provided by BHEL free of cost only for incorporation in the permanent work. Embedments /inserts required for the works in general shall be supplied by the bidder and payment shall be made as per corresponding item in BOQ. If BHEL provides Structural Steel for embedments/inserts from scraps (if available), payment shall be made as per corresponding item in BOQ.

1.2.3 The works to be performed under this contract consist of providing all labour, supervision, material, scaffolding, construction equipment's, tools and plants, temporary works, supplies including POL (Petroleum, oil & lubricants), 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

1.2.4 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. No separate payment for these operations shall be made. The cost of all these operations shall be deemed to have been included in the unit rates rendered for the different items under bill of quantities.

1.2.5 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.

1.2.6 The unit rates shall include all material equipment, fixtures, labour construction plant, temporary works and everything whether of permanent or temporary nature necessary for the completion of job in all respects.

1.2.7 The unit rates for various items of B.O.Q shall include all the stipulations mentioned in technical specifications and nothing extra over B.O.Q rates shall be payable

1.2.8 Drawings showing enough details for the construction as per the specification shall be furnished to the contractor in a phased manner

1.2.9 The bidder should fully apprise himself of the prevailing conditions at the proposed site, climatic conditions including monsoon pattern, local conditions, soil strata and site specific parameters and shall include for all such conditions and contingent measures in the bid, including those which may have not been specifically brought out in the specifications.

Note to Chapter-II

FOR FURTHER DETAILED SCOPE OF WORKS REFER RELEVANT CHAPTERS IN THIS BOOK.

VOLUME-IA PART-I CHAPTER-III

FACILITIES & CONSUMABLES IN THE SCOPE OF CONTRACTOR / BHEL (SCOPE MATRIX)

Sl.No.	Description	Scope to be taken care by		Remarks
	PART I	BHEL	Bidder	
1.3.1				
1.3.1.1.0	**ESTABLISHMENT**			
1.3.1.1.1	FOR CONSTRUCTION PURPOSE:			
1.3.1.1.1.1	Open space for office	Yes		Free of charges as provided by TSGENCO
1.3.1.1.1.2	Open space for storage	Yes		Free of charges as provided by TSGENCO
1.3.1.1.1.3	Construction of bidder's office, canteen and storage building, cement storage shed including supply of materials and other services		Yes	At bidder's own cost
1.3.1.1.1.4	Bidder's all office equipments, office / store / canteen consumables		Yes	At bidder's own cost
1.3.1.1.1.5	Canteen facilities for the bidder's staff, supervisors and engineers etc		Yes	At bidder's own cost
1.3.1.1.1.6	Firefighting equipments like buckets, extinguishers etc		Yes	At bidder's own cost
1.3.1.1.1.7	Fencing of storage area, office, canteen etc of the bidder		Yes	At bidder's own cost
1.3.1.1.2	FOR LIVING PURPOSES OF THE SUCCESSFUL BIDDER'S PERSONNEL			
1.3.1.1.2.1	Open space	Yes		Free of charges as provided by TSGENCO
1.3.1.1.2.2	Living accommodation		Yes	At bidder's own cost

Sl.No.	Description PART I	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.1.2.0	**ELECTRICITY**			
1.3.1.2.1	Electricity for construction purposes	Yes		Free of charges as provided by TSGENCO
1.3.1.2.1.1	Single point source (In general) For detail, refer clause no. 1.3.4.1	Yes		
1.3.1.2.1.2	Further distribution for the work to be done which include supply of materials and execution		Yes	At bidder's own cost
1.3.1.2.2	Electricity for the office, stores, canteen, labour colony, etc of the bidder which include:		Yes	At bidder's own cost
1.3.1.2.2.1	Distribution from single point including supply of materials and service		Yes	At bidder's own cost
1.3.1.2.2.2	Supply, installation and connection of material of energy meter including operation and maintenance		Yes	At bidder's own cost
1.3.1.2.2.3	Duties and deposits including statutory clearances for the above		Yes	At bidder's own cost
1.3.1.2.2.4	Demobilization of the facilities after completion of works		Yes	At bidder's own cost
1.3.1.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc. on the above lines		Yes	
1.3.1.3.0	**WATER SUPPLY**			
1.3.1.3.1	For construction purposes:	Yes		Free of charges as provided by TSGENCO
1.3.1.3.1.1	Making the water available at single point	Yes		As provided by TSGENCO
1.3.1.3.1.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	At bidder's own cost
1.3.1.3.2	Water supply for bidder's office, stores, canteen, labour colony, etc.		Yes	At bidder's own cost

Sl.No.	Description PART I	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.1.3.2.1	Making the water available at single point		Yes	At bidder's own cost
1.3.1.3.2.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	At bidder's own cost
1.3.1.4.0	**LIGHTING**			
1.3.1.4.1	For construction work (supply of all the necessary materials) - At office storage area - At the preassembly area - At the construction site /area		Yes	At bidder's own cost
1.3.1.4.2	For construction work (Execution of the lighting work / arrangements) - At office storage area - At the preassembly area - At the construction site /area - At the labour hutment		Yes	At bidder's own cost
1.3.1.5.0	**COMMUNICATION FACILITIES for site operations of the bidder**	**-**		
1.3.1.5.1	Telephone, Fax, internet, intranet, email etc.		Yes	At bidder's own cost

Sl.No.	Description PART II	Scope to be taken care by		Remarks
		BHEL	Bidder	
	CONSTRUCTION FACILITIES			
1.3.2.1.0	**Engineering works for construction**			
1.3.2.1.1	Providing the construction drawings for all the equipment covered under this scope	Yes		Progressively
1.3.2.1.2	Detailing of drawings for construction		Yes	In consultation with BHEL

Sl.No.	Description PART II	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.2.1.3	As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site- example - routing of small bore pipes	Yes	Yes	In consultation with BHEL
1.3.2.1.4	Shipping lists etc for reference and planning the activities	Yes	Yes	In consultation with BHEL
1.3.2.1.5	Preparation of site construction schedules and other input requirements		Yes	In consultation with BHEL, as per requirement of BHEL targets
1.3.2.1.6	Review of performance (Form-14) and revision of site construction schedules in order to achieve the end dates and other commitments		Yes	
1.3.2.1.7	Weekly construction schedules based on Sl. No. 1.3.2.1.5		Yes	
1.3.2.1.8	Daily construction / work plan based on Sl. No. 1.3.2.1.7		Yes	For daily monitoring meeting at site
1.3.2.1.9	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	At bidder's own cost
1.3.2.1.10	Preparation of preassembly bay, if any required		Yes	At bidder's own cost
1.3.2.1.11	Laying of racks for gantry crane if provided by BHEL or brought by the contractor / bidder himself			**Not applicable**

1.3.3 **OPEN SPACE**

Open space, as provided by TSGENCO, will be provided to the bidder free of cost. Availability of land within plant boundary is very limited and the contractor has to plan and use the existing land considering the use of land by other Civil /mechanical/ electrical contractors and the storage of plant machineries and materials. The existing land shall be shared by all erections agencies. Land will be allocated with certain time frame and to the extent available/ considered necessary, and will be reviewed by BHEL depending upon the area availability. Area within plant premises for batching

plant, office, storage area etc. for construction purpose shall be provided as per availability free of cost. The contractor will be responsible for handing back all lands, as handed over to him by BHEL.

Land for labour colony shall be provided by BHEL approximately nearer to site (outside plant premises) free of cost as provided by TSGENCO. The contractor has to construct labour colony as per the technical specification No.PSSR/PMX/CVL/Labour colony/01, latest revision enclosed along with this tender at his own cost. The contractor shall provide adequate water arrangement for drinking/washing/bathing with required toilets, drainage system, and electrification etc. in labour colony at his own cost. Suitable paved area to be provided in the labour colony at the cost of contractor.

1.3.4 **ELECTRICITY**

1.3.4.1 In general, Construction power will be provided to the contractor free of cost at one single point within the plant area by BHEL as provided by TSGENCO. However, based on request of Contractor and requirement of project, BHEL Site in charge, at his discretion, may provide construction power at multiple point (as close to work area as possible), free of cost, for smooth execution of the work at site. If, BHEL provides electricity at more than one point (as close to work area as possible), it will be responsibility of the contractor to provide all the support necessary for enabling BHEL for extending such provision to contractor. The contractor has to Provide necessary meter for measuring the power consumption. The contractor shall make his own arrangement for further distribution with necessary isolator/LCB etc.

1.3.4.2 Necessary “Capacitor Banks” to improve the Power factor to a minimum of 0.9 shall be provided by the contractor at his cost. Penalty if any levied by customer on this account will be recovered from contractor’s bills.

1.3.4.3 Any duty, deposit involved in getting the Electricity shall be borne by the bidder. As regards contractor’s office shed also all such expenditure shall be borne by the contractor.

1.3.4.4 Provision for distribution of electrical power from the given single central common point to the required places with proper distribution boards, approved cables and cable laying including supply of all materials like cables, switch boards, pipes etc., observing the safety rules laid down by electrical authority of the State / BHEL / their customer with appropriate statutory requirements shall be the responsibility of the tenderer / contractor.

1.3.4.5 BHEL is not responsible for any loss or damage to the contractor’s equipment as a result of variations in voltage / frequency or interruptions in power supply.

1.3.4.6 Contractor has to make their own arrangements for electricity requirement for labour colony at his own cost.

1.3.4.7 As there are bound to be interruptions in regular power supply, power cut/ load shedding in any construction sites, contractor should make his own arrangement for alternative source of power supply through deployment of adequate number of DG sets at their cost during the power breakdown / failure to get urgent and important work to go on without interruptions. No separate payment shall be made for this contingency.

1.3.5 **WATER**

1.3.5.1 Water (Raw water) required for construction purposes will be provided at one single point within the plant area free of cost as provided by TSGENCO. The required pumps & accessories, pipes for drawing water from the given point and further distribution will be arranged by the contractor at their cost to go on without interruptions.

1.3.5.2 In case of non-availability of water, the contractor shall make his own arrangements of **water suitable for construction purpose** to have uninterrupted work. No separate payment shall be made for any contingency arrangement made by contractor, due to delay / failure for providing water supply.

1.3.6 **MATERIAL SUPPLY**

1.3.6.1 Supply / providing aggregate, sand (river sand only) and all other materials required (excluding Free issue Materials by BHEL mentioned in clause 1.2.2) for the work are in the scope of the contractor. Embedments /inserts required for the works in general shall be supplied by the bidder and payment shall be made as per corresponding item in BOQ. If BHEL provides Structural Steel from scraps (if available), payment shall be made as per corresponding item in BOQ.

1.3.6.1.1 Regarding supply of cement, the cement shall be provided normally in bulkers and shall be unloaded in the silos (2 Nos minimum 100MT each per 30 Cum/hr batching plant) to be installed by the bidder nearer to their batching plants. This is only minimum requirement and the number of cement silos shall be increased based on the site requirement. Making arrangement for unloading of cement into the silo and provision of necessary manpower support is in the scope of successful bidder within the quoted price. On advance request of the bidder, the cement shall be supplied in Bags for other than RCC works like masonry, flooring works etc. Advance request for supply of cement in bags shall be minimum two months. Provision of necessary storage arrangement for cement received in bags is in the scope of successful bidder within the quoted price.

1.3.6.1.2 The steel material will be issued from BHEL stores, within the plant premises. Collection and transporting to the place of work is in contractor's scope without any extra cost to BHEL. The steel will be issued to the agency in standard lengths. In some instances, for 8mm, 10mm &12mm dia reinforcement steel will be supplied in coil form. No extra claims will be entertained against issue of Non-standard lengths of steel and de coiling of 8mm, 10mm &12mm dia. steel.

1.3.6.1.3 If any matching sections of steel are not available with BHEL, contractor may arrange these sections on certification of BHEL and the landing cost of sections

to site will be reimbursed based on the prevailing rate at SAIL at the time of procurement at the nearest SAIL outlet with the freight charges against supporting document.

1.3.7 **CONSUMABLES**

All consumables, like gas, electrodes, chemicals, lubricants etc. required for the scope of work, shall be arranged by the contractor at his own cost unless otherwise specifically mentioned in the contract. Prior approval from Engineer In-Charge shall be obtained for all the consumable to be used in permanent work.

In the event of failure of contractor to bring necessary and sufficient consumables, BHEL may arrange for the same at the risk and cost of the contractor. The entire cost towards this along-with overhead shall be paid by the contractor or deducted from the contractor's bills.

1.3.8 **LIGHTING FACILITY**

Adequate lighting facilities such as flood lamps, hand lamps and area lighting shall be arranged by the contractor at the site of construction, and contractor's material storage area etc. at his own cost.

1.3.9 **BLASTING**

1.3.9.1 Contractor should produce documentary evidence of valid blasting license for Telangana State (or) should produce documents for having tie-up with agency who is possessing valid blasting license for Telangana State within 30 days from issue of LOI.

1.3.9.2 For details on Blasting refer enclosed Bill of quantity (rate schedule) & Volume-IA Part-II Technical Specification.

1.3.10 **DEWATERING**

Contractor shall ensure at all times that his work area & approach/ access roads are free from accumulation of water, so that the materials are safe and the erection/ progress schedule are not affected. No separate claim in this regard shall be admitted by BHEL. No separate payments for dewatering of subsoil, surface water or catchments water, if required, at any time during execution of the work including monsoon period shall be considered by BHEL.

1.3.11 **CONTRACTOR'S OBLIGATION ON COMPLETION**

On completion of work, all the temporary buildings, structures, pipe lines, cables etc. shall be dismantled and leveled and debris shall be removed as per instructions of BHEL by the contractor at his own cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final

1.3.12 **BID DRAWINGS**

Bid drawings enclosed for information and this may get revised during execution.

VOLUME-IA PART-I CHAPTER-IV
T&Ps TO BE DEPLOYED BY CONTRACTOR

1.4.1 All the tools and plants required for satisfactory completion of the work have to be arranged by the contractor.

1.4.2 The contractor is required to arrange the following tentative Major T&Ps and other T&Ps for the satisfactory completion of the work

Sr No	T&P items	Mobilizing time from the date of start of work
A.	**Major T&P items**	
A. 1	1 No. Poclain CK90 or equivalent excavator	Within 45 days
A. 2	1 No. automatic concrete batching plant with printing facility (30 Cum/Hr) - and DG backup. With minimum 2 Nos of silo (100MT each)	To be commissioned within 45 days
A. 3	1 No. Truck mounted concrete mixer cum pump along with placing boom minimum 36 m high Concrete boom placer (36m)	As per BHEL requirement at site
A. 4	1 No. concrete pump (60 cum/ hr min capacity & lift 90M)	Within 45 days
A. 5	3 Nos. transit mixer (5/6 M3 capacity) with standby 1 no.	2 no's within 40 days. Balance progressively as per site requirement.
B.	**Other T&P items**	
B. 1	1 Nos. back hoe loader like JCB	Within 30 days
B. 2	2 Nos. dumper (Min 15 cum each)	Within 20 days.
B. 3	1 No. diesel Mixer machine of 0.5 cum capacity	As per BHEL requirement at site.
B. 4	2 Nos. self-priming dewatering pump 5 HP (diesel)	Within 20 days.
B. 5	2 Nos. self-priming dewatering pump 5 HP (electric)	Within 30 days

Sr No	T&P items	Mobilizing time from the date of start of work
	Other T&P items	
B. 6	2 Nos. curing pump – 1.5 /2 HP (pump for curing at heights)	Within 60 days.
B. 7	2 Nos. reinforcement bending machine	Within 20 days
B. 8	1 No. Vibromax (earth compactor)	As per BHEL requirement at site
B. 9	2 Nos. reinforcement cutting machine	Within 20 days
B. 10	Vacuum dewatered flooring machine - 1 No.	As per BHEL requirement at site
B. 11	MS scaffolding pipe / ACROW PIPE	As per BHEL requirement at site
B. 12	MS scaffolding pipe cup lock system /Doka D3 load bearing tower system.	As per BHEL requirement at site for various decks
B. 13	1 No. power driven earth rammer (Roller Type 1/2 T)	As per BHEL requirement at site
B. 14	Civil laboratory equipment's as per list in Sl 1.4.6 with temporary building one AC lab size 4.5mtrx6mtr and 1 non AC lab 4.5 mtrx4.5 mtr.	Within 55 days.
B. 15	1 No. building hoist	As per BHEL requirement at site
B. 16	1 No. Total Station with adequate arrangement for Surveyors.	Within 15 days
B. 17	1 No theodolite 1 second accuracy	within 15 days
B. 18	2 Nos. auto level & staff + 1 No. as required	2 Nos. within 15 days and balance as per requirement.
B. 19	120 no's concrete cube moulds	As per BHEL requirement at site

Sr No	T&P items	Mobilizing time from the date of start of work
B. 20	Adequate number of small trucks 2T/5T for shifting of reinforcement/cement/shuttering etc. within site	As per BHEL requirement at site
B. 21	1 No. drinking water tank – 5000 lit.	Within 30 days
B. 22	1No. mobile toilet block for labour use.	Within 30 days
B. 23	1 No. truck mounted 125 KVA DG set	As per BHEL requirement at site
B. 24	Construction power cable	As per Requirement
B. 25	Construction water Pipeline	As per Requirement
B. 26	1 No. trailor for shifting of crawler mounted equipment's like Poclain, Dozer	As per site requirement.
B. 27	1 No. Motorized External Platform (sky climber)	As per site requirement.
B. 28	Concrete vibrator with adequate needle (Minimum 5 Nos. diesel/power nos.)	3nos. within 45 Days. Balance as per site requirement.
B. 29	Portable fire extinguishers as below: Soda acid – 4 sets. Dry chemical powder – 4 sets CO2 – 4 sets. Water & sand bucket (4 buckets in one stand) – 4 sets. Fire hose with nozzle (50 M length) – 1 set.	25% within 30 days and balance progressively within 90 days.
B. 30	1 No. compression testing machine (200 T cap)	Within 30 days

Note :

1) T&P shown in the above mentioned list and the mobilization schedule is tentative requirement considering parallel working. However, mobilization schedule modification as well as no. of T&Ps as mutually agreed at site for major T&Ps, have to be adhered to. Numbers/ time of requirement will be reviewed time to time at BHEL site and contractor will provide required T&P/ equipment's to ensure completion of entire work within schedule/target date of completion without any additional financial implication to BHEL. Vendor shall give advance intimation & certification regarding capacity etc. prior to dispatch of heavy equipment's. Also

on completion of the respective activity, demobilization of T&P in total or in part can be done with the due approval of engineer in charge. Retaining of the T&P's during the contract period will be mutually agreed in line with construction requirement.

2) All T&P and all IMTEs, which are required for successful and timely execution of the work covered within the scope of this tender, shall be arranged and provided by the contractor at his own cost in working condition

3) In the event of non-mobilisation of Tools, Plants, Machinery, Equipment, Material or non-availability of the same owing to breakdown and as a result progress of work suffered, BHEL reserves the right to make alternative arrangement (available or higher capacity) in line with SCC clause no. 4.2.1. 7 and hire charges shall be applicable as under:

   A. **BHEL provides its own Capital T&P:** If BHEL provides owned T&P then BHEL hire charges (as per BHEL norms), will be recovered from the contractor as per the prevailing BHEL Corporate hire charges applicable as per following cases:
      - In case the T&P is specifically listed in "T&Ps to be deployed by Contractor", 'Rates of hire charges applicable to outside agencies other than contractors working for BHEL' will apply.
      - In case the T&P is not specifically listed in "T&Ps to be deployed by Contractor", 'Rates of hire charges applicable to contractors working for BHEL' will apply.

      The hire charges of Capital Tools & Plants are exclusive of operating expenses e.g., Operator, fuel & Consumables and the same shall be arranged by the contractor at his cost.

   B. **BHEL provides hired T&P:** In all cases other than that specified in "A" above, actual expenses incurred by BHEL for arranging T&P along with applicable overheads will be back-charged to the contractor.

4) In the event of need of change of type of any of major T&Ps, approval shall be taken from BHEL Engineer in-charge prior to mobilization. The decision of Number of T&P required due to replacing the enlisted T&P as per above table, shall be taken after analyzing the production capacity and suitability of both the T&Ps.

5) Mobilization of concrete boom placer in place of concrete pump will be allowed based on site requirement of BHEL.

1.4.3 In addition to the above, any other tools and plants required for execution of the above work are in contractor's scope.

1.4.4 The Bidder shall establish and maintain a field laboratory on the site and this laboratory shall be available at all time for testing. Successful bidder shall submit scheme for lab arrangement within 7 days from date of commencement of work at site for approval of BHEL engineer in-charge.

1.4.5 The laboratory must have qualified technicians to carry out all tests and must be adequately equipped to ensure that all necessary testing work can be carried out in compliance with the standards.

1.4.6 Field and laboratory testing procedures for materials follow Indian Standard Specifications with necessary equipment like as given in table below:

Concrete Testing Equipment				
Sl No	**NAME OF TEST**	**NAME OF EQUIPMENT**	**SIZE OF EQIPMENT**	**IS REF.**
1	Initial & final setting time, Consistency of cement	Vicat Apparatus with desk pot	Standard	IS 5513
2	Shrinkage of cement, Auto Clave Test	Le Chatelier's appratus Auto Clave Equipment	Standard	IS 5514
3	Abrasion value test	Los Angles Abrasion testing machine	Standard	IS 2386
4	Aggregate Impact value test	Aggregate Impact value testing machine with blow counter	Standard	IS 9377
5	Aggregate crushing value test	Crushing value apparatus	Standard	IS 2386
6	Flakiness index	Thickness gauge for measuring flakiness index	Standard	IS 2386
7	Elongation Index	Elongation guage	Standard	IS 2386
8	Bulk density, voids and bulking apparatus	Measuring cylinders	3, 5,10 & 15 liters cylinders	
9	Workability of concrete	Slump cone	Standard, at least 04 no's	IS 456
10	Specific gravity of aggregates	Pycnometer	Standard, at least 02 no's	IS 383
11	Cement mortar cube vibrating	Motorised vibration machine for cement testing	Standard	IS 4031
12	Course aggregate Sieve analysis (Concrete & Road Works)	Sieve set	450mm dia GI Frames Size: 125 mm, 90 mm, 75 mm, 63 mm, 53 mm, 40 mm, 20 mm, 16 mm, 12.5 mm, 10	IS 383

Concrete Testing Equipment				
Sl No	**NAME OF TEST**	**NAME OF EQUIPMENT**	**SIZE OF EQIPMENT**	**IS REF.**
			mm, 4.75 mm, Pan and cover	
13	Fine aggregate sieve analysis	Sieve set	200 mm dia Brass sieves; Size 4.75 mm, 2.36 mm, 1.18 mm 600 micron, 300 micron, 150 micron, 75 micron, 75 micron, Pan and cover	IS 383
14	Sieve Shaker	Motorized Sieve shaker	Mfg. Catalogue	
15	Silt content check	Sand silt content beaker	Standard	

Soil Testing Equipment				
Sl No	**NAME OF TEST**	**NAME OF EQUIPMENT**	**SIZE OF EQIPMENT**	**IS REF.**
1	Liquid limit test	Liquid limit apparatus	Standard	IS 2720
2	Core Cutter test	core cutter apparatus	Rammer, 6 no's of std. core cutter mould, dolly	IS 2720
3	Proctor density test	Std proctor Compaction apparatus	Standard	IS 2720
4	Moisture Content	Rapid moisture meter	Standard, at least 04 no's	IS 2720

List of testing equipment mentioned in the table above is tentative and final requirement shall be as mutually agreed between successful bidder and BHEL Engineer In-Charge in compliance with requirement spelt in FQP (Field quality plan).

1.4.7 Contractor shall have at all times experienced operators and technicians for routine and breakdown maintenance of the equipment. Any delay in rectification of defects will warrant BHEL rectifying the defect and charging the cost to the contractor.

1.4.8 The area and infrastructure development of the work area are to be carried out by the customer. However, in construction projects of this magnitude it is possible that all the areas / approaches may not be ready. In such cases consolidation of ground and arrangement of sleepers / sand bag filling etc for safe operation / movement of

equipment including cranes / trailers etc shall be the responsibility of the contractor at his cost. No compensation on this account shall be payable.

1.4.9 In general, any crane for the tendered scope will not be provided by BHEL. However, if requirement of crane of higher capacity arises for any unforeseen circumstance (i.e. more than 150MT), bidder may request BHEL to provide crane on chargeable basis but BHEL reserves right of provision of crane. If provided, in that case, Crane operators deployed by the contractor shall be tested by BHEL before they are allowed to operate the cranes.

1.4.10 The age of the contractor deployed cranes upto 150 T should be within 15 years as on date of deployment. Contractor has to provide documentary proof for the age of the crane at the time of deployment to the BHEL Engineer.

1.4.11 In case, cement is issued through bulkers being supplied from manufacturer /stockiest, the same shall be emptied in cement silos of batching plant and necessary assistance shall be provided by contractor without any additional financial implication to BHEL. Contractor to note that batching plant being established at site shall have cement silos of 100 MT capacities (minimum 2 nos.) each as mentioned in clause 1.4.2.- list of Tools & Plants to be deployed by the contractor.

VOLUME-IA PART-I CHAPTER-V

T&Ps & MMEs TO BE DEPLOYED BY BHEL ON SHARING BASIS

1.5.1 BHEL shall not provide any T & Ps. However, if in any unforeseen circumstances, requirement of any T&Ps (available with BHEL at site) arises, on request of bidder the same may be provided on chargeable basis but BHEL reserves the right of provision of such T&Ps. Charges shall be applied as per BHEL norms and guidelines and direction of engineer in-charge.

VOLUME-IA PART-I CHAPTER-VI
TIME SCHEDULE

1.6.1 TIME SCHEDULE

1.6.1.1 The entire work of Civil, Structural and Architectural works as detailed in the Tender Specification shall be completed within **23 (Twenty-three) months** from the date of commencement of work

1.6.1.2 The date of commencement of work at site shall be mutually agreed date between successful bidder and BHEL site in-charge. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer. The decision of BHEL in this regard shall be final and binding on the contractor.

1.6.1.3 During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL and the program of milestone events. The work fronts for construction will get released progressively during the course of execution at site. The required documents / drawings for construction will be progressively issued to the contractor during the course of execution at site.

1.6.1.4 The contractor is required to refer "Form 15: Monthly Performance Evaluation of Contractor" for all the instructions to be taken immediately after receipt of LOI. Please note that the Monthly Performance Evaluation of Contractor Form -15 in the Vol 1D - Forms and Procedures is revised and attached in Part-2, Chapter-9.

1.6.2 COMMENCEMENT OF CONTRACT PERIOD

The date of commencement of contract period shall be the date of commencement of work at site which shall be shall be mutually agreed date between successful bidder and BHEL site in-charge. In case of discrepancy, the decision of BHEL Site Engineer is final.

1.6.3 CONTRACT PERIOD

The contract period for completion of entire work under scope shall be **23 (Twenty-three) months** from the "COMMENCEMENT OF CONTRACT PERIOD" as specified earlier

1.6.4 MOBILISATION

1.6.4.1 The Contractor has to subsequently augment his resources in such a manner to achieve the completion schedules.

1.6.5 CONSTRUCTION SCHEDULE

Tentative construction schedule for works is as mentioned below. Overall completion period for the completion of works and submission of final bill is 23 months.

Sl.No	Area	Completion from the date of commencement of work
1.	Control room foundation	Progressively by 5th Month
2.	Roof Slab of Control Room	Progressively by 12th Month
3.	Finishing works of control room	Progressively by 15th Month
4.	Tower Foundations of Priority Bays	Progressively by 7th month
5.	Balance Tower Foundations	Progressively by 15th month
6.	Equipment Foundations of Priority Bays	Progressively by 8th month
7.	Balance Equipment Foundations	Progressively by 19th month
8.	Reactor Foundation including rail cum road	Progressively by 20th month
9.	Cable trenches including precast covers & cable trench crossings	Progressively by 20th month
10.	Fencing and gates	Progressively by 17th month
11.	Stone spreading including anti weed treatment	Progressively by 22nd month
12.	Documentation, final reconciliation, final bill submission and contract closing	Progressively by 23rd month

Intermediate Milestones:
M1 and M2 shall be the intermediate milestones for this work:

Sl. No.	Description	Completion month from the date of commencement of work	Intermediate Milestone
1	Completion of Tower Foundations of Priority Bays	7th Month	M1
2	Completion of Roof Slab of Control Room	12th month	M2

Note: Please refer Sl No. 7 Part II Chapter-1 of Technical Conditions of Contract (Volume 1A of Volume I Book I) for Penalty for Intermediate Milestones

1.6.5.1 The above schedule is tentative. In case the project is to be advanced, the civil works in the scope of the contractor is to be advanced to meet the project requirement. No extra payment whatsoever shall be paid on this account.

1.6.5.2 The above schedule is for entire completion and handing over the structure/ building to BHEL. Date of commencement of work shall be as mutually agreed at site between successful bidder and BHEL site in-charge.

1.6.5.3 The foundations, pedestals, floors, etc., required for the mechanical equipment erection / structural erection shall be handed over to BHEL progressively within the scheduled period given in the above table, as per the BHEL site requirement.

1.6.5.4 The left out minor finishing works shall also be completed and handed over to BHEL within the contract period.

1.6.5.5 The above time allowed for completion of work including Sundays and Holidays is from the date of commencement of work. Detailed program to be prepared by the bidder taking in to consideration of the COMPLETION SCHEDULES / site decision on drawings flow (latest) and submitted for BHEL's approval.

1.6.5.6 In order to meet above schedule in general, and any other intermediate targets set, to meet customer / project schedule requirements, contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL.

1.6.6 SUBMISSION OF L3 SCHEDULE

1.6.6.1 The contractor shall submit a detailed area/structure wise L3 schedule within 15 days from date of issue of LOI, in consultation with BHEL based on the tentative schedule provided as per the clause 1.6.5. The detailed L3 schedule shall be approved by BHEL and same shall be implemented. Contractor shall submit L3 schedule in MS Projects (or any suitable format as agreed between contractor and BHEL Engineer in charge) to meet the agreed project schedule covering various mile stone activities and their split up details such as construction, procurement of materials, fabrication & erection activities, etc. This schedule shall also clearly indicate the interface facilities/inputs to be provided by BHEL/Customer and the dates by which such facilities/inputs are required. The schedule shall be acceptable to BHEL for meeting their mile stone targets/schedule.

1.6.7 The bidder must submit a detail schedule (area wise) for completion of work to meet civil work schedule given in CLAUSE 1.6.5 within 15 days from the date of issue of LOI. The major activities as mentioned against the work schedule given in clause No.1.6.5 are to be indicated in detailed schedule which shall be prepared by the bidder.

1.6.8 GUARANTEE PERIOD

Guarantee period of 12 months shall commence from the date of completion of the whole work certified by the BHEL Engineer.

VOLUME-IA PART-I CHAPTER-VII
TERMS OF PAYMENT

1.7.1 Secured Advance

Not Applicable

1.7.2 Advance for Mobilization

1.7.2.1 Interest bearing advance for Mobilization, limited to 5% of the contract value will be paid against submission of bank guarantee of at least 110% of the advance valid for the contract period, which will be recovered from the first running bill onwards. The advance for mobilization shall be paid as under.

1.7.2.1.1 2% of contract value after receipt of initial Security Deposit and additional security deposit as applicable if any, as per relevant clauses in the GCC/TCC along with unqualified acceptance of detailed letter of intent.

1.7.2.1.2 1.5% of contract value on completion of site Mobilization of Machinery & T&P as given below and on certification by site in-charge for compliance provided clause no. 1.7.2.1.1 as mentioned above is also complied with.

i) Poclain CK90 or equivalent excavator - 1 No.

ii) Concrete pump (60 cum/ hr min capacity & lift 90M) - 1 No.

iii) Dumper (Min 15 cum each) - 2 Nos.

Note: Concrete pump can be replaced by concrete boom placer with due approval of Engineer In- Charge

1.7.2.1.3 1.5% of contract value on completion of site Mobilization of Machinery & T&P as given below in addition to the above, and on certification by site in-charge for compliance.

i) Transit mixer (5/6 M3 capacity) - 3 Nos.

ii) 1 No. Automatic concrete batching plant with printing facility (30 Cum/Hr) and DG backup. With minimum 2 Nos. of silo (100MT each)

1.7.2.2 Payment of the advance as specified herein and recovery of the advance will be as per clause 2.13 of GCC and Sl. No. 9, Chapter-1, Part-II of Technical Conditions of Contract (Volume IA of Volume I Book I). Option of availing the interest bearing mobilization advance is left with the bidder.

1.7.3 Interim Payment

1.7.3.1 Interim bills in the form of monthly running bills prepared by the contractor in soft as well as Hard copies shall be based on the quantities executed and measured.

1.7.3.2 95% item rate shall be released after completion of works certification by Engineer in charge.

1.7.3.3 5% of the item rate shall be released after submission of the quality check formats as per the quality plan for the quantum of work billed and duly certified by engineer.

1.7.4 Royalty/seigniorage charges (if any) for excavation inside plant premises as applicable as per Govt of Telangana shall be reimbursable to the bidder by BHEL for the quantum of earth work done on submission of necessary proof of payments as required by M/s TSGENCO for reimbursement.

1.7.5 BHEL Site Engineer, at discretion, may operate the part rate of the items in line with GCC clause no. 2.23.1 (v). Payment for supply portion (subjected to approval of Engineer In-Charge) shall be made only after receipt of material at site.

1.7.6 Method of Measurement

Mode of measurement shall be as per relevant IS 1200 in conjunction of IS code 3385. In case the same is also not available, the standard procedure adopted in CPWD shall be adopted. In case, the same is also not available in CPWD, the measurement of the work done will be based on the mutual agreement between BHEL and contractor. In all the above cases, the interpretation of BHEL will be final and binding to the contractor. Measurement guidelines as a ready reference is also available in the technical specification.

NO CLAIM WHAT SO EVER MAY BE, WILL BE ENTERTAINED UNDER THIS CONTRACT, AFTER DULY SIGNING THE FINAL BILL ALONG WITH MEASUREMENT BOOKS AND ACCEPTED BY BHEL.

Note:

For PVC, ORC, RA Bill payment, compensation for Quantity variation, Retention amount and Performance Security Deposit, Please Refer Part-II, Chapter-1: Corrections / Revisions in Special Conditions of Contract, General Conditions of Contract and Forms & Procedures of Technical Conditions of Contract (Volume-I Book-I).

VOLUME-IA PART – I CHAPTER-VIII TAXES AND DUTIES

1.8.1 Goods and service Tax (GST) & Cess

1.8.1.1 The successful bidder shall furnish proof of GST registration with GSTN Portal in the State in which the Project is being executed, covering the services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by the successful bidder on BHEL for this project/ work.

1.8.1.2 Contractor's price/rates shall be exclusive of GST & Cess (if applicable) (herein after termed as GST). Contractor shall submit to BHEL the GST compliant tax invoice/debit note/revised tax invoice on the basis of which BHEL will claim the input tax credit in its return. Since this is a works contract, the applicable rate shall be @ 18% GST, as applicable presently.

1.8.1.3 Bidder shall note that the GST Tax Invoice complying with GST Invoice Rules wherein the 'Bill To' details will be as below:

BHEL GSTN : 363AAACB4146P1ZG

NAME : BHARAT HEAVY ELECTRICALS LIMITED

ADDRESS : BHEL- PSSR SITE OFFICE,
Yadadri Thermal Power Station, 5X800 MW (Coal based),
Veerlapalem village, Dameracherla Mandal,
Nalgonda District, Telangana State

1.8.1.4 GST charged in the tax invoice/debit note/revised tax invoice by the contractor shall be released separately to the contractor only after contractor files the outward supply details in GSTR-1 on GSTN portal and input tax credit of such invoice is matched with corresponding details of outward supply of the contractor and has paid the GST at the time of filing the monthly return.

1.8.1.5 In case BHEL has to incur any liability (like interest / penalty etc.) due to denial/reversal / delay of input tax credit in respect of the invoice submitted by the contractor, for the reasons attributable to the contractor, the same shall be recovered from the contractor.

1.8.1.6 Further, in case BHEL is deprived of the Input tax credit due to any reason attributable to contractor, the same shall not be paid or Recovered if already paid to the contractor.

1.8.1.7 Tax invoice/debit Note/revised tax invoice shall contain all such particulars as prescribed in GST law and comply to the timelines for issue of the same. Invoices shall be submitted on time to the concerned BHEL Engineer In Charge.

1.8.1.8 TDS under GST (if/ as & when applicable) shall be deducted at prevailing rates on gross invoice value from the running bills.

1.8.1.9 E-way bills / Transit passes / Road Permits, if required for materials / T&P etc., bought into the project site is to be arranged by the Contractor only.

1.8.1.10 BHEL shall not reimburse any amounts towards any interest / penalty etc., incurred by contractor. Any additional claim at a later date due to issues such as wrong rates / wrong classification by contractor shall not be paid by BHEL.

1.8.2 All taxes and duty other than GST & Cess

The contractor shall pay all (except the specific exclusion viz GST & Cess), taxes, fees, license charges, deposits, duties, tools, royalty, commissions, Stamp Duties, or other charges / levies, which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract and the same shall not be reimbursed by BHEL. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.

1.8.3 Statutory Variations

Statutory variations are applicable under the GST Acts, against production of proof. The changes implemented by the Central / State Government during the tenure of the contract viz. increase / decrease in the rate of taxes, applicability, etc. and its impact on upward revision / downward revision are to be suitably paid/ adjusted from the date of respective variation. The bidder shall give the benefit of downward revision in favour of BHEL. No other variations shall be allowed during the tenure of the contract.

1.8.4 New Taxes/Levies –

In case Government imposes any new levy / tax after submission of bid during the tenure of the contract, BHEL shall reimburse the same at actual on submission of documentary proof of payment subject to the satisfaction of BHEL that such new levy / tax is applicable to this contract.

1.8.5 Direct Tax

BHEL shall not be liable towards Income Tax of whatever nature including variations thereof arising out of this contract as well as tax liability of the bidder and their personnel. Deduction of tax at source at the prevailing rates shall be effected by BHEL before release of payment as a statutory obligation, unless exemption certificate is produced by the bidder. TDS certificate will be issued by BHEL as per the provisions of Income Tax Act.

VOLUME-IA PART-I CHAPTER-IX
BILL OF QUANTITY

1.9.1 Bill of Quantities

As mentioned in the Volume II, Price Bid.

VOLUME-IA PART-I CHAPTER-X GENERAL

The scope of the work will comprise of but not limited to the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

1.10.1 Contractors are requested to furnish the following documents at PSSR-HQ, Chennai immediately after release of Letter of Intent (LOI).

i) Security Deposit and additional Security Deposit.
ii) Unqualified Acceptance for Detailed LOI / Work Order.
iii) Rs.100/- Stamp Paper for preparation of Contract Agreement.
iv) Option (whether a or b of said clause) exercised towards Performance Security Deposit for the subject contract as per Sl. No. 16 of Volume IA Part II Chapter 1 of TCC.

1.10.2 Contractors are requested to furnish the proof of documents for the following at PSSR- Site

i) Provident Fund Registration Number.
ii) Labour License Number.
iii) Workmen Insurance Policy Number.

1.10.3 **In addition to the clause 2.8 of General Conditions of Contract (Volume-IC of Book-II) the contractor shall comply with the following.**

1.10.3.1 **BOCW Act & BOCW Welfare Cess Act**

1.10.3.1.1 The Contractor should Register their Establishment under BOCW Act 1996 read with rules 1998 by submitting Form I (Application for Registration of Establishment) and Form IV (Notice Of Commencement / Completion of Building Other Construction Work) to the respective Labour Authorities i.e.,

a) Assistant Labour Commissioner (Central) in respect of the project premises which is under the purview of Central Govt.–NTPC, NTPL etc.

b) Appropriate State authorities in respect of the project premises which is under the purview of State Govt.

1.10.3.1.2 The Contractor should comply with the provisions of BOCW Welfare Cess Act 1996 in respect of the work awarded to them by BHEL.

1.10.3.1.3 The contractor should ensure compliance regarding Registration of Building Workers as Beneficiaries, Hours of work, welfare measures and other conditions of service with particular reference to Safety and Health measures like Safety Officers, safety committee, issue of Personal protective equipments, canteen, rest room, drinking water, Toilets, ambulance, first aid centre etc.

1.10.3.1.4 The contractor irrespective of their nature of work and manpower (Civil, Mechanical, Electrical works etc) should register their establishment under BOCW Act 1996 and comply with BOCW Welfare Cess Act 1996.

1.10.3.1.5 Contractor shall make remittance of the BOCW cess as per the Act in consultation with BHEL as per the rates in force (presently 1%). BHEL shall reimburse the same upon production of documentary evidence. However, BHEL shall not reimburse the fee paid towards the registration of establishment, fees paid towards registration of Beneficiaries and contribution of Beneficiaries remitted.

1.10.3.1.6 Non-compliance to Provisions of the BOCW Act & BOCW Welfare Cess Act is not acceptable. In case of any non-compliance, BHEL reserves the right to withhold any sum as it deems fit. Only upon total compliance to the BOCW Act and also discharge of total payment of Cess under the BOCW Cess Act by the Contractor, BHEL shall consider refund of the Amounts

1.10.3.2 **PROVIDENT FUND**

1.10.3.2.1 The contractor is required to extent the benefit of Provident Fund to the labour employed by you in connection with this contract as per the Employees Provident Fund and Miscellaneous Provisions Act 1952. For due implementation of the same, you are hereby required to get yourself registered with the Provident Fund authorities for the purpose of reconciliation of PF dues and furnish to us the code number allotted to you by the Provident Fund authorities within one month from the date of issue of this letter of intent. In case you are exempted from such remittance an attested copy of authority for such exemption is to be furnished. Please note that in the event of your failure to comply with the provisions of said Act, if recoveries therefore are enforced from payments due to us by the customer or paid to statutory authorities by us, such amount will be recovered from payments due to you.

1.10.3.2.2 The final bill amount would be released only on production of clearance certificate from PF / ESI and labour authorities as applicable.

1.10.3.3 **OTHER STATUTORY REQUIREMENTS**

1.10.3.3.1 The Contractor shall submit a copy of Labour License obtained from the Licensing Officer (Form VI) u/r25 read with u/s 12 of Contract Labour (R&A) Act 1970 & rules and Valid WC Insurance copy or ESI Code (if applicable) and PF code no. along with the first running bill.

1.10.3.3.2 The contactor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r78(1)(a)(1) of Contract Labour Rules, copies of monthly return of PF contribution with remittance Challans under Employees Provident Fund Act 1952 and copy of renewed WC Insurance policy or copies of monthly return of ESI contribution with Challans under ESI Act 1948 (if applicable) in respect of the workmen engaged by them.

1.10.3.3.3 The Contractor should ensure compliance of Sec 21 of Contract Labour (R&A) Act 1970 regarding responsibility for payment of Wages. In case of "Non-compliance of Sec 21 or non-payment of wages" to the workmen before the expiry of wage period by the contactor, BHEL will reserve its right to pay the workmen under the orders of Appropriate authority at the risk and cost of the Contractor.

1.10.3.3.4 The Contractor shall submit copies of Final Settlement statement of disbursal of retrenchment benefits on retrenchment of each workmen under I D Act 1948, copies of Form 6-A (Annual Return of PF Contribution) along with copies of PF Contribution Card of each member under PF Act and copies of monthly return on ESI Contribution – Form 6 under ESI Act 1948 (if applicable) to BHEL along with the Final Bill.

1.10.3.3.5 In case of any dispute pending before the appropriate authority under ID Act 1948, WC Act 1923 or ESI Act 1948 and PF Act 1952, BHEL reserve the right to hold such amounts from the final bills of the Contractor which will be released on submission of proof of settlement of issues from the appropriate authority under the act.

1.10.3.3.6 In case of any dispute prolonged / pending before the authority for the reasons not attributable to the contractor, BHEL reserves the right to release the final bill of the contractor on submission of Indemnity bond by the contractor indemnifying BHEL against any claims that may arise at a later date without prejudice to the rights of BHEL.

1.10.3.4 DEPLOYMENT OF SKILLED / SEMI-SKILLED TRADESMEN

The following clause is applicable in case the contract value / contract price is Rs. Five crores and above.

The contractor shall, at all stages of work deploy skilled / semi-skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute / Industrial Training. Institute / National Institute of Construction Management and Research (NICMAR), National Academy of Construction, CIDC or any similar reputed and recognized Institute managed / certified by State / Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled / semi-skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 100 per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman

possesses requisite skill and amount of compensation in case of default shall be final and binding.

1.10.3.5 **RECOVERY OF COMPENSATION PAID TO VICTIMS BY BHEL IN CASES OF DEATH/ PERMANENT INCAPACITATION OF PERSON DUE TO AN ACCIDENT DURING THE WORKS**

BHEL shall recover the amount of compensation paid to victim(s) by BHEL towards loss of life / permanent disability due to an accident which is attributable to the negligence of contractor, agency or firm or any of its employees as detailed below.

a) Victim: Any person who suffers permanent disablement or dies in an accident as defined below.

b) Accident: Any death or permanent disability resulting solely and directly from any unintended and unforeseen injurious occurrence caused during the manufacturing / operation and works incidental thereto at BHEL factories/ offices and precincts thereof, project execution, erection and commissioning, services, repairs and maintenance, trouble shooting, serving, overhaul, renovation and retrofitting, trial operation, performance guarantee testing undertaken by the company or during any works /during working at BHEL Units/ Offices/ townships and premises/ Project Sites.

c) Compensation in respect of each of the victims:

In the event of death or permanent disability resulting from Loss of both limbs: Rs. 10,00,000/- (Rs. Ten Lakh)

In the event of other permanent disability: Rs. 7,00,000/- (Rs. Seven Lakh)

Permanent Disablement: A disablement that is classified as a permanent total disablement under the proviso to Section 2 (I) of the Employee's Compensation Act, 1923.

1.10.4 **GENERAL**

1.10.4.1 Site Visit by the Bidder

The bidder shall, prior to submitting his tender for the work, visit, examine and acquire full knowledge & information and necessary conditions prevailing at the site and its surroundings of the plant premises together with all statutory, obligatory, mandatory requirements of various authorities about the site of works at his own expense, and obtain and ascertain for himself on his own responsibility that may be for preparing his tender and entering into a contract, and take the same into account in the quoted contract price for the work.

1.10.4.2 The bidder shall satisfy themselves about the following factors:

i). Site conditions including access to the site, existing and required roads and other means of transport/communication for use by him in connection with the work including diverting and re-routing of services.

ii). Requirement and availability of land and other facilities of his enabling works, establishment of his nursery, office, stores etc.

iii). Ground conditions including those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained there-from.

iv). Source and extent of availability of suitable materials, including water etc., and labour (skilled and unskilled) required for work, and laws and regulations governing their use and employment.

v). Geological, meteorological, topographical and other general features of the site and its surroundings as are pertaining to and needed for the performance of the work.

vi). The limit and extent of surface and subsurface water to be encountered during the performance of the work, and the requirement of drainage and pumping.

vii). The type of equipment and facilities needed, for and in the performance of the work;

viii). The extent of lead and lift required for the work in complete form over the entire duration of the contract, and

ix). All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.

1.10.4.3 The bidder should note that information, if any, in regard to the local conditions, as contained in these tender documents, has been given to tenderer merely for guidance and is not warranted to be complete.

1.10.4.4 A bidder shall be deemed to have full knowledge of the site, whether he inspects it or not, and no extra charges consequent on any misunderstanding or otherwise shall be allowed.

1.10.4.5 The bidder and any of his personnel or agents will be granted permission by the Site-In-Charge or his authorized nominee, on receipt of formal application in respect thereof a week in advance of the proposed date of inspection of site, to enter upon his premises and lands for purpose of such inspection, but only on the express condition that the tenderer (and his personnel and agents) will relieve and indemnify the Employer (and his personnel and agents) from and against all liability in respect thereof and will be responsible for personal injury (whether fatal or otherwise), loss of or damage to property and any other loss, damage, costs and expenses however caused which, but for the exercise of such permission, would not have arisen.

1.10.4.6 The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, engineering and construction management. The contractor must have adequate quantity of tools, construction aids, equipments etc., in his possession. He must also have on his rolls adequate trained, qualified and experienced supervisory staff and skilled personnel.

1.10.4.7 It is not the intent to specify herein all details of all material. Any item related this work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the work.

1.10.4.8 All the necessary certificates and licenses required to carry out this scope of work are to be arranged by the contractor then and there at no extra cost.

1.10.4.9 Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations.

1.10.4.10 The contractor shall carry out additional tests, if any, which the Engineer feels necessary because of site conditions and also to meet system specification.

1.10.4.11 The work shall be executed under the usual conditions without affecting power plant construction / operation and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall co- operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

1.10.4.12 All the work shall be carried out as per instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.

1.10.4.13 Wherever Construction sequences are furnished by BHEL, the contractor shall follow the same sequence. Contractor shall execute the supply and works as per sequence prescribed by BHEL at site engineer. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of execution of similar job in any other site or for any reasons whatsoever.

1.10.4.14 If required by BHEL, the contractor shall change the sequence of his operation so that work on priority sectors can be completed within the projects schedule. The contractor shall afford maximum assistance to BHEL in this connection without causing delay to agreed completion date.

1.10.4.15 Contractor shall, transport all materials to site and unload at site / working area for inspection and checking. All material handling equipment required shall be arranged by the contractor.

1.10.4.16 Contractor shall retain all T&P / Testing instrument / Material handling equipment’s etc. at site as per advice of BHEL engineer and same shall be taken out from site only after getting the clearances from engineer in charge.

1.10.4.17 The contractor at his cost shall arrange necessary security measures for adequate protection of his machinery, equipment, tools, materials etc. BHEL shall not be responsible for any loss or damage to the contractor’s construction equipment and materials. The contractor may consult the Engineer-in-Charge on the arrangements made for general site security for protection of his machinery equipment tools etc.

1.10.4.18 The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances. However, completion time for construction, agreed will be subject to the condition that contractor's work is not hampered by the agencies.

1.10.4.19 Contractor has to work in close co-ordination with other agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less / more at a particular given time. Activities and Construction program have to be planned in such a way that the milestones are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.

1.10.4.20 The contractor must obtain the signature and permission of the security personnel of the customer / BHEL for bringing any of their materials inside the site premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside. Surplus materials including steel item brought at site by the contractors with proper documentation and Gate pass, shall be allowed to taken out of the project premises after completion of relevant works, on certification by BHEL in charge.

1.10.4.21 Contractor shall remove all scrap materials periodically generated from his working area and collect the same at one place earmarked for the same. Load of scraps is to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect.

1.10.4.22 The contractor shall ensure that his premises are always kept clean and tidy to the extent possible. Any untidiness noted on the part of the contractor shall be brought to the attention of the contractor's site representative who shall take immediate action to clean the surroundings to the satisfaction of the Engineer-in-Charge.

1.10.4.23 The contractor is strictly prohibited from using BHEL's regular components like angles, channels, beams, plates, pipe / tubes, and handrails etc. for any temporary supporting or scaffolding works. Contractor shall arrange himself all such materials. In case of such misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor.

1.10.4.24 No member of the already erected structure / buildings, other component and auxiliaries should be removed / modified without specific approval of BHEL engineer.

1.10.4.25 Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on latest ISO 9001 Standards.

1.10.4.26 Sometimes, it may be required to re-schedule the activities to enable other

agencies to commence/ continue the work so as to keep the overall project schedule.

1.10.4.27 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.

1.10.4.28 Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.

1.10.4.29 On Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

1.10.4.30 It is the responsibility of the contractor to do the checking, testing etc. if necessary, repeatedly to satisfy BHEL Engineer with all the necessary tools and tackles, manpower etc. without any extra cost. The testing will be completed only when jointly certified so, by the BHEL Engineer.

1.10.4.31 If any item not covered but requires being executed, same shall be carried out by the contractor. Equivalent or proportional unit rate shall be considered wherever possible from the BOQ. The rates quoted by the contractor shall be uniform as far as possible for similar items appearing in rate schedule.

1.10.4.32 The contractor's work shall not hinder other work, either underground or over ground, such as electrical, phone lines, water or sewage lines, etc. In areas of overlap, the contractor shall work in coordination with other related contractors. Any damage by the landscape contractor's team to such utilities will be penalized and contractor shall be responsible for cost for such damages.

1.10.4.33 The contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be effected for such excess drawls at the rate prescribed by manufacturing units.

1.10.4.34 Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer for other agencies, like Boiler, piping, Turbine, Generator erection, Cabling, instrumentation, insulation etc., to commence their work from / on the equipments coming under this scope.

1.10.4.35 For the purpose of planning, contractor shall furnish the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.

1.10.4.36 DOCUMENTATION

1.10.4.36.1 RECORDS TO BE MAINTAINED AT SITE:

1.10.4.36.1.1 Record of Quantity of FREE / Chargeable items issued by BHEL must be maintained during contract execution. Also reconciliation statement to be prepared at regular intervals.

1.10.4.36.1.2 The under mentioned Records/ Log-books/ Registers applicable to be maintained.

a) Hindrance Register.
b) Site Order Book.
c) Test Check of measurements.
d) Supply and Consumption Daily Register for Cement and Steel
e) Records of Test reports of Field tests.
f) Records of manufacture's test certificates.
g) Records of disposal of scraps generated during and after the work completion.
h) List of T&Ps & MMEs.

1.10.4.36.2 Other documents / records as specified in chapter XI -Progress of work in PART- I of Technical conditions of Contract Volume IA (Volume I Book I).

1.10.4.36.3 L3 schedule as specified in chapter VI – TIME SCHEDULE in PART- I of Technical conditions of Contract Volume IA (Volume I Book I).

1.10.4.37 SITE INSPECTION

1.10.4.37.1 The Owner or his authorized agents may inspect various stages of work during the currency of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the Owner or his authorized agents without any extra cost to the Owner or his authorized agents. No cost whatsoever such duplication of inspection of work be entertained.

1.10.4.37.2 BHEL / Owner will have full power and authority to inspect the works at any time, either on the site or at the contractor's premises. The contractor shall arrange every facility and assistance to carry out such inspection. On no account will the contractor be allowed to proceed with work of any type unless such work has been inspected and entries are made in the site inspection register by Owner / BHEL.

1.10.4.37.3 The contractor shall maintain at site a joint protocol for recording actual measurement of work carried out at site, inspection and witnessing of various tests conducted by the contractor.

1.10.4.37.4 Field Quality Assurance (FQA) Formats:-
It is the responsibility of the contractor to collect and fill up the relevant FQA log sheets of BHEL and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL and Owner as token of their acceptance. Payment to the contractor will be inked with the submission of these FQA log sheets.

1.10.4.37.5 Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations.

1.10.4.37.6 Contractor shall, transport all materials to site and unload at site / working area for inspection and checking. All material handling equipment required shall be arranged by the contractor.

VOLUME-IA PART – I CHAPTER – XI
PROGRESS OF WORK

The scope of the work will comprise of following but not limited to the following:

1.11.1 Refer forms F -14 and F-15 furnished in Volume 1A, Part II, Chapters 8 & 9 as well as to forms F-16, F-17, F-18 of volume I D (Forms & Procedure) of volume -I Book-II. Plan and review will be done as per the formats.

1.11.2 Contractor is required to draw mutually agreed monthly work programs in consultation with BHEL well in advance monthly as per the Form-14. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.

1.11.3 Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities.

1.11.4 The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, consumables (gases / electrodes/ferules/lugs) report, T & Ps availability report and other reports as per Performa considered necessary by BHEL Engineer as per the BHEL formats. The periodicity of the reports will be decided by BHEL Engineer at site.

1.11.5 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.

1.11.6 The monthly report as a booklet shall be submitted at the end of every month and shall contain the following details:-

a. Progress photographs in colour.
b. Work progress in terms of percentage of work completion as relevant to the respective work areas against planned. Construction progress in terms of quantity, CUM, etc., completed as relevant to the respective work areas against planned.
c. Site Organization chart of engineers & supervisors as on the last day of the month with further mobilization plan.
d. Category- wise man hours engaged during the previous month under the categories of bar benders, carpenters, mason, fitters, welders, riggers, khalasis, grinder-men, gas-cutters, electricians, crane operators, store keepers, lab technicians helpers, security etc. Data shall be split up under the work areas.

e. Consumables report giving consumption of all types of gases and electrodes during the previous month, as applicable.
f. Availability report of cranes / T & Ps / Equipments
g. Safety implementation report in the format.
h. Pending drawings / materials and any other inputs required from BHEL for activities planned during the subsequent month.

1.11.7 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.

1.11.8 During the course of construction, if the progress is found unsatisfactory, or if the target dates fixed from time to time for every milestone are to be advanced, or in the opinion of BHEL, if it is found that the skilled workmen like fitters, operators, technicians etc employed are not sufficient BHEL will induct required additional workmen to improve the progress and recover all charges incurred on this account including all expenses together with BHEL overheads from contractor's bills.

1.11.9 It is the responsibility of the contractor to provide all relevant information on a regular basis regarding progress of work, labour availability, equipment deployment, testing, etc.

1.11.10 The progress reports shall indicate the progress achieved against plan, indicating reasons for delays, if any. The report shall also give remedial actions which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original plan the slippages do not accumulate and affect the overall programme.

1.11.11 The contractor to reflect actual progress achieved during the month and will be submitted to BHEL, so that slippages can be observed and necessary action taken in order to ensure that the situation does not get out of control will update the construction schedule forming part of this contract each month.

VOLUME-IA PART-I CHAPTER-XII

MATERIAL HANDLING

The scope of the work will comprise of but not limited to the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

1.12.1 Open land as available shall be provided by BHEL on free of cost basis as provided by TSGENCO. Contractor shall maintain one centralized fenced store cum bar bending yard at his own cost. Hard surfacing of this yard and all round drain shall be carried out by the contractor at his own cost within the quoted rate. Batching plant area, shall be provided nearer plant premises and contractor shall make use of the area for installation and operation of the Batching Plant at his own cost. The bidder shall make complete arrangement of necessary security personnel, to safeguard all such materials in his custody at his own cost. Materials issued will be used only for construction of permanent work. The contractor shall take care of material issued by BHEL and shall protect the same from theft, damage and weathering at his own cost.

1.12.2 The system for receipt, storage & issue of materials shall be available with vendors for easy traceability.

1.12.3 Periodic audit of system of purchasing, storing and issue, etc. will have to be carried out by the vendors. BHEL will also audit the same.

1.12.4 The contractor shall construct waterproof cement store (capacity 400MT or as directed by engineer in-charge based on requirement at site) for initial period for storing and stacking of cement at his own cost, CGI/ asbestos roofing (slope) with brick masonry wall, PCC flooring. Materials required for the same shall be provided by contractor at his own cost. Cement has to be kept over wooden raised platform. Stacking of cement is to be done as per IS codes with proper illumination and locking arrangements.

1.12.5 The contractor shall in no case be entitled for any compensation or damages on account of any delay in supply or non-supply thereof for all or any such material.

1.12.6 Clotting of cement and excessive rusting of steel must be avoided. In case, due to any cause attributable to the contractor, rusting of steel for BHEL issued steel occur rendering the same unusable, then such quantity of cement steel shall be recovered from the interim payment at the penal rate specified in the tender.

1.12.7 The contractor shall maintain proper store account for all the BHEL issued materials and shall give three copies of computerized reconciliation statement of such account to the BHEL with each running bill.

1.12.8 All reinforcement steel shall be stacked over sleeper's diameter wise.

1.12.9 All TMT shall be stacked over sleeper's diameterwise.

1.12.10 Materials shall not under any circumstances taken out of the project site unless otherwise permitted by BHEL.

VOLUME-IA PART –I CHAPTER –XIII
ACCOUNTING OF MATERIALS ISSUE

1.13 ACCOUNTING OF MATERIALS ISSUE

The materials issued to the contractor by BHEL will be accounted as follows:

1.13.1 CEMENT

1.13.1.1 ISSUE OF CEMENT

1.13.1.1.1 Cement as received from the manufacturer/ stockiest will be issued **free of cost** to the contractor. The cement shall be provided normally in bulkers and shall be unloaded in the silos (2 Nos cement silo of 100MT per 30CUM/hr batching plant) to be installed by the bidder nearer to their batching plants. This is only minimum requirement and the No of cement silos shall be increased based on the site requirement. Unloading arrangements shall be provided by the bidder at his own cost including provision of necessary manpower support.

1.13.1.1.2 On advance request of the bidder, the cement shall be supplied in 50kg tamper proof sealed Bags for other than RCC works like masonry, flooring works etc. The theoretical weight of each bag of cement for issued purposes will be considered as 50 kg, the contractor shall be accountable for the cement issued to him on this notional weight only. No claim whatsoever will be entertained because of difference between theoretical and actual weight of the bags of cement. The empty cement bags duly accounted for against issue shall be in the custody of the contractor and the same shall be disposed by the contractor as per statutory regulation prevailing in the project. Proper storage area/ shed shall be constructed by successful bidder at his own cost.

1.13.1.1.3 The contractor shall submit to the engineer, a statement indicating estimated quantity of cement required during a quarter, at least two months in advance of the quarter. In addition, the contractor shall also furnish the estimated requirement of cement during a month by the third week of the previous month indicating his requirement.

1.13.1.1.4 Bidder is responsible for unloading the cement as soon as the arrival of cement, either in silo, if received in bulker or in the weather proof cement storage sheds, if received bags. Bagged cement shall be stored in a weatherproof sheds having dense impervious bituminous or concrete floors which shall be kept swept clean at all times. The storage arrangements (to be made by the contractor at his own cost) shall be fully completed and approved by the owner (BHEL/TSGENCO) before any cement is delivered to site. The construction of cement storage sheds as per the requirement of BHEL, unloading of cement bags, stacking properly in the storage sheds, removal of the sheds after the completion of the work is in the scope of bidder within the quoted price.

1.13.1.1.5 Bidder is responsible for sampling and testing of cement as per Indian Standard/Specification/approved quality plan in the testing laboratory established by the bidder.

1.13.1.1.6 Bidder is responsible for carrying out design mix as per IS 456/10262 Latest revision and specification, using the cement provided by BHEL and submit the design mix proportions for the approval of BHEL/TSGENCO. The design/trial mix shall be carried out time to time on change of brand/type of cement supplied by BHEL and suitable adjustments on the quantity of ingredients (sand, aggregates, admixture) of the concrete to get the required workability and durability, shall be the responsibility of the bidder without any extra cost to BHEL.

1.13.1.1.7 Following shall be limit for the maximum quantity of BHEL issue materials that would be with the contractor at any point of time when work is in progress (excluding what has already been incorporated in the works).

Sl. No.	ISSUE OF MATERIALS	MAX. QUANTITY IN CONTRACTOR'S STORE
1.	Cement	Requirement of one month

1.13.1.2 RETURN OF CEMENT

Sealed cement bags remaining unused and in perfectly good condition at the time of completion or termination of the contract shall be returned promptly, (within 15 days from assessment) if BHEL/ Engineer is satisfied of the physical condition of the cement. Return of such cement to the project stores/ place as identified within the project area by Engineer/ BHEL will not be entitled to handling and incidental charges. Surplus sealed and good conditioned cement bags will be taken back on weighment basis.

Cement once supplied at silo will not be taken back by BHEL. Bidder shall take care of the requirement of cement in the last phase of the work and order shall be given to BHEL judiciously for the balance works.

1.13.1.3 CEMENT CONSUMPTION AND WASTAGE

The theoretical consumption of cement shall be based on the following.

i. For design mix concrete as per approved design mix.
ii. For nominal mix concrete work, as per minimum cement as specified or as approved by Engineer-in-charge.

For item of works, where volume mix is permitted in writing by the BHEL, for masonry works, plaster other miscellaneous items, the cement consumption shall be governed by the "Statement of Cement Consumption" attached to the Delhi schedule of Rates of CPWD-DSR- LATEST REVISION unless otherwise specified in the specifications or the drawing of contract or mutually agreed by Engineer-in-charge and contractor.

Actual consumption= Issue – Surplus / unused quantity of cement returned in

good condition by contractor to store. (No sweep cement will be taken back by BHEL).

1.13.1.4 CEMENT WASTAGE

Allowable wastage: One and half percent (+1.5%) of theoretical consumption of cement unless specified otherwise in the technical specification.

For any material issued by BHEL to the contractor free of cost, and which is not accounted by the contractor to BHEL, then recovery for such material shall be effected at penal rates.

Sl No	Cement consumption	Basis of issue & penal recovery
C-1	Theoretical consumption (without considering any wastage or loss).	Free
C-2	Actual consumption being Limited to one and half percent (+1.5%) of aforesaid theoretical consumption towards allowable wastage.	Free
C-3	Actual consumption beyond one and half percent (+1.5%) of above (C-1).	Penal rate

1.13.2 STEEL MATERIAL

1.13.2.1 ISSUE OF STEEL

1.13.2.1.1 The steel shall be issued to the contractor on the following basis:

Sl. No.	Description	Basis
(a)	Structural Steel	Weighment basis (Unit – MT)
(b)	Reinforcement Steel and Earthing rod (MS round)	Weighment basis (Unit – MT)

1.13.2.1.2 All the steel (structural, reinforcement, earthing MS rod) issued by BHEL shall be properly accounted for. The total quantity of steel required for the work will be calculated from the approved Bar Bending schedule, fabrication drawings, approved laps, chairs and lugs. The measurement for payment as well as for accounting shall be based on the sectional weights as indicated in the following IS specifications. No rolling tolerances shall be accepted in any case for issue, return of materials, reconciliation and payment purposes.

IS: 808 (Latest revision) Beams, Channels and Angles
IS: 1730 (Latest revision) Plates, Sheets and Strips/Flats
IS: 1732 (Latest revision) Rounds including deformed high yield strength bars.
IS:1786 (Latest revision) Reinforcement steel

In case any such sectional weights are not available in the above documents, the manufacturer recommendation shall be binding.

1.13.2.1.3 The steel issued to the contractor shall be mainly in standard length and sections as received from the supplier. However, the contractor shall be bound to accept the steel in length as available in the project stores. No claims for extra payment because of issue of non-standard length will be entertained.

1.13.2.1.4 The contractor shall satisfy himself of the quality and quantity of the materials at the time of taking delivery from BHEL stores. No claims whatsoever will be entertained by BHEL because of quality or quantity after the materials are taken by the contractor from BHEL stores.

1.13.2.1.5 The contractor shall submit to the engineer, a statement indicating estimated quantity of steel required during a quarter, at least two months in advance of the quarter. In addition, the contractor shall also furnish the estimated requirement of steel during a month by the third week of the previous month indicating his requirement.

1.13.2.1.6 Following shall be limit for the maximum quantity of BHEL issue materials that would be with the contractor at any point of time when work is in progress (excluding what has already been incorporated in the works).

SL. No.	ISSUE OF MATERIALS	MAX. QTY IN CONTRACTOR'S STORE.
1	Reinforcement Steel & Earthing rod MS round	Requirement of one month

1.13.2.1.7 Bidder to note that steel materials required for foundation bolts, embedded items, etc. other than those supplied by BHEL, etc shall be supplied by the bidder. However, Bidder shall use the scrap materials (if issued by BHEL) for their use in the permanent works as embedment/inserts etc. after necessary store issue formalities and shall be accounted for monthly reconciliation.

1.13.2.2 RETURN OF MATERIALS

a) All surplus steel and all wastage materials will be taken back on weighment basis.

b) Surplus, unused and untampered steel shall be sorted section-wise and returned separately to a place directed by BHEL / Engineer within the project area. Return of such materials will not be entitled to any handling and incidental charges.

c) All wastage / scrap (including melting scrap, wastage, unusable scrap) shall be promptly returned to the stores and a receipt obtained for material accounting purposes. Return of such material will not be entitled to any transportation and incidental charge.

1.13.2.2.1 SCRAP & SERVICEABLE MATERAILS:

a) All pipes measuring 2 M and above in length shall be treated as serviceable materials provided they are in good and acceptable condition. Pipe in less than 2 M length shall be treated as scrap.

b) All TMT measuring 3 M and above in length shall be treated as serviceable materials provided they are in good and acceptable condition. TMT in less than 3 M length shall be treated as scrap.

c) All Structural steel of length above 2 M except M.S. Plate shall be considered as serviceable materials provided the materials is in good and acceptable condition. Structural steel in length less than 2 M shall be treated as scrap.

d) Plates having both sides greater than 1 Metre OR if any side is less than 1 M but greater than 0.5 M and the total area is equal or greater than 2 Sq. Metre shall be considered as serviceable.

1.13.2.3 STEEL CONSUMPTION AND WASTAGE

1.13.2.3.1 REINFORCEMENT AND EARTHING ROD MS ROUND STEEL CONSUMPTION AND WASTAGE.

a) CONSUMPTION.

The theoretical consumption of various sections and/or diameter of reinforcement and earthing rod steel shall be based on approved construction drawing and bar bending schedule. Weight shall be calculated considering the sectional weights as per Indian standards. No extra cost shall be payable to the contractor for any deviation in weights for the different procedures adopted for issue and calculation of the theoretical consumption including rolling tolerances.

Actual consumption = Issue – Surplus.

Surplus = Un-tampered & unused quantity of steel and serviceable materials as stipulated under clause “Scrap and Serviceable Materials (Refer Clause 1.13.2.2.1 above)” returned by the contractor to BHEL store along with relevant documents.

Wastage = Actual consumption – Theoretical consumption.

b) WASTAGE:

ALLOWABLE WASTAGE: (+3%) (Three percent) of the theoretical consumption shall be considered as allowable wastage. Invisible wastage (max limit to 0.5%), if any, shall be considered to be included in the specified 3 % allowable wastage.

S.No	CONSUMPTION OF REINFORCEMENT STEEL & EARTHING ROD, MS ROUND	BASIS OF ISSUE & PENAL RECOVERY
R-1	Theoretical consumption (without considering any wastage, scrap or loss) as per spec. & drg.	Free
R-2	Wastage limited to plus three percent (+3%) of the aforesaid theoretical consumption (R-1) towards allowable wastage including invisible wastages (invisible wastages limited to 0.5% of theoretical consumptions)	Free
R-3	Wastage beyond three Percent (3%) of the aforesaid theoretical consumption (R-1)	Penal Rate

1.13.2.3.2 STRUCTURAL STEEL, (ROLLED SECTION, PLATES ETC.) CONSUMPTION & WASTAGE:

A) CONSUMPTION: -

The theoretical consumption of various sections shall be based on approved drawings. Weights shall be calculated considering the sectional weights as per Indian standard. No extra payment shall be payable to the contractor for any deviation in weights for the two different procedures adopted for issue and calculation of the theoretical consumption including rolling tolerances.

i) Actual consumption = Issue – Surplus.

ii) Surplus = Un-tampered & unused quantity of steel and Serviceable materials as stipulated under clause “Scrap and Serviceable Materials (Refer Clause 1.13.2.2.1 above)” returned by the contractor to BHEL store along with relevant documents.

iii) Wastage = Actual consumption – Theoretical consumption.

B) WASTAGE

Allowable wastage: - 4% (FOUR percent) of the theoretical consumption shall be considered. Wastage shall be considered as cut pieces and scrap material, measured as per actual weightment basis. Invisible wastage (max limit to 0.5%), if any, shall be considered to be included in the specified 4 % allowable wastage.

Sl.No.	CONSUMPTION OF STRUCTURAL STEEL (ROLLED SECTION, PLATES)	BASIS OF ISSUE & PENAL RECOVERY.
S-1	Theoretical consumption (without considering any wastage, scrap or loss) as per spec. & drg.	Free
S-2	Wastage limited to plus Four percent (+4%) of the aforesaid theoretical consumption (S-1) towards allowable wastage including invisible wastages (invisible wastages limited to 0.5% of theoretical consumptions)	Free
S-3	Wastage beyond Four percent (4%) of the aforesaid theoretical consumption (S-1).	Penal Rate

1.13.2.3.3 RECONCILIATION OF MATERIALS

a) The contractor shall submit a reconciliation statement of steel issued to him with each RA Bill.

b) At the time of submission of bills, the contractor shall properly account for the material issued to him as specified herein to the satisfaction of BHEL certifying that the balance materials are available with contractor's custody at site.

c) At the time of submission of bills by the contractor, if it is noticed by BHEL that the wastage is high and calls recovery at the penal rate, then, BHEL will proceed for recovery for the excess wastage as per penal recovery rates as specified.

d) The reference drawings for actual material consumption to be used for the purpose of reconciliation shall be drawings prepared by the BHEL and drawings approved by BHEL for fabrication works and such other drawings approved by BHEL. This shall also include the bar bending schedule prepared by the contractor and approved by BHEL.

1.13.3 RECOVERY OF MATERIAL

If wastage exceeds the specified limit, the recovery of excess wastage shall be made from monthly RA Bill at the Penal Rate.

The penal rate of materials shall be as follows:

Sl. No.	Description	Penal Rate
A.	**REINFORCEMENT STEEL** Cold rolled steel, high strength deformed bar or mild steel round bars including earthing rod MS round	**Rs. 44,100/- per MT** + GST and/or other taxes & duties
B.	**STRUCTURAL STEEL** MS plates, MS flats, rolled steel joists, channels and angles, MS pipes, Chequered plates etc. in sizes and lengths as available	**Rs. 48,615/- per MT** + GST and/or other taxes & duties
C.	**CEMENT (OPC/ PPC/ PSC)**	**Rs. 4,266/- per MT** + GST and/or other taxes & duties

VOLUME-IA PART-II CHAPTER-1

CORRECTIONS / REVISIONS IN SPECIAL CONDITIONS OF CONTRACT, GENERAL CONDITIONS OF CONTRACT AND FORMS & PROCEDURES

Sl.No.: 1

Clause 4.1.11 of SCC is deleted.

Sl. No.: 2

OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT MANAGEMENT/ QUALITY ASSURANCE PROGRAMME

The following clauses in Occupational Health, Safety & Environment Management / Quality Assurance Programme published in Chapter-IX of Special Conditions of Contract (Volume I Book-II) is revised as under.

Chapter IX Clause 9.1 is modified as below:

Contractor will comply with HSE (Health, Safety & Environment) requirements of BHEL as per the "HSE Plan for Site Operations by Subcontractor" (Document No. HSEP: 14 Rev 01) enclosed.

Chapter IX Clause 9.1.1 to 9.1.25 stands deleted.

Chapter IX Clause 9.2 to 9.62 stands deleted.

Sl No.: 3

Clause No. 10.5 on RA Bill Payments, in Special Conditions of Contract (SCC), Volume- IB, Book- II, is revised as under:

The payment for running bills will normally be released within 30 days of submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc., and other dues in the meanwhile.

Sl No.: 4

Earnest Money Deposit (EMD) clause 1.9 in General Conditions of Contract (GCC) (Volume I Book-II) is revised as under.

1.9 EARNEST MONEY DEPOSIT

1.9.1 Every tenderer shall submit the prescribed amount of Earnest Money Deposit (EMD) to BHEL PSSR, only in the following forms: -

i. Electronic Fund Transfer credited in BHEL account (before tender opening)

ii. Through Online EMD payment portal of BHEL with SBI (before tender opening) by following steps as below:-

1. Visit www.onlinesbi.com -> Go to State Bank Collect (In the tab section)
2. Click Check box to proceed for payment -> Click on Proceed

3. Under State of Corporate/ Institution ->Select Tamilnadu
4. Under Type of Corporate/ Institution -> Select PSU – Public Sector Undertaking ->Go
5. Under PSU – Public Sector Undertaking Name -> Select BHEL PSSR CHENNAI and Submit
6. Under Select Payment Category ->-> SCT Tender EMD & Tender Fees

iii. Banker's cheque or Pay order or Demand Draft in favour of 'Bharat Heavy Electricals Limited' (along with offer) and payable at Chennai.

iv. Fixed Deposit Receipt (FDR) issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL) along with the offer.

v. In case EMD amount is more than Rs. Two Lakhs, Tenderer has the option to submit Rs. Two lakhs in the forms described above in clause no. 1.9.1. (i) to (iv) and the remaining amount over and above Rs. Two Lakhs in the form of Bank Guarantee from Scheduled Bank (along with the Offer).

Note:

a) Proforma of Bank Guarantee (in lieu of Earnest Money)- Form WAM 23 is enclosed with this Tender.

b) The Bank Guarantee shall be valid for at least six months from the due date of tender submission mentioned in the Notice Inviting Tender.

c) Date of Expiry of Claim shall be as given in Proforma of Bank Guarantee (in lieu of Earnest Money)- Form WAM 23.

Bank Details for the purpose of Taking EMD

Name and Address of Beneficiary:	Bharat Heavy Electricals Ltd. EVR Periyar Building, 690, Anna Salai, Nandanam, Chennai - 600035
Name of Bank:	State Bank Of India
Bank Branch Address:	SBI Saidapet Branch, EVR Periyar Building, Nandanam, Anna Salai, Chennai - 600035
IFSC Code :	SBIN0000912
Account No. :	10610819499

Details for SFMS (Structured Financial Messaging System) transmission of BG

Bank and Branch	SBI TFCPC Branch
Branch Code	5056
IFSC Code	SBIN0005056

1.9.2 EMD shall not carry any interest.

1.9.3 EMD by the Tenderer will be forfeited as per NIT Conditions, if:

i. After opening the tender and within the offer validity period, the Tenderer revokes his tender or makes any modification in his tender which is not acceptable to BHEL.

ii. The Contractor fails to deposit the required Security deposit or commence the work within the period as per LOI/Contract.

1.9.4 EMD given by all unsuccessful tenderers will be refunded normally within 15 days of award of work.

1.9.5 EMD of successful tenderer will be retained as part of Security Deposit.

1.9.6 EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged under the provisions of extant" Guidelines on Suspension of Business dealings with suppliers/contactors" and forfeited / released based on the action determined under these guidelines.

Sl No.: 5

SECURITY DEPOSIT

The **SECURITY DEPOSIT** (SD) clause 1.10 published in General Conditions of Contract (Volume I Book-II) is revised as under.

1.10 Security Deposit:

1.10.1 Upon acceptance of Tender, the successful Tenderer should deposit the required amount of Security Deposit for satisfactory completion of work, as given below:

1.10.2 The total amount of Security Deposit will be 5% of the contract value. EMD of the successful tenderer shall be converted and adjusted towards the required amount of Security Deposit.

1.10.3 The Security Deposit should be furnished before start of the work by the contractor.

1.10.4 Modes of deposit:

1.10.4.1 The balance amount to make up the required Security Deposit of 5% of the contract value may be furnished in any one of the following forms

i. Cash (as permissible under the extant Income Tax Act)

ii. Local cheques of Scheduled Banks (subject to realization)/ Pay Order / Demand Draft/ Electronic Fund Transfer in favour of BHEL

iii. Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format for Security Deposit shall be in the prescribed formats.

iv. Fixed Deposit Receipt issued by Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The FDR should be in the name of the contractor, A/C BHEL, duly discharged on the back.

v. Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (Certificates should be held in the name of Contractor furnishing the security and duly endorsed / hypothecated / pledged, as applicable, in favour of BHEL and discharged on the back)

(Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith)

1.10.5 At least 50% of the Security Deposit including the EMD should be deposited in any form as prescribed before start of the work and the balance 50% of the Security Deposit will be recovered by deducting 10% of the gross amount progressively from each running bills of the contractor till the total amount of the required Security Deposit is collected.

1.10.6 The recoveries made from running bills (cash deduction towards balance SD amount) will be released against submission of equivalent Bank Guarantee in the prescribed formats, but only once, before completion of work.

1.10.7 The Security Deposit shall not carry any interest.

1.10.8 If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the excess Security Deposit due the enhancement shall be immediately deposited by the Contractor or recovered from payment/s due to the Contractor.

1.10.9

1.10.9.1 The validity of Bank Guarantees towards Security Deposit shall be initially upto the completion period as stipulated in the Letter of Intent/Award + 3 months, and the same shall be kept valid by proper renewal till the acceptance of Final Bills of the Contractor, by BHEL

1.10.9.2 Date of Expiry of Claim shall be as given in the prescribed formats for Bank Guarantee towards Security Deposit.

1.10.10 BHEL reserves the right of forfeiture of Security Deposit in addition to other claims and penalties in the event of the Contractor's failure to fulfill any of the contractual obligations or in the event of termination of contract as per terms and conditions of contract. BHEL reserves the right to set off the Security Deposit against any claims of other contracts with BHEL.

1.10.11 Penalty for Delayed Remittance of Security Deposit

If the contractor fails to furnish SD before start of work, in line with 1.10.3 above, Simple Interest against delayed remittance of the Security Deposit shall be deducted from the sub-contractor at the rate of SBI PLR + 2% on the value of 50% SD of the contract, for the delayed period (i.e., period between start of work and date of remittance of Initial SD, i.e., atleast 50% of SD). In case, the delayed period has different SBI PLR rates, Simple Interest shall be calculated based on different rates by considering the corresponding time period. On similar lines Penalty shall be levied for delayed remittance of Additional Security Deposit (if applicable).

Note: - Bank details & SFMS details provided above in Sl. No. 04 (Earnest Money Deposit) may be used for the purpose of arranging Bank Guarantees towards Security Deposit / Additional Security Deposit also.

Sl. No.: 6

Clause 2.7.2 and 2.7.3 in GCC regarding Rights of BHEL is revised as under:

2.7.2.

2.7.2.1 To terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor after due notice of a period of 14 days' by BHEL in any of the following cases:

i. Contractor's poor progress of the work vis-à-vis execution timeline as stipulated in the Contract, backlog attributable to contractor including unexecuted portion of work does not appear to be executable within balance available period considering its performance of execution.

ii. Withdrawal from or abandonment of the work by contractor before completion of the work as per contract.

iii. Non-completion of work by the Contractor within scheduled completion period as per Contract or as extended from time to time, for the reasons attributable to the contractor.

iv. Termination of Contract on account of any other reason(s) attributable to Contractor.

v. Assignment, transfer, subletting of Contract without BHEL's written permission.

vi. Non-compliance to any contractual condition or any other default attributable to Contractor.

Risk & Cost Amount against Balance Work:

Risk & Cost amount against balance work shall be calculated as follows: Risk & Cost Amount= [(A-B) + (A x H/100)]

Where,

A= Value of Balance scope of Work (*) as per rates of new contract

B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.

H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

* Balance scope of work (in case of termination of contract):

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount.

Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.

Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities.

Substitute / extra items whose rates have already been approved would form part of contract quantities for this purpose. Substitute / extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.

However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: Incase portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work' for calculating Risk & Cost amount.

LD against delay in executed work in case of Termination of Contract:

LD against delay in executed work shall be calculated in line with LD clause no. 2.7.9 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of "LD against delay in executed work in case of termination of contract" is given below.

i). Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1

ii). Let the value of executed work till the time of termination of contract= X

iii). Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y

iv). Delay in executed work attributable to contractor i.e. T2= [1-(X / Y)] x T1

v). LD shall be calculated in line with LD clause (clause 2.7.9) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2.7.2.2 In case Contractor fails to deploy the resources as per requirement, BHEL can deploy own/hired/otherwise arranged resources at the risk and cost of the contractor and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC.

2.7.3 **Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor**

Following sequence shall be applicable for recoveries from contractor:

a) Dues available in the form of Bills payable to contractor, SD, BGs against the same contract.

b) Demand notice for deposit of balance recovery amount shall be sent to contractor, if funds are insufficient to effect complete recovery against dues indicated in (a) above.

c) If contractor fails to deposit the balance amount to be recovered within the period as prescribed in demand notice, following action shall be taken for balance recovery:

i) Dues payable to contractor against other contracts in the same Region shall be considered for recovery.

ii) If recovery cannot be made out of dues payable to the contractor as above, balance amount to be recovered, shall be informed to other Regions/Units for making recovery from the Unpaid Bills / Running Bills / SD / BGs / Final Bills of contractor.

iii) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

Sl. No.: 7

In addition to clause 2.7.9 of General Conditions of Contract (GCC), a New clause 2.7.9.1 is added as below.

2.7.9.1 **Penalty for Intermediate Milestones**

2.7.9.1.1 M1 and M2 shall be intermediate Milestones for this work.

2.7.9.1.2 In case of slippage of these identified Intermediate Milestones, Delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones in reference to Form 14.

2.7.9.1.3 Incase delay in achieving M1 milestone is solely attributable to the contractor,0.5% per week of executable contract value* limited to Maximum 2% of executable contract value will be withheld.

2.7.9.1.4 Incase delay in achieving M2 milestone is solely attributable to the contractor,0.5% per week of executable contract value* limited to maximum 3% of executable contract value will be withheld.

2.7.9.1.5 Amount already withheld, if any, against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 milestone.

2.7.9.1.6 Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA Bills.

2.7.9.1.7 Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion / closure of contract. Withheld amount, if any due to slippage of intermediate milestones shall be adjusted against LD or released as the case may be.

2.7.9.1.8 In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted in to recovery.

Note: * Executable contract value-value of work for which inputs/fronts were made available to contractor and were scheduled for execution till the date of achievement of that milestone.

Sl. No.: 8

The OVERRUN COMPENSATION (ORC) clause 2.12 published in General Conditions of Contract (Volume I Book II) is revised as under.

2.12 **OVERRUN COMPENSATION (ORC)**

2.12.1 **ORC during original contract period:** No ORC shall be applicable during the original contract period.

2.12.2 **ORC during extended period for the reasons solely attributable to contractor:** No ORC shall be applicable during the extended period granted for the reasons solely attributable to contractor and work executed during this period shall be paid as per original contract rates.

2.12.3 **ORC during extended period for the reasons not attributable to contractor:** ORC shall be payable as per following procedure:

2.12.3.1 For initial period of twelve months of extended period, ORC rate applicable over executed value shall be 5%. For every subsequent period of twelve months, ORC rate shall be further increased by 5% over the previous rate. For example, ORC rates applicable for initial period of 12 months and subsequent period of 12 months are given below.

Sl. No.	Extended Period for the reasons attributable to BHEL	ORC rate applicable over executed value
1	First 12 months	5%
2	13^{th} - 24^{th} month and so on	10.25% {[(1.05 x 1.05)-1] x 100}

This process of increasing ORC rate for each subsequent period of 12 months shall continue till applicability of ORC.

2.12.3.2 On completion of original contract period as well as on completion of each subsequent period of twelve months i.e. at the time of change in applicable ORC rate, Delay Analysis shall be carried out and percentage shortfall attributable to both BHEL & Contractor shall be calculated.

2.12.3.3 For the purpose of calculation of ORC, executed value of work in the month shall be divided in Part-1 and Part-2 in proportion of percentage shortfall attributable to BHEL and contractor respectively, based on the last delay analysis as worked out in 2.12.3.2.

ORC shall be payable only on Part-1 and no ORC shall be payable on Part-2.

Value of Part-1 shall be further limited to the value of actual inputs provided by BHEL i.e. “Plan - Shortfall attributable to BHEL” for the month, as per Form-14 for calculation of ORC.

2.12.3.4 Payment of ORC amount shall be further regulated as follows:

(i) 50% of the ORC is allocated for deployment of matching resources (with weightages) agreed as per the joint programme drawn vide 2.11.4. ORC Payment against resources shall be calculated in proportion to percentage of resources actually deployed w.r.t. planned resources, as per Form-14.

(ii) 50% of ORC is allocated for achieving of planned progress agreed as per the joint programme drawn vide 2.11.4. ORC Payment shall be reduced in proportion to

percentage shortfall attributable to contractor w.r.t.-"Plan - Shortfall attributable to BHEL" for the month, as per Form-14.

2.12.3.5 The maximum amount of ORC payable for the month shall be limited to Rs. 5,00,000/-.

2.12.3.6 In case, there is no shortfall attributable to contractor for the month and also contractor has deployed the resources as agreed in Form-14 but ORC amount payable for the month worked out as per procedure mentioned in clause 2.12.3.3, 2.12.3.4 and 2.12.3.5, is less than Rs.1,00,000/-, then ORC amount payable for the month shall be Rs.1,00,000/- otherwise ORC amount payable for the month shall remain same.

2.12.3.7 In case execution is on **HOLD** (Other than Force Majeure), ORC shall be payable as per following:

i). Contractor has not been permitted by BHEL to de-mobilize

a) ORC amount of Rs. 1,00,000/- per month shall be applicable during the period of HOLD provided resources as planned are deployed (not demobilised) during the period of hold.

b) Subsequent to lifting of HOLD, Period of HOLD shall not be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

ii). Contractor has been permitted to demobilize and to remobilize after lifting of HOLD

a) No ORC shall be payable to contractor for the period of HOLD.

b) Subsequent to lifting of HOLD, Period of HOLD shall not be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

2.12.3.8 In case **Force Majeure** is invoked:

(i) No ORC shall be applicable during the period of Force Majeure.

(ii) Subsequent to revocation of Force Majeure, period of Force Majeure shall be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

2.12.4 Applicability of ORC: ORC shall not be applicable for following activities.

(i) Area cleaning, removal of temporary structures and return of scrap.

(ii) Punch list points / pending points liquidation pending due to reasons attributable to contractor

(iii) Submission of "As built Drawing"

(iv) Material Reconciliation

(v) Completion of Contract Closure formalities like HR Clearance/ No dues from various dept./ Statutory Authorities etc.

2.12.5 Total Over Run Compensation shall be limited to 10% of the cumulatively executed contract value till the month (excluding Taxes and Duties if payable extra). For this

purpose, executed contract value excludes PVC, ORC and Extra/Supplementary Works.

Sl No.: 9

Clauses 2.13.1, 2.13.6, 2.13.7 in GCC on Interest Bearing Recoverable Advances are revised as under

- Clauses 2.13.1, 2.13.6 & 2.13.7 in GCC are revised as under:
- Clause 2.13.1 in GCC is revised as "Normally no advance payment shall be payable to the contractor. Mobilization advance payment in exceptional circumstances shall be interest bearing and secured through a Bank Guarantee and shall be limited to a maximum of 5% of contract value. This 'Interest Bearing Recoverable Advance' shall be payable in not less than two installments with any of the installment not exceeding 60% of the total eligible advance".
- Clause 2.13.6 in GCC is revised as "The rate of interest applicable for the above advances shall be the Base rate of State Bank of India prevailing at the time of disbursement of the advance + 6%, and such rate will remain fixed till the total advance amount is recovered".
- Clause 2.13.7 in GCC is revised as "Unadjusted amount of advances paid shall not exceed 5% of the total contract value at any point of time. Recovery of advances shall be made progressively from each Running Bill such that the advance amounts paid along with the interest is fully recovered by the time the contractor's billing reaches 90% of contract value."

Sl. No.: 10

Clause 2.14.1 on Quantity Variation in General Conditions of Contract (GCC), Volume-IC, Book- II is revised as under:

2.14.1 "The quantities given in the contract are tentative and may change to any extent (both in plus side and minus side). The derived item rates for individual items shall remain firm irrespective of any variations in the individual quantities. No compensation becomes payable in case the variation of the final executed contract value is within the limit of Minus (-) 30% of awarded contract value."

Sl. No.: 11

PRICE VARIATION COMPENSATION (PVC)

The PRICE VARIATION COMPENSATION (PVC) clause 2.17 published in General Conditions of Contract (Volume IC Book-II) is revised as under.

2.17 PRICE VARIATION COMPENSATION

2.17.1 In order to take care of variation in cost of execution of work on either side, due to variation in the index of LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD,

CEMENT, STEEL, MATERIALS, Price Variation Formula as described herein shall be applicable (only for works executed during extended period, if any, subject to other conditions as described in this section).

2.17.2 **85%** component of executed Contract Value shall be considered for PVC calculations and remaining 15% shall be treated as fixed component. The basis for calculation of price variation in each category, their component, Base Index, shall be as under:

Sl. No.	CATEGORY	BASE INDEX	PERCENTAGE COMPONENT ('K')				
			CIVIL PACKAGES (See Note A/B/C)			MECHANICAL PACKAGES	Electrical, C&I, Material Management / Handling and other labour oriented packages
			A	**B****	**C**		
i)	LABOUR (ALL CATEGORIES)	'MONTHLY ALL-INDIA AVERAGE CONSUMER PRICE INDEX NUMBERS FOR INDUSTRIAL WORKERS' published by Labour Bureau, Ministry of Labour and Employment, Government of India. (Website: labourbureau.nic.in)	**40**	**25**	**30**	**65**	**80**
ii)	HIGH SPEED DIESEL OIL	Name of Commodity: HSD Commodity code: 1202000005 (**See Note E**)	**5**	**3**	**5**	**5**	**5**
iii)	WELDING ROD	Name of Commodity: MANUFACTURE OF BASIC METALS Commodity code:1314000000 (**See Note E**)				**15**	
iv)	CEMENT	Name of Commodity: ORDINARY PORTLAND CEMENT Commodity code: 1313050003 (**See Note E**)		**20**	**30**		
v)	STEEL (Structural and Reinforcement Steel)	Name of Commodity: MILD STEEL: LONG PRODUCTS Commodity code: 1314040000 (**See Note E**)		**25**			
vi)	ALL OTHER MATERIALS (Other than Cement & Steel)	Name of Commodity: ALL COMMODITIES Commodity code: 1000000000 (**See Note E**)	**40**	**12**	**20**		

Note: A) Cement & Steel: Free Issue (BHEL Scope)

B) Cement & Steel: In Contractor Scope

C) Cement in Contractor Scope, and Steel is Free Issue (BHEL Scope)

D) For Composite packages (i.e. Civil + Mechanical + Electrical and / or CI or Civil + Mechanical or Mechanical + Electrical and / or CI), the Component ('K') for various categories shall be as per respective packages as above

E) As per the 'MONTHLY WHOLE SALE PRICE INDEX' for the respective Commodity and Type, published by Office of Economic Adviser, Ministry of Commerce and Industry, Government of India. (Website: http://www.eaindustry.nic.in/download_data_0405.asp). Revisions in the index or commodity will be re adjusted accordingly.

2.17.3 **Void**

2.17.4 Payment / recovery due to variation in index shall be determined on the basis of the following notional formula in respect of the identified component ('K') viz LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS.

$$P = K \times R \times \frac{(X_N - Xo)}{Xo}$$

Where

P = Amount to be paid/recovered due to variation in the Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials

K = Percentage component ('K') applicable for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials

R = Value of work done for the billing month (Excluding Taxes and Duties if payable extra)

X_N = Revised Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials for the billing month under consideration

Xo = Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials as on the Base date.

2.17.5 **Base date shall be the calendar month of the schedule completion date (i.e. Actual Start date + Scheduled Contractual Completion period as per Letter of Intent / award and / or work order).**

2.17.6 PVC shall not be payable for the ORC amount, Supplementary / Additional Items, Extra works. However, PVC will be payable for items executed under quantity variation of BOQ items under originally awarded contract.

2.17.7 The contractor shall furnish necessary monthly bulletins in support of the requisite indices from the relevant websites along with his Bills.

2.17.8 The contractor will be required to raise the bills for price variation payments on a monthly basis along with the running bills irrespective of the fact whether any increase / decrease in the index for relevant categories has taken place or not. In case there is delay in publication of bulletins (final figure), the provisional values as published can be considered for payments and arrears shall be paid / recovered on getting the final values.

2.17.9 PVC shall be applicable only, during extended period of contract (if any) after the scheduled completion period and for the portion of work delayed/backlog for the reasons not attributable to the contractor.

However, the total Quantum of Price Variation Amount payable/recoverable shall be regulated as follows:

i) For the portion of shortfall/backlog not attributable to contractor, PVC shall be worked out on the basis of indices applicable for the respective month in which work is done. Base index shall be applicable as defined in clause 2.17.5

ii) In case of Force Majeure, the PVC shall be regulated as per (a) or (b) below.

a) Force Majeure is invoked before "Base Date" / "revised base date" (as explained below) OR immediately after "base date" / "revised base date" in continuation (i.e. during the period when PVC is not applicable):

1. Base date shall be revised: Revised Base date = Previous base date + duration of Force Majeure.

   No PVC will be applicable for the work done till revised base date.

2. PVC will be applicable for the work done after "base date"/" revised date" as the case may be (during extended period when delay is not attributable to contractor). PVC shall be worked out on the basis of indices applicable for the respective month in which work is done with base index as on "base date"/ "revised base date" as the case may be.

b) Force Majeure is invoked after "base date"/ "revised base date" as the case may be (during extended period when delay is not attributable to contractor).

1. PVC shall be applicable for the work done after revocation of Force Majeure.
2. PVC for the work done after revocation of Force Majeure shall be worked out on the basis of indices applicable for the respective month on which work is done excluding the effect of change in indices during total period of Force Majeure(s) invoked after "base date" / "revised base date" as the case may be. Base index shall be taken as on "base date" / "revised base date" as the case may be.

iii) The total amount of PVC shall not exceed 15% of the cumulatively executed contract value. Executed Contract value for this purpose is exclusive of PVC, ORC, Supplementary / Additional items and Extra works except items due to quantity variation.

Sl. No.: 12

Clause 2.21 "ARBITRATION" of GCC has been amended as follows:

2.21 ARBITRATION & CONCILIATION

2.21.1 ARBITRATION:

2.21.1.1 Except as provided elsewhere in this Contract, in case Parties are unable to reach amicable settlement (whether by Conciliation to be conducted as provided in Clause 2.21.2 herein below or otherwise) in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or. in any manner touching upon

the Contract (hereinafter referred to as the 'Dispute'), then, either Party may, commence arbitration in respect of such Dispute by issuance of a notice in terms of section 21 of the Arbitration & Conciliation Act, 1996 (hereinafter referred to as the 'Notice'). The Notice shall contain the particulars of all claims to be referred to arbitration in sufficient detail and shall also indicate the monetary amount of such claim. The arbitration shall be conducted by a sole arbitrator to be appointed by the Head of the BHEL Power Sector Region issuing the Contract within 60 days of receipt of the complete Notice. The language of arbitration shall be English.

The Arbitrator shall pass a reasoned award.

Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder as in force from time to time shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be Chennai (the place from where the contract is Issued). The Contract shall be governed by and be construed as per provisions of the laws of India. Subject to this provision 2.21.1.1 regarding ARBITRATION, the principal civil court exercising ordinary civil jurisdiction over the area where the seat of arbitration is located shall have exclusive jurisdiction over any DISPUTE to the exclusion of any other court.

2.21.1.2 In case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable:

In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD (Administrative Mechanism for Resolution of CPSEs Disputes) as mentioned in DPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018 as amended from time to time.

2.21.1.3 The cost of arbitration shall initially be borne equally by the Parties subject to the final allocation thereof as per the award/order passed by the Arbitrator.

2.21.1.4 Notwithstanding the existence of any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and expedition in a professional manner unless the dispute inter-alia relates to cancellation, termination or short-closure of the Contract by BHEL.

2.21.2 CONCILIATION:

If at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning,

operation, effect, interpretation or breach of the agreement, contract), which the Parties are unable to settle mutually, arise inter-se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee (IEC) to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators.

Notes:

1. No serving or a retired employee of BHEL/Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators.
2. Any other person(s) can be appointed as Conciliator(s) who is/are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators.

The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided in Procedure 2.3 to this GCC. The Procedure 2.3 together with its Formats will be treated as if the same is part and parcel hereof and shall be as effectual as if set out herein in this GCC.

The Contractor hereby agrees that BHEL may make any amendments or modifications to the provisions stipulated in the Procedure 2.3 to this GCC from time to time and confirms that it shall be bound by such amended or modified provisions of the Procedure 2.3 with effect from the date as intimated by BHEL to it.

Note: Procedure 2.3 that forms the part of Forms and Procedures is published as Chapter 12 in Volume 1A Part II of this booklet (Volume-I Book-I).

2.21.3 No Interest payable to Contractor

Notwithstanding anything to the contrary contained in any other document comprising in the Contract, no interest shall be payable by BHEL to Contractor on any moneys or balances including but not limited to the Security Deposit, EMD, Retention Money, RA Bills or the Final Bill, or any amount withheld and/or appropriated by BHEL etc., which becomes or as the case may be, is adjudged to be due from BHEL to Contractor whether under the Contract or otherwise.

Sl No: 13

Procedure 2.3 that forms the part of Forms and Procedures is published as Chapter 12 in Volume 1A Part II of this booklet (Volume-I Book-I).

Sl. No.: 14

Existing format on Monthly Plan Review with Contractor, as available in Form No F-14 of Volume ID Forms and procedure stands Deleted. Form No.- F-14 (Rev 01) is enclosed.

Sl No.: 15

Existing format on Monthly Performance Evaluation of Contractor, as available in Form No F-15 of Volume ID Forms and procedure stands Deleted. Form No.- F-15 (Rev 02) is enclosed.

Sl No: 16

Clause 2.22 in GCC regarding Retention Amount is revised as under:

2.22 Performance Security Deposit

2.22.1 After award of work, Vendor shall submit 5% of the contract value towards Performance Security Deposit, in the form of (a) or (b) below.

(a) CASH (DD/ Online payment), 5% of the contract Value towards Performance Security Deposit, before commencing the contract

(or)

(b) Recovery 5% from Each Running Bill towards Performance security deposit.

(Note: Subcontractor has to choose either Option (a) or (b) before issue of Detailed LOI).

(c) However, Performance Security Deposit on part of PVC will be recovered at the rate of 5% from every running bill towards performance security deposit.

2.22.2 Refund of Performance Security Deposit:

a) 50% of Performance Security Deposit shall be released along with the final bill (and)

b) Balance 50% will be released after completion of Performance Guarantee Period (i.e., after expiry of Guarantee period), provided all the defects noticed during the guarantee period have been rectified to the satisfaction of BHEL Site Engineer/ BHEL Construction Manager, and after deducting all expenses/ other amounts due to BHEL under the contract/ other contracts entered into by BHEL with them. This portion of Performance Security Deposit, amount can be released on commencement of the Guarantee Period, on submission of equivalent Bank Guarantee.

Sl. No.: 17

The chapter Reverse auction procedure published in 'Forms and Procedures' of Volume I Book-II stands deleted (Explanation: Reverse auction is not applicable for this Tender).

Sl. No.: 18

Existing format on BANK GUARANTEE FOR SECURITY DEPOSIT as available in Form No F-11 (Rev 00) of Volume ID Forms and Procedure stands deleted. Refer Proforma of Bank Guarantee (in lieu of Security Deposit)- Form WAM 22 provided as Volume IA Part II Chapter 11

Sl No.: 19

Existing format for Integrity Pact, as available in Volume ID Forms and procedure stands Deleted. Revised Format is enclosed.

Sl No.: 20

Existing format on No Deviation Certificate, as available in Form No F-03 of Volume ID Forms and procedure stands Deleted. Revised Format is enclosed.

Sl. No.: 21

PRICE BID OPENING

Clause 1.6 (v) in General Conditions of Contract (Volume IC Book-II) regarding Price Bid opening is revised as under.

1.6 (v) Price Bids submitted in E-Procurement portal https://www.bhel.abcprocure.com by the shortlisted bidders only shall be opened.

Sl No.: 22

Clause 2.15.5 of GCC in Extra Works is revised as under:

2.15.5: After eligibility of extra works is established and finally accepted by BHEL engineer / designer, payment will be released on competent authority's approval at the following rate.

MAN-HOUR RATE FOR ELIGIBLE EXTRA WORKS:

Single composite average labour man-hour rate, including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, consumables for carrying out any major rework / repairs / rectification / modification / fabrication as certified by site as may arise during the course of erection, testing, commissioning or extra works arising out of transit, storage and erection damages, payment, if found due will be at Rs 108/- per man hour.

VOLUME-IA PART – II

CHAPTERS 2 to 14

Chapter 2 to 14 in next 943 pages as below

Chapter 2	Bore Log Data Sheet	45 pages
Chapter 3	Drawings	12 pages
Chapter 4	Technical Specifications	746 pages
Chapter 5	Technical Specification and drawings for Labour Colony	10 pages
Chapter 6	T&P Hire Charges	14 pages
Chapter 7	"HSE Plan for Site Operations by Subcontractor" (Document No. HSEP: 14 Rev01)	82 pages
Chapter 8	Format for Form no.: F-14 (Rev 01); Monthly Plan and Review with Contractors	05 pages
Chapter 9	Format for Form no.: F-15 (Rev 02); Monthly Performance Evaluation of contractor	06 pages
Chapter 10	Proforma for Bank Guarantee (in lieu of Earnest Money)	03 pages
Chapter 11	Pro forma for Bank Guarantee (in lieu of Security Deposit)	03 pages
Chapter 12	Procedure 2.3-Procedure For Conduct Of Conciliation Proceedings	11 pages
Chapter 13	Integrity Pact	05 pages
Chapter 14	No Deviation Certificate	01 page

VOLUME I

Geotechnical Investigation report of 5X800MW Yadadri thermal Power station at Veerlapalem, Telangana state for ISG scope consists of three volumes as per details given below:

VOLUME –I – Methodology, Analysis & Recommendations

VOLUME – II – Bore logs, Trial pits, Field permeability test Double Packer and laboratory tests results

VOLUME – III – Plate load tests,Cyclic plate load tests,Electrical resistivity tests ,Cross hole, shear tests, Pressuremeter tests.

This Volume consists of Methodology, Analysis and Recommendations for proposed the power plant.

Table of contents

GEOTECHNICAL INVESTIGATION REPORT
FOR
5X800MW YADADRI THERMAL POWER STATION
NALGONDA DISTRICT,
TELANGANA STATE

NOBLE GEO-STRUCTS PROJECT NO. S 16022

Aug 19, 2016

INTRODUCTION

Noble Geo-Structs is pleased to submit Geotechnical Investigation Report for 5x800MW Yadadri Thermal Power Station, Nalgonda District, Telangana State. Geotechnical Investigation work was awarded by M/s Bharat Heavy Electricals Limited; Chennai through quotation no. NGS/Q/15/52 dated 02/07/2015.
Vide PO no:BHEL PSSR SC 1588/28th August 2015

The purpose of this report is to describe the subsurface conditions observed at the Fourty eightborings drilled for this study, analyze and evaluate the test data, and provide recommendations with respect to:

- chemical nature of the sub-soil and
- strength and stability of strata for deciding the founding level.

PROJECT DESCRIPTION

The project involves Soil Investigation & Topographical survey for 5x800MW Yadadri Thermal Power Station at Veerlapalem village, Dameracherla Mandal, Nalgonda District, Telangana State.
Site Location: 7km from the NH-5, Veerlapalemvillage, Dameracherla Mandal, Nalgonda district, Telengana State.

Co=ordinates: N=16^{0}42’20.40, E= 79^{0}34’41.56

The nearest town to the site is Miryalaguda at a distance of 30km which is easily accessible from the TelenganaState capital Hyderabad by road. The nearest railway station is Vishnupuram at 6.50km from the project site. The nearest airport is Vijayawada at 130km from the site.

SCOPE OF WORK

Specifications of the work include drilling Two Hundred and eleven bore holes at stipulated locations, tests (in-situ and ex situ) on soil, rock and ground water samples, interpretation of test data and test results and preparation of a geotechnical report.

Field Work

Field work consists of Two Hundred and eleven boreholes at stipulated locations (Table No 1),collecting disturbed, undisturbed soil samples and rock samples at salient locations, conducting standard penetration test (SPT).

Drilling at the stipulated boreholes was planned up to a sufficient depth of the rock level to determine the competent strata for foundation design. Minimum diameter of the boreholes was 150mm and boring was carried out in accordance with the provisions of IS 1892 upto the termination depth.

Field Tests

The Field Work involves following activities and the co-ordinates with levels are given in the corresponding tables as mentioned:

a) Visual identification of soil samples
b) Standard Penetration Test
c) Plate load test (Table No 8)
d) Cyclic plate load test (Table No 3)
e) Electrical Resistivity Test (Table No 10)
f) Pressure Meter Test (Table No 4)
g) Cross hole Shear wave Test (Table No 2)

Project :5x800MW Yadadri Thermal Power Station at Veerlapalem, Telangana State.
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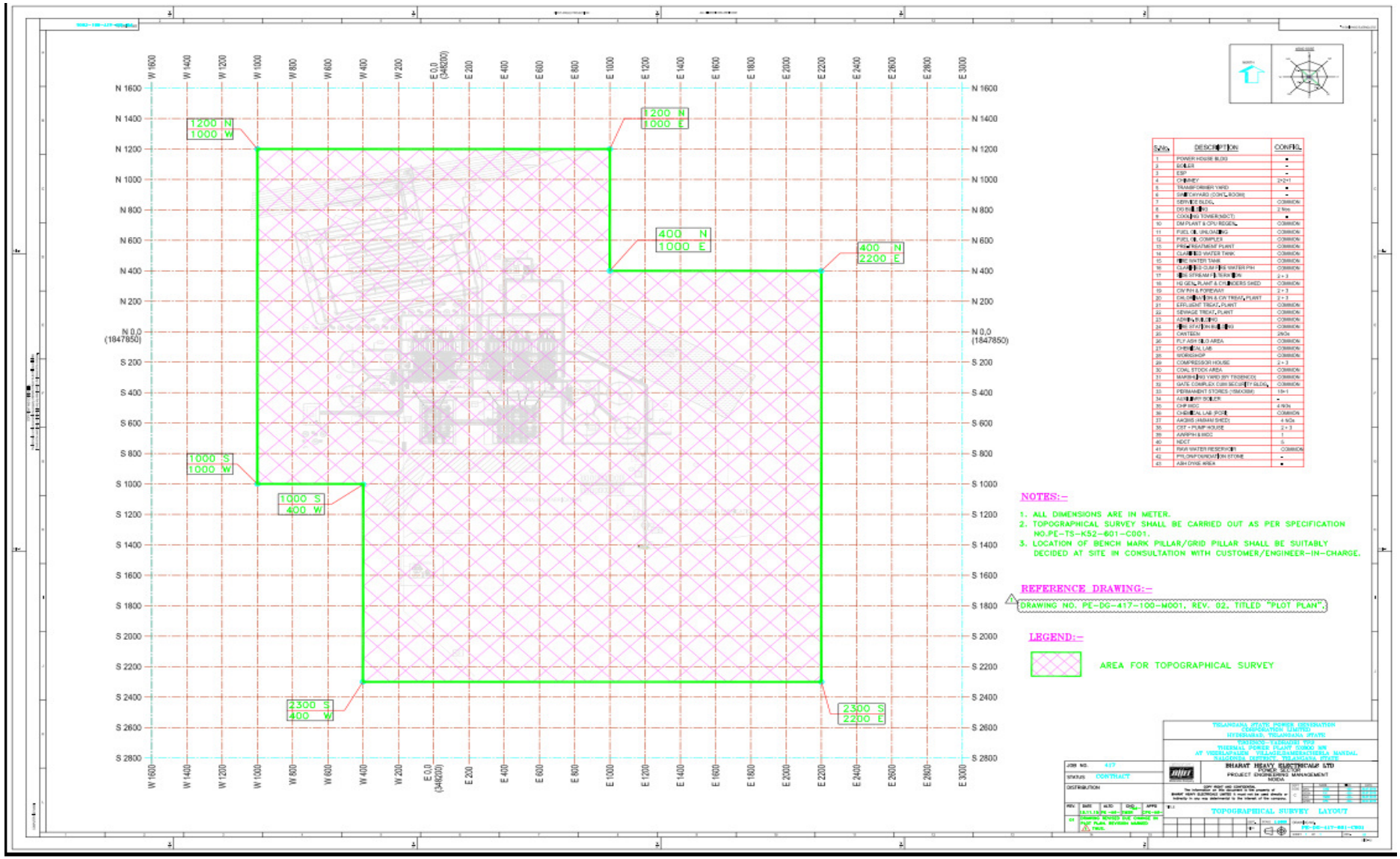

Project :5x800MW Yadadri Thermal Power Station at Veerlapalem, Telangana State.
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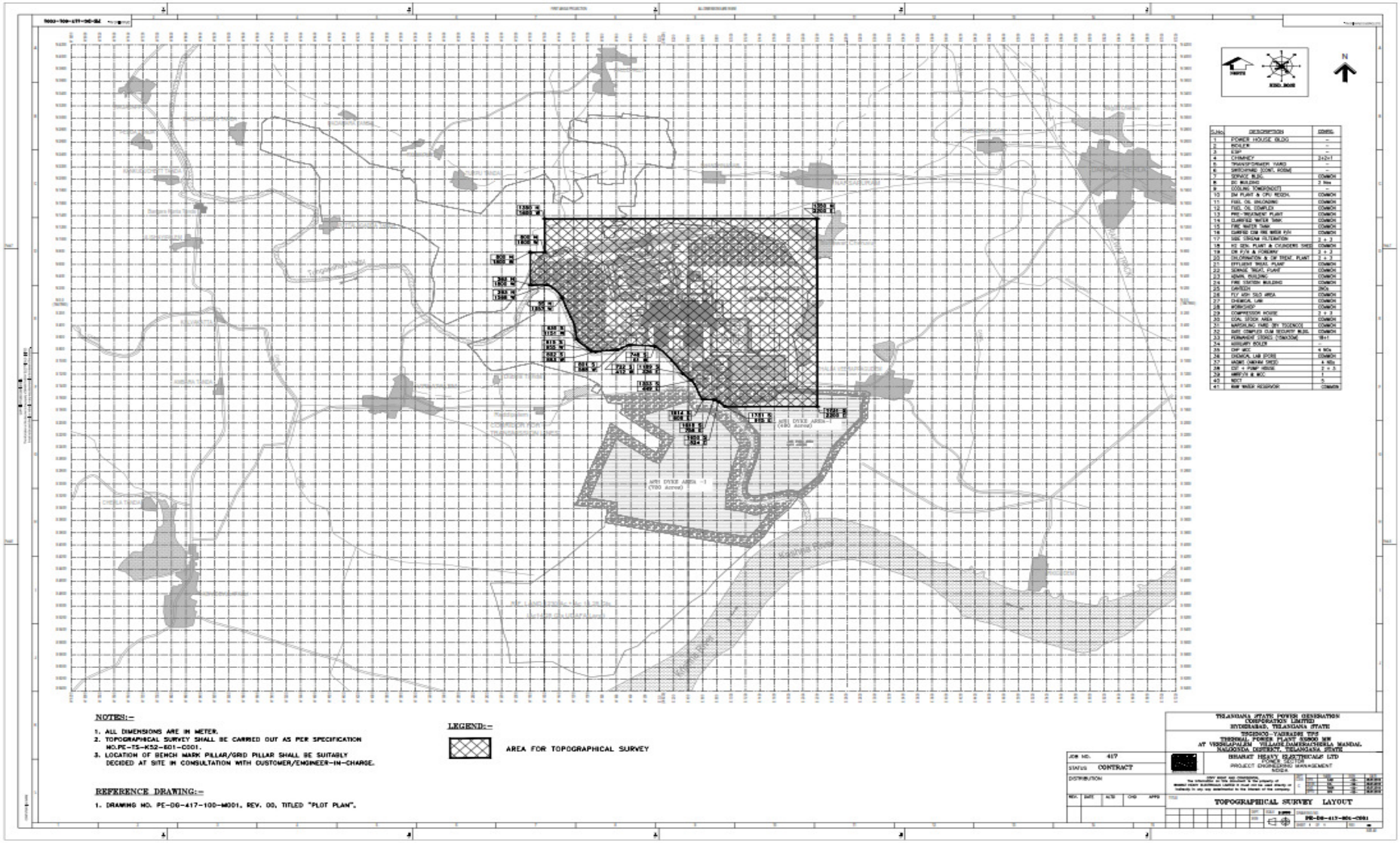

Project :5x800MW Yadadri Thermal Power Station at Veerlapalem, Telangana State.
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August 19, 2016

Table No 1 Borehole details:

Sr no	Structure type	Bore/Test no	Northing	Easting	Ground level (G.L.) in terms of RL(+)	Water Table below (G.L.)	Termination depth (m)
1	Wagon Tippler,Track Hopper and Tunnels	IBH 1	1008	-127	95.15	-	20.0
2		IBH 2	952	-116	90.23	-	10.0
3		IBH 3	930	-552	96.46	-	15.0
4		IBH 4	913	-186	89.66	-	20.0
5		IBH 5	888	-427	90.23	-	15.0
6	Coal Stock Yard with Conveyors and JNTs	IBH 6	769	-114	86.87	-	10.0
7		IBH 7	714	-155	86.80	-	10.0
8		IBH 8	720	-72	87.96	3.00	10.0
9		IBH 9	659	-361	86.59	-	10.0
10		IBH 10	649	-172	92.75	-	10.0
11		IBH 11	633	99	92.02	-	10.0
12		IBH 12	624	-729	88.71	-	10.0
13		IBH 13	597	-650	87.75	-	10.0
14		IBH 14	545	-26	88.24	-	15.0
15		IBH 15	544	-321	85.50	-	10.0
16		IBH 16	526	-198	88.32	4.00	10.0
17		IBH 17	510	125	88.49	3.00	10.0
18		IBH 18	69	142	87.16	3.00	10.0
19		IBH 19	439	-209	84.24	-	10.0
20		IBH 20	437	-705	88.62	-	10.0
21		IBH 21	419	-11	86.33	3.90	15.0
22		IBH 22	401	225	86.27	3.50	10.0
23		IBH 23	395	-415	86.00	-	10.0
24		IBH 24	385	152	87.05	-	10.0
25		IBH 25	341	-672	89.27	4.10	10.0

Project :5x800MW Yadadri Thermal Power Station at Veerlapalem, Telangana State.
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Sr no	Structure type	Bore/Test no	Northing	Easting	Ground level (G.L.) in terms of RL(+)	Water Table below (G.L.)	Termination depth (m)
26	Coal Stock Yard with Conveyors and JNTs	IBH 26	329	314	85.60	-	10.0
27		IBH 27	329	314	83.70	3.60	10.0
28		IBH 28	288	249	84.30	-	10.0
29		IBH 29	288	249	87.25	3.10	10.0
30		IBH 30	242	176	84.15	-	10.0
31		IBH 31	242	176	87.57	3.90	10.0
32		IBH 32	216	-648	88.01	-	10.0
33		IBH 33	193	57	84.77	-	10.0
34		IBH 34	193	-57	83.94	3.85	10.0
35		IBH 35	119	-548	85.80	-	10.0
36		IBH 36	116	-417	84.08	-	10.0
37		IBH 37	74	-615	86.24	-	10.0
38	CHP & AHP Structures in Power Block Area	IBH 38	69	142	84.12	-	10.0
39		IBH 39	20	249	80.58	4.00	10.0
40		IBH 40	13	-139	79.66	5.00	10.0
41		IBH 41	-158	0	78.01	3.00	10.0
42		IBH 42	-158	431	82.62	4.00	10.0
43		IBH 43	-1578	-38	77.28	-	10.0
44		IBH 44	-144	867	87.38	4.00	10.0
45		IBH 45	167	-154	77.89	5.50	10.0
46		IBH 46	-1558	-94	79.11	3.50	10.0
47		IBH 47	-166	579	84.96	-	10.0
48		IBH 48	-2110	140	77.53	2.90	10.0

Project :5x800MW Yadadri Thermal Power Station at Veerlapalem, Telangana State.
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Field tests details are enlisted below:

Table No 2 PLATE LOAD TEST

Sr no	Structure type	Bore/Test no	Northing	Easting	Ground level (G.L.) in terms of RL(+)
1	Coal Stock Yard with Conveyors and JNTs	IPLT 1	744	-364	88.20
2		IPLT 2	518	271	88.03
3		IPLT 3	508	-490	86.21
4		IPLT 4	305	-228	84.72
5	CHP & AHP Structures in Power Block Area	IPLT 5	0	143	82.40
6		IPLT 6	1607	-62	78.09
7		IPLT7	-207	192	81.67
8		IPLT8	-198	261	80.97

Table No 3 CYCLIC PLATE LOAD TEST

Sr no	Structure type	Bore/Test no	Northing	Easting	Ground level (G.L.) in terms of RL(+)
1	Coal Stock Yard with Conveyors and JNTs	ICPLT 1	608	-705	88.33
2	CHP & AHP Structures in Power Block Area	ICPLT2	-158	328	81.08
3		ICPLT3	-158	-36	77.78

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Table No 4 ELECTRICAL RESISTIVITY TEST

Sr no	Structure type	Bore/Test no	Northing	Easting	Ground level (G.L.) in terms of RL(+)
1	Coal Stock Yard with Conveyors and JNTs	IERT 1	808	-111	87.05
2		IERT 2	793	-231	89.59
3		IERT 3	482	279	87.66
4		IERT 4	396	-709	88.89
5	CHP & AHP Structures in Power Block Area	IERT 5	54	-139	82.13
6		IERT 6	20	301	81.04
7		IERT 7	-23	208	80.27
8		IERT 8	101	199	79.03
9		IERT 9	1591	110	80.75
10		IERT 10	232	184	81.91

Table No 5 PRESSUREMETER TEST

Sr no	Structure type	Bore/Test no	Northing	Easting	Ground level (G.L.) in terms of RL(+)
1	Wagon Tippler,Track Hopper and Tunnels	IPMT 1	1027	-155	97.76
2		IPMT 2	969	-338	95.29
3		IPMT 3	834	-611	91.41
4	Coal Stock Yard with Conveyors and JNTs	IPMT 4	409	-2	86.16

Table No 6 CROSS HOLE SHEAR WAVE TEST

Sr no	Structure type	Bore/Test no	Northing	Easting	Ground level (G.L.) in terms of RL(+)
1	Coal Stock Yard with Conveyors and JNTs	ICST 1	639	-753	88.89
2		ICST 2	613	-874	88.27

INVESTIGATION METHODOLOGY AND SUB-SOIL CHARACTERISTICS

Subsurface Exploration

The subsurface condition was evaluated through Fourty eighttest boreholes to the required depth. The borings were drilled using Calyx machine at the stipulated locations. The boring depths were measured from the existing grade at the time of our field activities. The object of site exploration is to provide reliable, specific and detailed information about the soil and rock conditions for foundation design.

Field Investigation

Drilling

Core drilling was completed using rotary type boring machine with diamond bits. Casing of 150mm diameter was advanced up to the firm strata as per IS 1892-1979. In order to extract maximum possible information and to prevent the loss of valuable sub-surface data obtained during the drilling of rock core (NX size) indexing and storing of the cores obtained was done as specified by IS 4078.

Sampling in soils

Undisturbed soil samples

Cohesive soil samples were obtained using thin wall tube samplers, as per IS: 2132 in such a manner that moisture content and structure of soil did not alter. The sampler was slightly oiled from outside to reduce friction. It was then attached to the boring rod, lowered to the bottom of the hole and pressed into the soil. The sampler tubes were serially numbered immediately on their recovery.

Disturbed soil sample

Cohesionless soil samples were obtained from boreholes at each 1 m interval or at the change of strata whichever occurs earlier and stored as per procedure laid down by IS: 1892-1979. The samples were stored in polythene bags and numbered appropriately for proper identification. These samples were used for grain size analysis and chemical analysis.

Standard Penetration Test on Soil

The standard penetration tests were conducted inside exploratory bore holes at depths shown in bore logs as per the procedure stipulated in IS: 2131 - 1981. The disturbed soil sample from tube was carefully stored to carry out further tests. The values of standard penetration blows, N values, at various borehole locations were indicated in the respective bore logs. SPT ‘N’ values were co-related with relative density of non-cohesive stratum and with consistency of cohesive stratum. Co-relations are tabulated in Annexures“General Notes” Table 1 and Table 2.

Sampling in rock

Rock cores

When rock was encountered, size of borehole was changed to NX (76mm) diameters. Double tube and NX sized bits were used for rotary drilling and recovering rock cores, conforming to IS 6926. Recovered rock cores were numbered serially and preserved in good quality sturdy wooden core boxes. Rock Core Recovery and Rock Quality Designation (RQD) were computed for every run length drilled. Rock samples were selected based on the probable founding elevation of the proposed structure.

Rock classification in terms of weathering and state of fractures and strength is carried out as in Annexures“General Notes” Table 3.

Static Plate Load Test:(Reaction Method)

The test is conducted as per IS 1888 – 1982.

The plate load test is carried out at desired pit location. A rigid, 25 mm thick steel plate of 450mm x 450 mm is firmly seated at the center of the pit. The loads on the test plate are applied by reaction loading method to avoid fluctuations, impact, eccentricity etc. The loading frame fabricated on ground for this purpose, has the weight of 1 T. The hydraulic jack has an attached pressure gauge, which is carefully calibrated. A steel ball is placed at the central point of the jack and the frame, to ensure vertical application of the load. The pressures are applied in suitable increments. The pressure is increased to the next higher intensity of pressure step when no appreciable settlement is noted under the applied intensity of pressure over considerable time interval. The settlement, of the test plate is measured with reference to an independent steel slotted angle, anchored in the ground. The settlements are measured using dial gauges having least count of 0.01 mm i.e. measuring to the accuracy of 0.01 mm.

After completion of the test load Vs settlement curve is plotted to the arithmetic scale. From the curves safe bearing capacity is read corresponding to the settlement of plate (Sp) which is calculated for the assumed footing settlement using the following formula.

$$S_p = S_f \left[\frac{B_p}{B_f} X \frac{(B_f + 30)}{(B_p + 30)} \right]^2$$

Where:

S_p = Settlement of plate (mm)

S_f = Settlement of footing (mm)

B_p = Width of plate (cm), and

B_f = Width of footing (cm

For different size of footing settlement of plate is calculated. Corresponding to the calculated settlement of plate the safe bearing capacity is obtained from the load Vs settlement graph.

Cyclic plate load test (Reaction Method)

The cyclic plate load test is carried out at desired at the test depth. A rigid, 25 mm thick steel plate of 450 mm x 450 mm or of desired size is firmly seated at the center of the pit. The loads on the test plate are applied by reaction loading method to avoid fluctuations, impact, eccentricity etc. The loading frame fabricated on ground for this purpose, has the weight of 1 T. The hydraulic jack has an attached pressure gauge, which is carefully calibrated. A steel ball is placed at the central point of the jack and the frame, to ensure vertical application of the load. The pressures are applied in suitable increments. The pressure is increased to the next higher intensity of pressure step when no appreciable settlement is noted under the applied intensity of pressure over considerable time interval. The settlement, of the test plate is measured with reference to an independent steel slotted angle, anchored in the ground. The settlements are measured using dial gauges having least count of 0.01 mm i.e. measuring to the accuracy of 0.01 mm.

Packer Permeability Test

After completion of boring packer's permeability test was carried out as per the IS Method.The water is allowed in the tube well at the pressure intervals of 2 kg/cm2, 4 kg/cm2 and 6 kg/cm2 noted the water meter readings at t = 0, 5, 10 and 15 minutes time interval. Then again water meter mediator was noted at the reduced pressure of 4 and 2 kg/cm2. Finally water intake for the every 15 minutes interval is calculated. Then average intake is evaluated. Based on these observations the daily recharging possible is calculated.From all the three methods of recharging, it is concluded that all the methods are within reasonable limits of variance.

Electrical Resistivity Test (Wenner's Method)

The test was conducted as per IS 1892 & IS 3043The electrical resistivity method is based on the measurement and recording of change in the mean resistivity or apparent specific resistance of various soils. The resistivity is usually defined as the resistance between opposite phases of a unit cube of the material. By the determination of vertical and lateral variations in this resistance it is possible, within certain limitations, to infer the stratification and lateral extent of subsurfacedeposits. Several methods involving different electrode arrangement have been developed for making field resistivity measurements. Among these are the Wanner, Schlumberger, and Lee Methods. Schlumberger method is commonly utilized for most European surveys. This method is also accepted in India.

P	=	2 * 3.142*DE/I
Wherein		
P	=	Mean resistivity Ohm-m
D	=	Distance between the electrodes (cm)
E	=	Potential drop between inner electrode (V)
I	=	Current flowing between outer electrode (A)

Pressure meter test

Pressure meter test shall be carried out at 1m, 3m, 5m, 7m, 9m, 12m, 15m, 18m and 20m depths in all types of strata.The purpose of the pressure meter tests is to determine rock strength parameters.Deformation modulus, E parameter shall be obtained from the tests.The pressure meter and its associated equipment is of electronic type and the size of the pressure meter probe corresponds to NX size of borehole. The pressure meter is capable of applying 350kg/cm^2 radial pressure without distress. The pressure meter equipment is suitable for the rock strata and depth to be tested.The test was conducted in at various depth(s) indicated as directed by the Consultant. The probe was introduced through boreholes advanced by conventional rotary drillings.

After placing the probe at the required elevation, pressure was applied in more than 6 equal pressure increments up to failure point or till the specified maximum pressure of 350 Kg/cm^2 is reached. In a standard test, readings of volume change in relation to the time were taken at 60 seconds after pressure increase for each pressure step.The volume changes at 60 seconds versus pressure is plotted to give the in situ stress-strain curve.

Cross hole shear wave test

The cross hole shear wave test was conducted as per IS 13372 part 1 & 2.This test shall be generally carried out in accordance with IS: 13372to establish the dynamic elastic properties of soil and rock. In thistest, the seismic waves are to be picked up in two adjacent receiverboreholes. The spacing of boreholes shall be determined so as toobtain good results. The boreholes shall be uncased in the portioncarrying the geophones. However it should be kept filled with wateror drilling mud in order to ensure perfect contact between the borehole wall and the geophone. In case of cased hole preferably alow velocity material such as a high impact PVC should be used forcasing and it is essential that it should be well grouted behind inorder to make an intimate contact with the soil.

The charge shall beinstalled within the depth as specified and the waves shall be pickedup from the geophones installed at required depths in receiverboreholes. Knowing the travel time from shot hole to receiver holeand corresponding distance, the velocity of the waves is determinedwhich enables to estimate dynamic elastic modulus, shear modulusand Poisson's ratio. In each receiver borehole multiple geophonesshall be provided at 2m interval (with starting depth as 3m belowground level) to cover the depth and various strata as specified.Intensity of the waves shall be recorded by multiple channelseismograph.

Laboratory Work

The laboratory work scope included analysis of the soil, rock and groundwater samples from the fieldwork for the following parameters:

A)Soil

1. Grain size analysis (GSA)
   a) Sieve analysis
   b) Hydrometer analysis
2. Specific gravity
3. Dry Density
4. Natural Moisture Content
5. Atterberg Limits
   a) Liquid Limit
   b) Plastic Limit
   c) Shrinkage Limit

B) Rock

1. Density
2. Water absorption
3. Specific Gravity
4. Porosity
5. Unconfined Compression Test
6. Point Load Index
7. Modulus of Elasticity
8. Slake Durability Index
9. Hardness test
10. Soundness test

C) Chemical analysis of soil

Chemical analysis test of soil samples including sulphate (SO_3), Chloride and pH

D) Chemical analysis of water

Chemical analysis test of water samples including sulphate (SO_3), Chloride, and pH

E) Foundation Recommendation

1 Depth of foundation
2 Type of foundation
3 Net safe bearing capacity

Laboratory Tests

Tests on Soil samples:

The soil samples collected from boreholes were analyzed for their physical and engineering properties as described below:

Grain Size Analysis

A quantitative determination of the particle size distribution in the soil was made by wet sieve analysis and sedimentation analysis using hydrometer. Procedure laid down by IS: 2720 Part – IV was followed. The particle sizes were designated according to the scale given in IS: 1498 (Table -1).

Particle size distribution

Classification (Identified by behavior)	Denseness	Size of particles in mm
Gravel	Coarse	80 to 20
	Fine	20 to 4.75
Sand	Coarse	4.75 to 2
	Medium	2 to 0.425
	Fine	0.425 to 0.075
Silt & Clay		Less than 0.075

Specific Gravity

Specific gravity of soil was determined by the density bottle method. This test is determined as per test procedure laid in IS: 2720 (Part III/Section 1).

Natural Moisture Content

Natural moisture content was determined by using the oven drying method. This test was carried out as per IS: 2720 (Part - II).

Dry Density

Dry Density was carried out in accordance with the water displacement method stated in IS 2720 (Part V) and was determined for undisturbed samples only.

Atterberg Limits

To understand the plasticity and shrinkage characteristic of the soils, liquid limit, plastic limit and shrinkage limits were determined. Liquid limit is the moisture content at which soil passes from plastic stage to liquid state, as determined by the liquid limit test. Plastic Limit is the moisture content at which the soil becomes too dry to be in a plastic condition, as determined by the Plastic Limit Test. Reduction of moisture content by drying below

Shrinkage Limit is not accompanied by decrease in volume; instead air enters the voids of the system and material becomes partially or fully unsaturated. Liquid Limit and Plastic Limit are determined as per IS: 2720 Part - V and Shrinkage Limit as per IS: 2720 Part VI.

Tests on Rock samples:

Density

Density was determined as per IS 13030.

Water Absorption

Water Absorption was determined as per procedure laid in IS: 1124.

Specific Gravity

Specific gravity was determined as per procedure laid in IS: 1124.

Porosity

Porosity was determined as per test procedure laid in IS: 1122.

Unconfined Compression test

Unconfined Compression test was determined as per test procedure laid in IS: 9143.

Point Load Index

Point Load Index was determined as per test procedure laid in IS: 8764 (1998).

Modulus of Elasticity

Modulus of Elasticity wasdetermined as per test procedure laid in IS: 9221 (1979).

Slake Durability Index

Slake Durability Index was determined as per test procedure laid in IS: 10050 (1981).

Chemical Analysis:

Tests on Soil

Chloride Content, Sulphate content and pH value were determined as per test procedure laid in IS: 2720 (Part XXVI and Part XXVII).

Tests on Water

Chloride Content, Sulphate content, and pH value were determined as per test procedure laid in IS: 3025 (Part XXVI and Part XXXII).

GEOLOGICAL REPORT

GEOLOGY OF THE STUDIED SECTION:

The proposed site for Thermal Power Plant lies over Stage Nandyal shale of Kundair Series in Kurnool System. The Kurnool have been sub-divided into four series, composed mainly of limestones with sub-ordinate shale and sandstones. Outcrops of Kurnool rocks, sometimes called PALNAD SERIES, are developed in Palnad, in the north-east of the Cuddapah basin, stretching on both sides of the Krishna river. They lie unconformably on the Cuddapahs.

GENERAL DESCRIPTION OF ENCOUNTERED ROCK:

Sandstone:

Sandstone is the abundant rock type encountered within the area of interest. It is essentiallycomposed of quartz with decomposed and altered feldspar and mica as minor constituents;rare dark minerals are not uncommon. Depending on the intensity of weathering the bodycolor of the rock varies from light grey to brownish grey. The rock is dominantly fine tomedium grained, some are very fine; apparently massive and medium spaced bedded.Sometimes thick to moderately thick beds are very thinly inter banded and a few instancesshows sets of cross bedding. Grains are mostly sub rounded-to-rounded. Frequently thesandstone contains extremely fine-grained shale clasts of variable sizes and also stringersand layers of it. The orientation of such clasts is dominantly bed parallel. A general trend offining -up sequence is observed. In general the sandstone is matrix supported, moderately to medium hard, moderately strong (at fresh end), medium to tightly compacted and moderately porous with medium low specific gravity. Depending on weathering the strength parameters also reduced a great extent.

Shale :

The color of the shale varies depending on degree of weathering though remains reddish brown. Grain size of the rock varies from extremely fine to fine grains contains good amount of silt / very sand size grains particularly at the gradual transition from sandstone to shale. It is very thinly laminated but not cleaved. The shale frequently contains stringers of sand / silt and less frequently clasts of sandstone / siltstone. Mineralogical composition of shale is not identified due to its extreme fine (shale) nature. The rock is soft, densely compacted and depending on degree of weathering it may be weak, usually strong to very strong. Preferably and easily split along the almost horizontal to very low angle (<5°) lamination planes. Weathered shale easily breaks under finger pressure or even disintegrates into rock particles when kept in water and at dry conditions the surface of the shale is marked with sun-cracks. Compositionally shale is homogeneous and structurally isotropic but intervention with silt / sand is dominant at some depths. Porosity of the shale is very low and the specific gravity is medium.

Limestone:

The color of the limestone varies depending on degree of weathering though remains white in colour.Limestone consist essentially of calcium carbonate with some magnesium carbonate and quartz grains. The average chemical analysis shows 92% of CaCo3 and MgCo3 together, and 5% SiO3 the proportion of magnsium carbonate is small except in magnesium and dolometic limestones.

Limestones are bedded rock often containing many fossile ; they are readily scratched with a knife , effervesce on the addition of cold dilute hydrochloric acid (except dolomite). They are formed both chemically and organically.

Calcium carbonate is present in the form of crystals (aragonite and calcite) and as amorphouse calcium carbonate , and also as the hard parts of organisms (fossils) such as shells and calcareous skeletons, on their broken fragments.Thus consolidated shells isa limestones by virtue of the calcium carbonate of which the shells are made. Onthe other hand chemically deposited calcium carbonate builds limestone under conditions where water of high alkalinity has restricted circulation as in a shallow sea or lake. Impurities commonly present in limestone include clay, silica in colloidal form or as quartz grains on the other hand detrital grains. Though usually grey or white in colour the rock may be tinted by iron compounds or finely devided carbon or by bitumen.

Quartzite

It is formed by contact or hydrothermal metamorphism. It is composed of quartz grains so firmly cemented that when broken, it fractures through the grains instead of around them.

The colour of the rock varies according to the nature of the impurities, pure impurieties, pure quartzite is white.Quartzite is quite resistant action. It is used for paving blocks and for manufacturing of silica bricks.

GEOLOGY OF TELANGANA

Nalgonda area bounded by latitudes 16°45' ;17°12 and longitudes 79°00' ; 80°00 E over an area of about 5000 sq.km. The area forms a part of the Eastern Dharwar Craton and comprises mainly rocks of older Metamorphics, Peninsular Gneissic Complex and minor schist belts occurring as linear NNW-SSE trending belt at Medavaram (16°57'30"; 79°40'35", 56 P/9). The hornblende schist and amphibolites (older metamorphics), which are the oldest rocks, occur as rafts, enclaves and discontinuous linear bands within the Gneissic Complex. The Gneissic Complex is represented by migmatites, granites, granodiorite, tonalite-trondhjemite suite of rocks and hornblende-biotite schists. The schist belts comprise metabasalt, metarhyolite and banded haematite quartzite. These are intruded by younger granites, basic dykes and quartz pegmatite veins and the rocks of the Gneissic Complex are unconformably overlain by the sedimentary rocks of the CuddapahSupergroup and Kurnool Group in the southeastern part of the area.

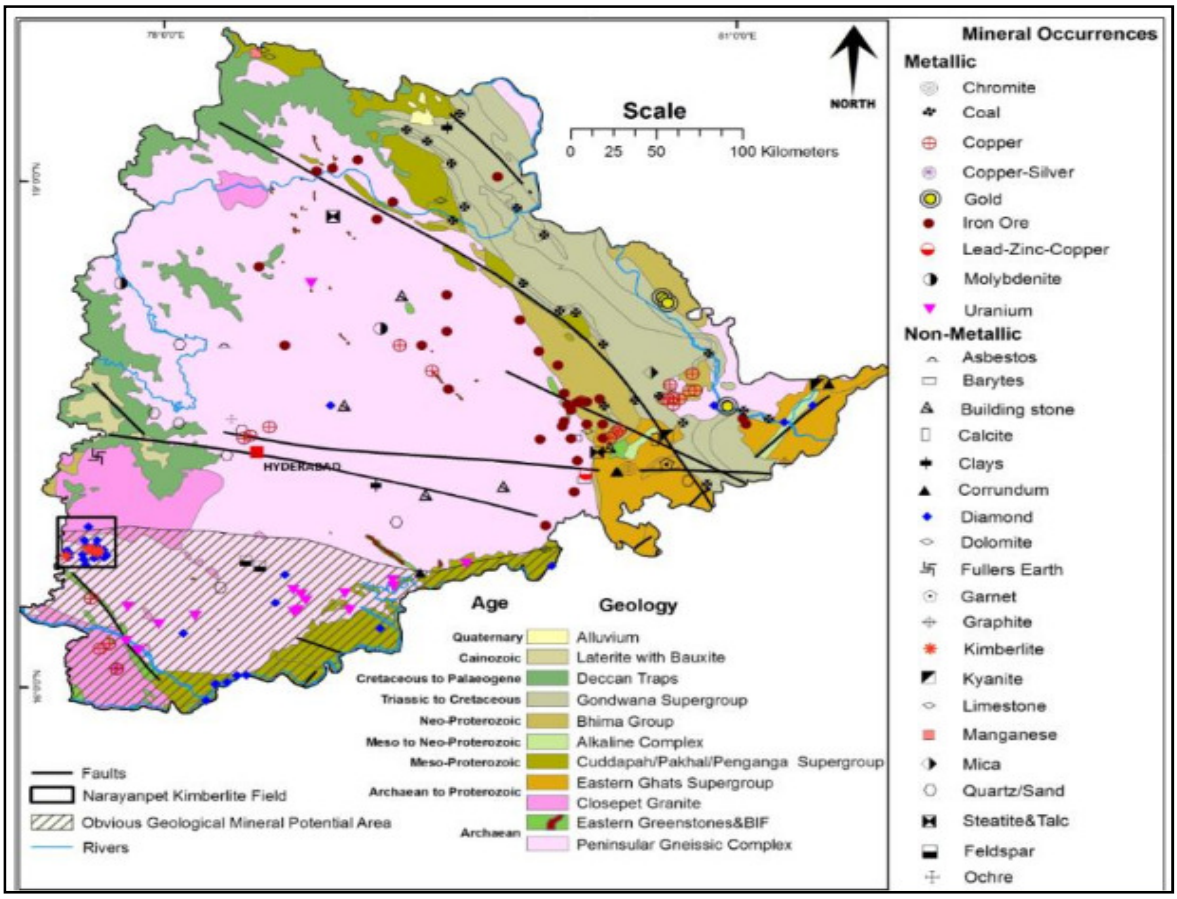

Fig. 1 Gelogical map showing mineral occurrence in Telangana Site

Table 1.Relation between Soil Properties and Penetration Resistance on Basis of Standard Penetration Test for Sand/Non Plastic Silt According to Geotechnique journal Vol XXXVI No.3, Sept. 1986.

Relative Density	Penetration Value	Relative Density I_D %
Very Loose	0 to 4	0-15
Loose	4 to 10	15-35
Medium	10 to 30	35-65
Dense	30 to 50	65-85
Very Dense	50 and above	85-100

Table 2. Relation Between soil properties and Penetration resistance on basis of Standard Penetration Test for Clay / Plastic Silt.

Consistency	Number. of Blows (SPT)
Very Soft	0 to 2
Soft	2 to 4
Medium	4 to 8
Stiff	8 to 15
Very Stiff	15 to 30
Hard	30 and above

Table 3 Rock quality in terms of Weathering Grades of Rock Mass According to I.S. 4464.

Terms	Description	Grade	Interpretation
Fresh	No visible sign of rock material weathering; perhaps slight discoloration on major discontinuity surfaces.	I	*CR > 60%*
Slightly Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. Weathering may discolour all the rock material.	II	CR between 40% to 60%
Moderately Weathered	Less than half of the rock material is decomposed or disintegrated to a soil. Fresh or discoloured rock is present either as a continuous framework or as core stones.	III	CR between 25% to 40%
Highly Weathered	More than half of the rock material is decomposed or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as core stones.	IV	CR between 11% to 25%
Completely Weathered	All rock material is decomposed and / or disintegrated to soil. The original mass structure is still largely intact.	V	CR between Zero to 10%
Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.	VI	CR = Zero % But N > 50

It should be understood that all grades of weathering may not be seen in a given rock mass and that in some cases a particular grade may be present to a very small extent. Distribution

of the various weathering grades of rock material in the rock mass may be related to the porosity of the material and the presence of open discontinuities of all types in the rock mass.

Table 4 Ground Water Limits According to IS 456 - 2000

Test	Value
pH	6 to 8
Cl ppm	500
SO_3 ppm	400

Table 5.Chemical Content Limits for soils According to IS 456 - 2000

Test	Value
pH	6.5 to 8.30
Cl %	0.2
SO_3 %	0.04
Salinity %	3.30

CHEMICAL TESTS:

Chemical tests were performed on few soil and water samples for determining the pH value, Sulphate, Chloride, carbonate content etc. The results are given in a tabular form below:

Chemical Analysis of soil

BH. No.	Depth	Total Carbonates (as CaCO3)	Sulphate (as SO4)	Sulphite (as SO3)	Chloride (as Cl)	Nitrate (as NO3)	Nitrite (as NO2)	p H Value (By Digital p H Meter)	Turbidity (as N T U)	Total Organic matter
		ppm	ppm	ppm	ppm	ppm	ppm	6.50 – 8.30	max 1000	ppm
IBH 1	5.80	167	37	30.83	128	0.041	0.030	7.81	361	59
IBH 10	5.10	156	31	25.83	123	0.047	0.035	7.9	370	60
IBH 12	5.00	159	50	41.67	135	0.051	0.038	7.7	377	62
IBH 26	3.60	152	31	25.83	117	0.027	0.020	7.45	347	51
IBH 44	4.00	162	39	32.50	122	0.038	0.028	7.5	344	49

Nature of the Sample Water

Results of Analysis	*Water IBH 45*	Depth (m): 1.00
Sulphate (as SO4)	0.034	%
Chloride (as Cl)	0.16	%
p H Value (By Digital p H Meter)	7.4	**6.50 – 8.30**

It is seen that the values are within permissible limits (as per IS:456-2000) and so no special cement will be required for foundation concrete. either ordinary Portland cement or Portland slag cement or Portland Pozzolana cement can be used for concreting.

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Sr. No.	IBH No.	Depth (m)	Core Piece No.	Water Absorption or Moisture content (%)	Specific Gravity	Hardness (Moh's scale)	Soundness %	Porosity (%)	Dry Density (g/cc)	Slake Durability (I_d)	Point Load Index at in situ water content (MPa)	Point Load Index at saturated water content (MPa)	Deformability or Evalue (Mpa) at in situ water content	Deformability or Evalue (Mpa) at saturated water content	UCS (MPa) at in situ water content	UCS (MPa) at saturated condition	Core Description
1	1	3.00 to 3.75	7	0.31	2.61			1.15	2.58								Quartzite
2	1	11.25 to 12.00	38				15					5					Quartzite
3	2	2.25 to 3.00	7	1.20	2.56			1.17	2.53								Quartzite
4	3	5.25 to 6.00	13				7							1.43E+04		118	Quartzite
5	3	6.75 to7.50	17								2						Limestone
6	4	9.75 to 10.50	31	0.48	2.63		4	1.14	2.60								Limestone
7	5	3.00 to 3.75	17			4					2						Limestone
8	5	6.00 to 6.75	30									4				107	Quartzite
1	6	3.75 to 4.50	16				5						1.46E+04			19	Quartzite
2	7	3.00 to 3.75	16								3						Quartzite
3	8	3.75 to 4.50	7			7					4						Quartzite
4	9	3.00 to 3.75	5							15							Limestone
5	9	8.25 to 9.00	13			7	10										Quartzite
6	10	1.50 to 2.25	10	0.41	2.72			1.10	2.69								Quartzite
7	10	4.50 to 5.25	37									2					Quartzite
8	11	6.00 to 6.75	25	0.74	2.56			1.17	2.53								Quartzite
9	11	7.50 to 8.25	31			7									21		Quartzite
10	12	7.50 to 8.25	29	0.27	2.56			1.17	2.53								Quartzite
11	12	9.00 to 9.75	35				7					5				115	Quartzite
12	13	0.75 to 1.50	10				11			20	1						Limestone
13	13	9.75 to 10.50	31			3				19							Limestone
14	13	9.75 to 10.50	31							22						79	Limestone
15	14	5.25 to 6.00	26	4.17	2.53			1.23	2.40								Limestone
16	14	9.00 to 9.75	49											1.60E+04	83		Limestone
17	14	9.00 to 9.75	49			3									32		Limestone
18	15	3.75 to 4.50	25				10							1.60E+04	86		Limestone
19	15	4.50 to 5.25	19	0.32	2.51			1.20	2.48								Limestone
20	15	6.00 to 6.75	39			6						4					Quartzite
21	16	2.25 to 3.00	5							15			1.43E+04		88		Quartzite
22	17	6.75 to 7.50	24	0.99	2.56			1.17	2.53								Quartzite
23	17	9.00 to 9.75	35							20							Quartzite
24	18	4.50 to 5.25	10										1.67E+04		154		Quartzite
25	18	6.00 to 6.75	31			3	7				2						Limestone
26	19	3.75 to 4.50	21											1.25E+05		77	Limestone
27	19	3.00 to 3.75	15	0.41	2.55			1.18	2.52								Limestone
28	20	3.75 to 4.50	6										1.15E+04		71		Limestone
29	20	7.50 to 8.25	10	2.38	2.53			1.23	2.40								Limestone
30	21	5.25 to 6.00	21											9.67E+04		75	Quartzite

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31	22	2.25 to 3.00	6										1.09E+04		29		Quartzite
32	22	4.50 to 5.25	12			7	11										Quartzite
33	23	8.25 to 9.00	30			3										113	Limestone
34	23	6.75 to 7.50	21	1.12	2.57		12	1.17	2.54								Limestone
35	24	1.50 to 2.25	3							22							Quartzite
36	24	2.25 to 3.00	9	0.32	2.60			1.16	2.57								Quartzite
37	25	0.75 to 1.50	5			7					2						Quartzite
38	25	6.00 to 6.75	25	0.34	2.57		9	1.17	2.54								Limestone
39	26	5.25 to 6.00	13			6											Quartzite
40	26	9.00 to 9.75	33											1.62E+04		143	Quartzite
41	27	4.50 to 5.25	13	0.50	2.59			1.26	2.36						22		Limestone
42	27	5.25 to 6.00	17			3						2					Limestone
43	27	4.50 to 5.25	13									5					Limestone
44	28	3.00 to 3.75	9	1.74	2.58		14	1.20	2.46								Quartzite
45	29	5.25 to 6.00	33			6					9						Quartzite
46	29	6.00 to 6.75	38				13								56		Quartzite
47	30	3.00 to 3.75	9			3				18							Limestone
48	30	4.50 to 5.25	18	0.30	2.50			1.20	2.47								Quartzite
49	31	4.50 to 5.25	20	0.47	2.54			1.40	2.11								Limestone
50	31	3.75 to 4.50	16									5		1.43E+04		115	Limestone
51	32	3.75 to 4.50	12	0.33	2.58			1.16	2.55								Quartzite
52	32	5.25 to 6.00	16							18						32	Quartzite
53	33	1.50 to 2.25	4			7						4	6.00E+04			91	Quartzite
54	34	5.25 to 6.00	26	0.29	2.60		12	1.15	2.57						86		Quartzite
55	34	1.50 to 2.25	7			6						1					Quartzite
56	35	2.25 to 3.00	8													115	Quartzite
57	35	0.75 to 1.50	2				13				2						Quartzite
58	36	4.50 to 5.25	9			6									103		Quartzite
59	36	2.25 to 3.00	6	0.44	2.67			1.12	2.64					1.16E+04		28	Quartzite
60	37	3.75 to 4.50	19	0.48	2.57			1.27	2.34								Quartzite
61	37	4.50 to 5.25	25			3									35		Quartzite
62	38	1.50 to 2.25	14	0.67	2.62		2	1.15	2.59	20		2					Quartzite
63	39	3.75 to 4.50	15				4			18	3						Quartzite
64	40	4.50 to 6.00	43			6				22							Quartzite
65	40	9.00 to 10.00	70										1.57E+04		120		Shale
66	41	3.00 to 3.75	16				4						1.33E+05		197		Quartzite
67	42	2.25 to 3.00	30			7				15					8		Limestone
68	43	3.00 to 3.75	12	0.41	2.55			1.18	2.52					1.20E+05		28	Limestone
69	44	0.00 to 0.75	3				9			19				1.46E+05		80	Quartzite
70	45	6.00 to 6.75	66							15							Quartzite
71	45	9.00 to 10.00	88			4	8				3						Shale
72	46	8.25 to 9.00	20			7							7.00E+04		63		Limestone
73	47	6.00 to 7.50	71	0.60	2.59			1.16	2.56	16	8			1.54E+04		65	Shale
74	48	3.00 to 3.75	13	0.76	2.60			1.16	2.57								Limestone

Based on the bore log details and laboratory test results of soil & rock samples, it has been observed that the entire project area is having more or less same profile and following design parameters are obtained to arrive Net safe bearing capacity of isolated and raft footings.

Design parameters (ISG area)

Areas covered – Wagon Tippler,Track Hopper and Tunnels, Coal Stock Yard with Conveyors and JNTs, CHP & AHP Structures in Power Block Area

GENERALIZED PROFILE OF VARIOUS SOIL/ROCK LAYERS ENCOUNTERED AT SITE

Stratum I

It consists of dense sandy silt with completely weathered rock from existing ground level to 1.00m.The Standard penetration tests conducted in this stratum show generally refusal but the lowest value being 81. The DS samples collected show the following properties

Non plastic characteristics.

Grain size

Gravel: 4.21%

Sand: 47.17%

Silt + clay : 48.63%

Atterberg limits: Non plastic in nature

Specific gravity: 2.66

Stratum II

It consists of Highly to moderately weathered light grey fine grained rock from 2.0m to 7.50m. The core recovery varies from 4% to 58% and RQD in the range of Nil to 48%

The following tests were carried out and the average values are given below:

Water absorption (%): 0.71

Specific Gravity: 2.59

Hardness (MOH's Scale): 8

Soundness (%): 8

Porosity (%): 1.17

Dry density (g/cc): 2.54

Slake Durability (%): 18.39

Point Load Index (Mpa, in- situ): 2.62

Point Load Index (Mpa, 7days saturation): 3.54

Deformability (Mpa, in- situ): 7.72E+04

Deformability (Mpa, 7days saturation):6.32E+04

UUCS (Mpa, in- situ): 84.61

UCS (Mpa, 7days saturation): 83.18

Stratum III

It consists of Slightly weathered to Fresh fine grained rock from 4.50m to 20.0m. The core recovery varies from 24% to 89% and RQD in the range of Nil to 74%

The following tests were carried out and the average values are given below:

Water absorption (%) : 0.6

Specific Gravity: 2.59

Hardness (MOH's Scale): 6

Soundness (%): 6

Porosity (%): 1.16

Dry density (g/cc): 2.56

Slake Durability (%): 17.75

Point Load Index (Mpa, in- situ): 4.5

Deformability (Mpa, in- situ): 4.29E+04

Deformability (Mpa, 7days saturation):1.54E+04

UCS (Mpa, in- situ) : 91.4

UCS (Mpa, 7days saturation): 65.3

Design parameters (ISG area)

Areas covered – Wagon Tippler,Track Hopper and Tunnels, Coal Stock Yard with Conveyors and JNTs, CHP & AHP Strutures in Power Block Area

Sub soil Profile for ISG area

Ground Level (GL): varies

Stratum	Description	Depth (m)	Thickness of layer (m)	SPT N value	CR (%)	RQD (%)
I	Sandy silt	GL to 1.0 m	1.0	81		
II	Highly weathered fine grained rock having UCS value 500 kg/sqcm upto 3.5m depth below ground level.	1.0 to 3.5 m	2.5		21 to 58	Nil to 26
III	Moderately weathered to fresh fine grained rock having UCS value 700 kg/sqcm below 3.5m depth below ground level.	3.5 m to 11.0 m	7.5	-	21 to 89	NIL to 74

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Safe Bearing Capacity Calculations

SAFE BEARING CAPACITY IS EVALUATED FROM SHEAR FAILURE CRITERION.

								soil	
			square					**s**	
c=							=	**0**	t/sqm
∅=	ANGLE OF SHEARING RESISTANCE			r			=	**30**	degrees
D_f=	DEPTH OF FOUNDATION						=	**1**	m
r =	SATURATED DENSITY						=	**1.00**	t/m^3
f_s=	FACTOR OF SAFETY						=	**2.5**	
W'=	WATER TABLE CORRECTION						=	**0.5**	
α	inclination angle						=	**0**	
q=	OVER BURDEN PRESSURE	=r*Df					=	**1.00**	t/m^2
B=	WIDTH OF FOUNDATION						=	**10**	m
L=	LENGTH OF FOUNDATION						=		
$\sqrt{N_\phi}$=	$\tan(\pi/4 + \phi/2)$						=	1.7320508	
N_c=							=	30.14	
N_q=	BEARING CAPACITY FACTORS						=	18.4	
N_γ=	BEARING CAPACITY FACTORS						=	22.4	
S_c=	SHAPE FACTOR						=	1.3	
S_q=	SHAPE FACTOR	=1+(B/L)*0.2					=	1.2	
S_γ=	SHAPE FACTOR	=1-0.4*(B/L)					=	0.8	
	dc	dq	dg	ic	iq		ig		
	1.03	1.017321	1.017321	1	1		1		
q_{ult}=	$cN_c s_c d_c i_c + q(N_q - 1) s_q d_q i_q + 0.5 B\gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$						=		
$cN_c s_c d_c i_c$		0	30.14	1.3	1.03		1		0
$q(N_q - 1) s_q d_q i_q$		1.00	17.4	1.2	1.01732		1		21.24165
$0.5 B\gamma N_\gamma s_\gamma d_\gamma i_\gamma W'$		0.5	10	1.00	22.4		0.8	0.5	45.57596
		1.017321	1						66.81761
							q_{ult}=	66.82	T/sqm
	WITH	FS = 2.5					q_{ns} safe=	**26.727044**	
q_{ns} safe=	Net Safe Bearing Capcity							**20.00**	T/sqm

SETTLEMENT ANALYSIS

Schmertmann's method of settlement calculations is presented.

$$s = C_1 * C_2 * \Delta P \sum_{i=1}^{n} \frac{Izi * \Delta zi}{\Sigma E}$$

s=	settlement,cms	=			
B=	Width of foundation			10	m
d'o=	Depth upto foundation level	=		1	m
γ_o=	Density upto foundation level	=		1.00	t/m^3
σ'_o=	insitu overburden pressure at foundation level	=		1	t/m^2
C_1=	**embedment factor**	**=**			
C_1=	1-0.5*σ_o/($\triangle$ p)	> or = 0.5			0.975
				0.975	
t=	time in years	=		**50**	years
C_2=	**long term settlement factor**	**=**			
C_2=	1+.2 $\log_{10}$(t / 0.1)				1.540
Δp=	**net foundation pressure**	**=**		**20.0**	**t/m^2**
Δ zi=	**thickness of ith layer**	**=**			
Δz_1=	thickness of 1st layer	=		5	m
Δz_2=	thickness of 2nd layer	=		5	m
Δz_3=	thickness of 3rd layer	=		5	m
Δz_4=	thickness of4th layer	=		5	m
Ezi=	**Modulus of elasticity of ith layer**				
Ez_1=	Modulus of elasticity of 1st layer	=		2538597.8	t/m^2
Ez_2=	Modulus of elasticity of 2nd layer	=		3170000	t/m^2
Ez_3=	Modulus of elasticity of 3rd layer	=		3170000	t/m^2
Ez_4=	Modulus of elasticity of 4th layer	=		3170000	t/m^2
Izi=	**Influence factor in ith layer**	**=**			
d'o=	Depth upto B/2 below foundation level	=		5	m
γ_1=	Density from foundation level to B/2 below the foundation level	=		**1.00**	**t/m^3**
σ' v_p=	insitu vertical stress at B/2 below the foundation level	=		6.00	
Iz =	Influence factor at *b/2 level* below the foundation				
Iz =	0.5+0.1*sqrt(Δ p/ σ' v_p)	=			0.68

0

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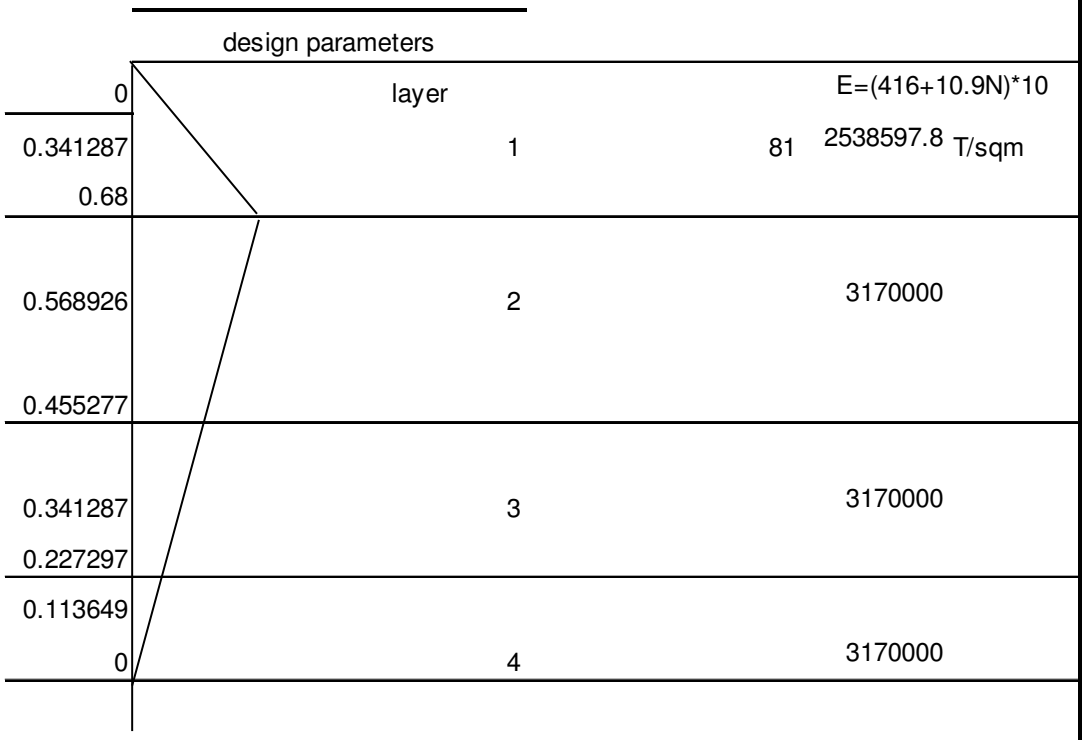

layer	Izi	Δzi	Ei	Iz*Δ zi/Ezi
1	0.341287	500	2538597.8	6.722E-05
2	0.568926	500	3170000	8.974E-05
3	0.341287	500	3170000	5.383E-05
4	0.113649	500	3170000	1.793E-05
				0.0002108

$$s = C_1 * C_2 * \Delta P * \sum_{i=1}^{n} \frac{izi*\Delta zi}{Ezi}$$

s=	0.975	1.540	20.0	0.0002108	0.0063291	cm
Depth correction factors		0.97	Rigidity factor	0.8	**0.06**	mm

SBC for 0.06 mm settlement = 20.00 T/sqm

Settlement analysis by IS 8009 (Part 1) figure 9				
Standard penetration	N	=	81	
Effective overburden pressure		=	1	kg/cm^2
Correction factor		=	1	as per IS 2131 fig 1
Corrected N value		=	81	
Settlement for 1kg/cm^2		=	5	mm
Water table correction factor		=	0.5	as per IS 8009 (Part 1) fig. 9 and clause 9.1.4
Settlement for 20t/m^2		=	5	mm
Immediate settlement		=	0.06	mm
Total settlement		=	5.06	mm
Depth factor		=	0.97	
Rigidity factor		=	0.8	
Corrected Total settlement		=	3.93	mm for 20 t/m^2

Project :5x800MW Yadadri Thermal Power Station at Veerlapalem, Telangana State.
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SAMPLE CALCULATION OF BEARING CAPACITY ISG SCOPE STRUCTURES

BEARING CAPACITY CALCULATION BASED ON CORE STRENGTH OF ROCK MASS

As per IS 12070:1987, Clause 6

For rock mass with favourable characteristics:

1 rock surface is parallel to the base of the foundation
2 load has no tangential component
3 rock mass has no open discontinuities

$$q_s = q_o * N_j$$

q_s = safe bearing pressure (gross)

q_o = average uniaxial compressive strength of rock cores

N_j = empirical coefficient depending on the spacing of discontinuities

$$N_j = \frac{3+S/B_t}{10\sqrt{(1+300\,\delta/S)}}$$

assumed FOS = 3

δ	=	thickness of discontinuities	=	1	cm
S	=	spacing of discontinuities	=	30	cm
B_t	=	footing width considered	=	1000	cm
N_j	=	(3+30/1000)/ (10*SQRT(1+300*1/30))	=	0.0914	

Relationship valid for rock mass with:

1 spacing of discontinuities greater than 0.3m = 30cm
2 aperture (opening) of discontinuities less than 10mm
(15mm filled with soil or rock debris)
3 foundation width greater than 0.3m = 30cm

Considerations for correction factors:				
1	Submergence =		c_1	0.5
2	Cavity =		c_2	0.5
3	Slope =		c_3	0.5

.....(clause 9.2)

Sl. No	Depth of footing below EGL (m)	UCS (q_o) (kg/cm^2)	$q_s = q_o * N_j$ (kg/cm^2)	Net safe bearing capacity ($q_{ns}=qs*c_1*c_2*c_3$) (kg/cm^2)	Net safe bearing capacity, q_{ns} (t/m^2)
1	1				NA
2	2	500	45.68	5.71	57
3	3	500	45.68	5.71	57
4	4	700	63.95	7.99	80
5	5	900	82.22	10.28	103
6	5m and above	900	82.22	10.28	103

Project :5x800MW Yadadri Thermal Power Station at Veerlapalem, Telangana State.
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August 19, 2016

BEARING CAPACITY CALCULATION BASED ON RMR METHOD FOR ROCK STRATA IN ISG SCOPE AREA

Depth (M)			UCS Mpa	Rating for Comp. Strength	RQD (%)			Rating Drilling Quality	Spacing of Discon tinuity m	Rating for Spacing	Oreintation of Discon tinuity	Rating for Oreintation	Condition of Discon tinuity	Rating for Condition	Ground water Condition	Rating for Ground water	RMR Value	SBC T/m2
				1				2		3		4		5		6	Col (1+2+3+4+5+6)	
	To					To												
1.0	-	2.0	50	4	0	-	25	3	0.06 - 0.2	8	Fair	-7	slickened	10			25	66
2.0	-	3.0	50	4	0	-	25	3	0.06 - 0.2	8	Fair	-7	slickened	10	wet	7	25	66
3.0	-	4.0	70	7	0	-	25	3	0.06 - 0.2	8	Fair	-7	slickened	10			28	80
4.0	-	5.0	90	7	0	-	25	3	0.06 - 0.2	8	Fair	-7	slickened	10			28	80
5.0	-	>5	90	7	0	-	25	3	0.06 - 0.2	8	Fair	-7	slickened	10			28	80

RECOMMENDATIONS FOR NET SAFE BEARING CAPACITY

Recommended net safe bearing capacity for Isolated and raft footings for all areas

GL: varies

S. No.	Depth of foundation below EGL (m)	Recommended Net safe bearing capacity (T/m2)
1	1	20
2	2	50
3	3	55
4	4	80
5	5 m or below	80

Note: In case any soil/loose pocket is observed at the founding level, the same shall be removed and filled with PCC up to the required founding level.

Suitability of the soil for construction of roads and embankments:

Suitability of the soil for construction of roads and embankments ,their stable slopes for shallow and deep excavations, active andpassive earth pressures, earth pressure at rest are furnished.

For $\phi = 30$

$K_a = \tan^2(45-\phi/2) = 0.928$

$K_p = \tan^2(45+\phi/2) = 1.072$

$K_0 = 1-\sin\phi = 0.500$

For $\phi = 45$

$K_a = \tan^2(45-\phi/2) = 0.828$

$K_p = \tan^2(45+\phi/2) = 1.172$

$K_0 = 1-\sin\phi = 0.293$

Sand is suitable with factor of safety 1.5

Suitability of locally available soils at site for filling and backfilling purposes:

On an average basis, soil hasgravel content 5.09%, sand, 54.20%, silt 16.51% and clay 24.20%. The Atterberg Limits shows soil to be non plastic in nature. The Specific gravity is 2.67. The soil is non swelling and chemically non reactive. Hence it is suitable for backfilling purpose.

Identification of any other potential geotechnical problems and their remedial measures are as follows:

- Limestones shall have soluble cavities. Piping is to be checked for water retaining structures.
- Limestone shall be friable at high temperature. Stability of rock as high temperature is not assumed.
- Necessary buffer layer over limestone is to be designed and provided. A bentonite cake is one of the useful provisions.
- Shale has a tendency to soften on exposure to alternate wetting and drying.

Protective measures based on chemical nature of soil and groundwater:

Protective measures based on chemical nature of soil and groundwater with due regard to the potential deleterious effects on concrete, steel and other building materials etc.

- The aggressive chemicals especially sulphates are within the permissible limits of 0.20%. The aggressive chemicals are within the permissible limits as per IS 456-2000. Hence no precautions in the form of extra cover or anticorrosive treatment to the reinforcement are necessary. The type of cement to be used for the concreting is Ordinary Portland Cement (OPC).
- Hence, no protective measures are required.

Suitability of quartzite as aggregate:

Hard rock encountered at the site is quartzite. It can be used as an aggregate in

a) Road construction
b) Concreting in construction field

because of the following reasons:

i. Density is more than 2.5 gm/cc
ii. Water absorption is less than 1%.
iii. Specific gravity is greater than 2.5
iv. Hardness is about 6-7
v. Soundness is less than 12%
vi. Rock has good unconfined Compressive Strength
vii. Good CBR values

Suitability of soil/weathered rock as back filling material

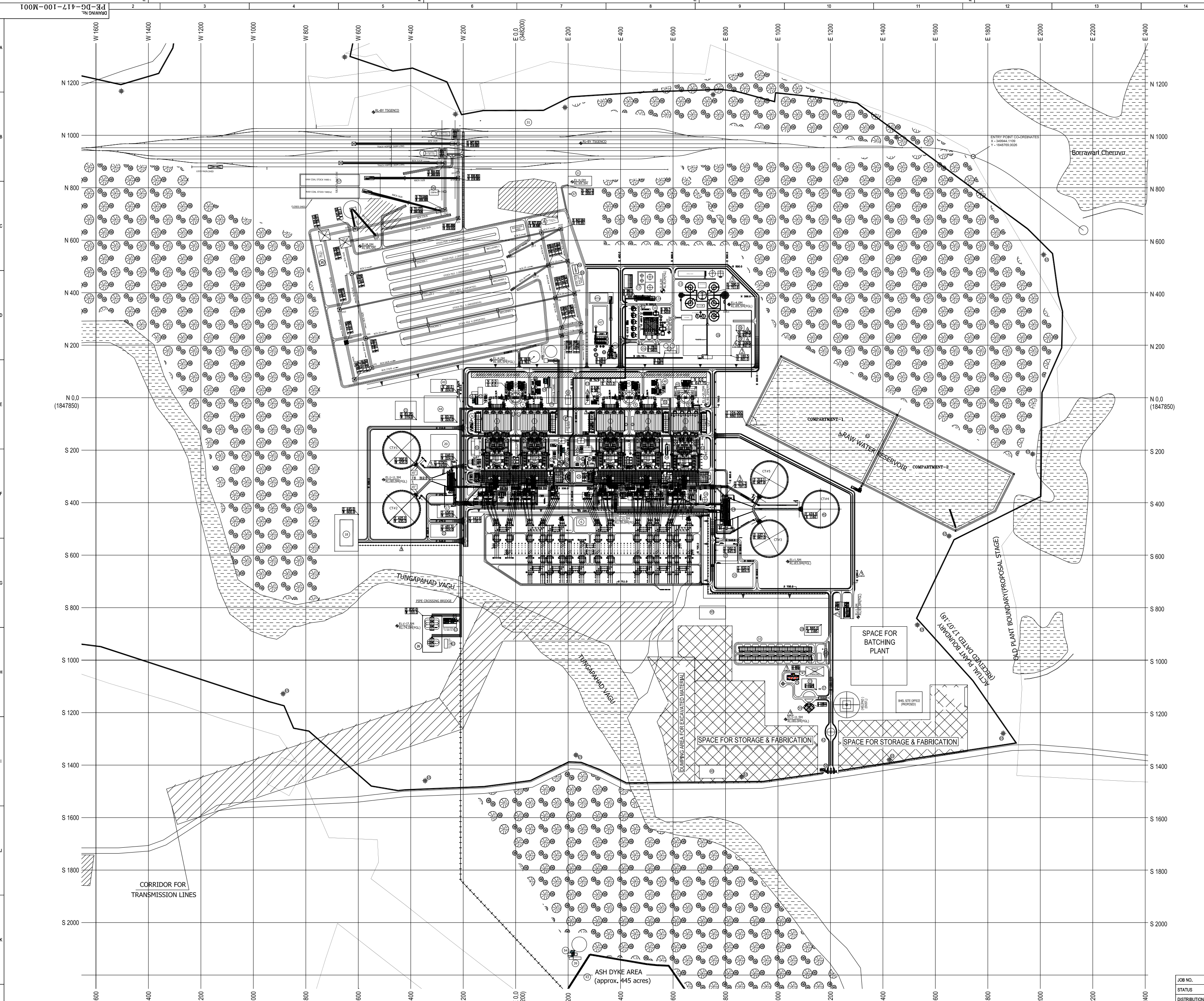
i. Specific gravity is 2.66
ii. It is non plastic in nature.
iii. It is non swelling soil
iv. Good proctor density
v. Sufficient Safe bearing capacity
vi. Chemically not aggressive.

General Note:

1. The sub soil formation at the project site consists of Highly Weathered Light grey fine grained Quartzite rock followed by moderately weathered rock and further slightly weathered to fresh Quartzite up to termination depth of bore holes. At some bore holes, Limestone/shale/Basalt is also encountered.
2. The minimum depth of foundation shall be 1 m below Existing Ground Level (EGL).
3. The project site is located in Seismic Zone–II as per IS 1893 Part-1, 2002. Considering very little soil horizon and predominantly Highly weathered to moderately weathered rock at shallow depth, the possibility of liquefaction is ruled out.
4. The existing top layer is highly weathered rock and is suitable for filling/backfilling purposes.
5. Considering the presence of weathered rock from Ground level in almost all bore holes, blasting may be required during excavation. Slope during excavation may be kept as 1:0.5 depending upon type of rock strata.
6. Electrical Resistivity Test results shall be referred from Vol-II
7. Cyclic Plate load test results, Pressure meter test results, Seismic refraction test results and Cross hole shear test results shall be referred from Volume-III
8. For design of Machine foundations, Cross Hole Shear Test results shall be referred.

REFERENCES

IS : 2131	-	Standard Penetration Test
IS : 2720 Part – II	-	Determination of Moisture Content of soil.
IS : 2720 Part – III	-	Determination of Specific Gravity of Soil.
IS : 2720 Part – V	-	Determination of Liquid Limit and Plastic Limit of Soil.
IS : 2720 Part – VI	-	Determination of Shrinkage Limit of Soil.
IS : 2720 Part – IV	-	Grain Size Analysis of Soil.
IS : 2720 Part – XXVII	-	Determination of Sulphate Content of Soil.
IS : 2720 Part – XXVI	-	Determination of pH Value of Soil.
IS : 3025 Part – 24	-	Determination of Sulphate Content of Water.
IS : 3025 Part – 32	-	Determination of Chloride Content of Water.
IS : 1498 – 1970	-	Indian Classification system.
BIS13030 : 1991	-	Determination of Water Absorption and Porosity on Rock
BIS 13030 : 1991	-	Determination of Unit weight of Rock.
BIS 9143 : 1979	-	Determination of Unconfined Compressive Strength of Rock core
Dr. N. V. Nayak	-	Foundation Manual



S.No.	DESCRIPTION	CONFIG.	SCOPE	ZONE
1	POWER HOUSE BLDG	-	BHEL	F-6,7&8
2	BOILER	-	BHEL	F-6,7&8
3	ESP	-	BHEL	E-6,7&8
3a	ESP CONTROL BUILDING	5	BHEL	E-6,7&8
4	CHIMNEY	2+2+1	BHEL	E-6,7&8
5	TRANSFORMER YARD	-	BHEL	E-6,7&8
6	SWITCHYARD & SWIT. CONT. ROOM	-	BHEL	F-7
7	SERVICE BLDG.	2 Nos.	TSGENCO	F-7 & F-9
8	DG BUILDING	3 Nos	BHEL	F-6,8 &9
9	SPACE FOR AIR WASHER	-	BHEL	F-6,7,8 &9
10	DM PLANT	COMMON	BHEL	D-8
10a	CPU REGEN PLANT	COMMON	BHEL	E-8
11	FUEL OIL UNLOADING BY RAIL(HFO)	COMMON	BHEL	B-7
12	FUEL OIL TANK-FARM AREA	COMMON	BHEL	D-8
12a	FUEL OIL FORWARDING P/H	COMMON	BHEL	D-8
13	PRE-TREATMENT PLANT	COMMON	BHEL	D-9
14	SW OVERHEAD TANK	1NOs	BHEL	F-9
15	FIRE WATER P/H CUM TANK	COMMON	BHEL	E-8
16	CLARIFIED WATER P/H CUM TANK	COMMON	BHEL	D-9
17	SIDE STREAM FILTERATION	2 + 3	BHEL	F-6&F-9
18	H2 GEN. PLANT & CYLINDERS SHED	COMMON	BHEL	G-5
19	CW P/H & FOREWAY	2 + 3	BHEL	F-6&F-9
20	CHLORINATION & CW TREAT. PLANT	2 + 3	BHEL	F-6&F-9
21	EFFLUENT TREAT. PLANT	COMMON	BHEL	E-5
22	SEWAGE TREAT. PLANT	COMMON	BHEL	F-6
23	ADMIN. BUILDING	COMMON	TSGENCO	H-10
24	FIRE STATION BUILDING	COMMON	TSGENCO	G-10
25	CANTEEN	2NOs	TSGENCO	F-7 & G-10
26	FLY ASH SILO AREA	COMMON	BHEL	G-6
~~27~~	~~CHEMICAL LAB~~ (PART OF PT PLANT)	-	-	
28	WORKSHOP	COMMON	TSGENCO	G-10
29	COMPRESSOR HOUSE	2 + 3	BHEL	F-6 & F-7
30	COAL STOCK AREA	COMMON	BHEL	E-4/7 & C-4/7
31	MARSHLING YARD (M/S TSGENCO)	COMMON	TSGENCO	B 1 TO 9
32	GATE COMPLEX CUM SECURITY BLDG.	COMMON	TSGENCO	I-10
33	PERMANENT STORES (15MX30M)	18+1	TSGENCO	H-9&10
34	AUXILIARY BOILER	COMMON	BHEL	E-7&8
35	CHP ELECTRICAL BLDG. 1	1 No.	BHEL	B-5/6
	CHP ELECTRICAL BLDG. 2	1 No.	BHEL	B-5/6
	CHP ELECTRICAL BLDG. 3	1 No.	BHEL	C-4
	CHP ELECTRICAL BLDG. 4	1 No.	BHEL	C-7
	CHP ELECTRICAL BLDG. 5	1 No.	BHEL	E-7
36	CHEMICAL LAB (PCRI)	2 Nos.	TSGENCO	D-9
37	AAQMS (4MX4M SHED)	4 NOs	BHEL	H-10,F-7,C-7 & F-9
38	CST + PUMP HOUSE	2 Nos.	BHEL	F-7
39	AWRP/H, CLARIFIER, CHEM. BLDG & MCC	COMMON	BHEL	K-7
40	NDCT	5 NOs.	BHEL	E-5/6 & F-9/10
41	RAW WATER RESERVOIR	COMMON	TSGENCO	E-10/11
42	PYLON/FOUNDATION STONE	-	TSGENCO	I-10
43	ASH DYKE AREA (M/S TSGENCO)	-	TSGENCO	L-7/8
44	AMMONIA STORAGE&HANDLING PLANT	COMMON	BHEL	E-6
45	FGD	-	BHEL	E-6,7,8&9
46	LIME STONE PREPERATION AREA	COMMON	BHEL	D-7&8
47	GYPSUM DEWATERING & STORAGE	COMMON	BHEL	D-7&8
47a	LIME STONE STORAGE SHADE	COMMON	BHEL	D-7&8
48	FGD MCC & CONTROL ROOM	2 Nos.	BHEL	E-6&8
49	RAIN WATER HARVESTING PONDS	3 Nos.	TSGENCO	G-9/I-9/E-5
50	ASH SLURRY PUMP HOUSE	3 Nos.	BHEL	F-6/F-7/F-8
51	VACCUM PUMP HOUSE	5 Nos.	BHEL	G-6/7/8
52	CLARIFIER & CHEM. BLDG	COMMON	BHEL	D-7
52A	ASH WATER PH WITH TANK .	COMMON	BHEL	D-7
53	AHP COMPRESSOR HOUSE	2 Nos.	BHEL	E-7/E-6/F-7/ F-8/G-6/L-7/8
54	AHP ELECTRICAL BLDG. 1	1 No.	BHEL	
	AHP ELECTRICAL BLDG. 2	1 No.	BHEL	
	AHP ELECTRICAL BLDG. 3	1 No.	BHEL	
	AHP ELECTRICAL BLDG. 4	1 No.	BHEL	
	AHP ELECTRICAL BLDG. 5	1 No.	BHEL	
	AHP ELECTRICAL BLDG. 6	1 No.	BHEL	
~~55~~	~~HELIPAD (EXISTING BY TSGENCO)~~	~~-~~	~~TSGENCO~~	
56	DSPH	03 Nos.	BHEL	C-6/C-7/E-7
57	RAW COAL STOCKYARD	-	BHEL	C-4/5
58	COAL PILE RUN OF POND	-	BHEL	D-7
59	SIMULATOR CUM TRAINING BLDG.	COMMON	TSGENCO	H-10
60	WEIGH BRIDGE (PEM)	1 No.	BHEL	H-10
61	11KV & 3.3KV SWGR	2 Nos.	BHEL	F-6/D-8
62	FLY ASH EQUIPMENT TOWER	5 Nos/ UNIT	BHEL	E-6/7/8
63	HCSD PUMP HOUSE CUM SILO UTILITY BLDG,UNIT-1&2	1 Nos.	BHEL	H-6
	HCSD PUMP HOUSE CUM SILO UTILITY BLDG,UNIT-3,4&5	1 Nos.	BHEL	H-6
64	BA OVER FLOW TANK CUM DRAIN SUMP	1 No./UNIT	BHEL	F-6,7&8
65	WATCH TOWER	20 Nos.	TSGENCO	ALONG BOUNDARY

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD
					03	19.11.18	MK	BKA	JJ	02	03.07.18	MK	BKA	JJ	01	06.04.18	AMS	BKA/MK	JJ
					01	PLOT PLAN REVISED AS PER COMMENTS RECIVED DATED 18.07.18				01	PLOT PLAN REVISED AS PER MOM OF MEETING HELD ON 19.04.18 AT VIDYUT SOUDHA, HYDERABAD				01	PLOT PLAN REVISED AS PER MOM OF KICK-OFF MEETING HELD ON 26-27.02.18 AT VIDYUT SOUDHA, HYDERABAD			
					02	REVISED AS MARKED 3.				02	REVISED AS MARKED 2.				02	REVISED IN LINE WITH TCE COMMENTS RECEIVED VIA EMAIL DATED 19.03.18.			

JOB NO. 417
STATUS CONTRACT
DISTRIBUTION

CUSTOMER: TELANGANA STATE POWER GENERATION CORPORATION LTD
TELANGANA INDIA
YADADRI TPS (5X800 MW)

CONSULTANT: TATA CONSULTING ENGINEERS LIMITED
BANGALORE INDIA

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE: M

	NAME	SIGN	DATE
DRN	AMS	-Sd-	15.12.17
DESN	MK	-Sd-	15.12.17
CHD	BKA	-Sd-	15.12.17
APPD	JJ	-Sd-	15.12.17

TITLE

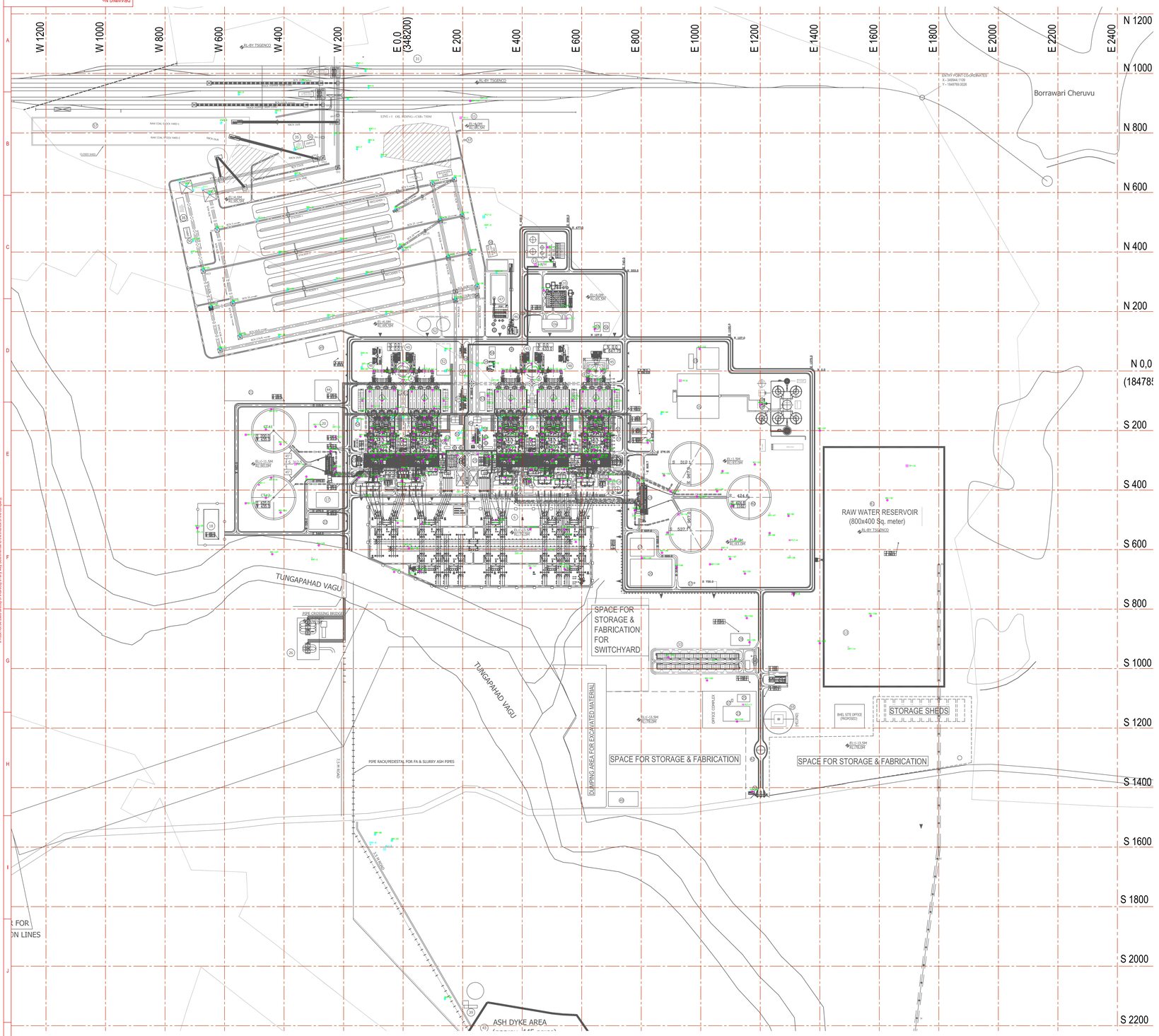
PLOT PLAN

DEPT. SIGN SCALE 1:5000

DRAWING NO. PE-DG-417-100-M001

SHEET 1 OF 1 REV. 03

SIZE-A0



N O T E S :–

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. BORE HOLE SHALL BE DRILLED UPTO THE DEPTH INDICATED AGAINST EACH BORE HOLE OR UPTO 5M IN ROCK WITH CONTINUOUS ROD OF 50% WHICHEVER IS EARLIER. ROCK CORES SHALL BE ARRANGED AND PLACED IN WOODEN CORE BOXES SEQUENTIALLY AND SHALL BE NUMBERED SERIALLY AS PER SPECIFICATION.
3. BACKFILLING OF BORE HOLES AND PITS SHALL BE AS PER SPECIFICATION AND AS DIRECTED BY THE ENGINEER-IN-CHARGE.
4. STARTING DEPTH OF STANDARD PENETRATION TEST (SPT) SHALL BE 1M BELOW GROUND LEVEL AND THE TEST SHALL BE CONDUCTED AT EVERY 1M INTERVAL ALTERNATE TO COLLECTION OF UNDISTURBED SAMPLE (UDS) UPTO 5M DEPTH AND AT EVERY 1.5M INTERVAL ALTERNATE TO COLLECTION OF UDS BEYOND 5M DEPTH, AT CHANGE OF STRATA & AT DEPTHS WHEREVER UDS COULD NOT BE COLLECTED.
5. STARTING DEPTH OF COLLECTION OF UDS SHALL BE 2M BELOW GROUND LEVEL AND UDS SHALL BE COLLECTED AT 1M INTERVAL ALTERNATE TO CONDUCTING SPT UPTO 5M DEPTH & AT EVERY 1.5M INTERVAL ALTERNATE TO CONDUCTING SPT BEYOND 5M DEPTH.
6. PUMP IN TYPE FIELD PERMEABILITY TEST SHALL BE CARRIED OUT AT 1.5M, 4M & 8M DEPTH BELOW GROUND LEVEL IN BH–3, BH–20, BH–48, BH–66, BH–121, BH–135, BH–150, BH–161, IBH–1, IBH–3 & IBH–14.
7. ELECTRICAL RESISTIVITY TEST SHALL BE CARRIED OUT AS PER WENNER'S METHOD.
8. PRESSURE METER TEST SHALL BE CARRIED OUT AT 1M, 3M, 5M, 7M, 9M, 12M, 15M, 18M & 20M DEPTH BELOW GROUND LEVEL.
9. GROUND WATER SAMPLE SHALL BE COLLECTED FROM BH–20, BH–50, BH–74, BH–110, BH–118, BH–140, BH–147, IBH–1, IBH–10, IBH–12, IBH–26, IBH–44 & IBH–47.
10. CROSS HOLE SHEAR WAVE TEST SHALL BE CARRIED OUT AT 2M, 4M, 6M, 8M, 10M, 12M, 15M, 18M & 20M DEPTH BELOW GROUND LEVEL.
11. GEOTECHNICAL INVESTIGATION SHALL BE CARRIED OUT AS PER SPECIFICATION NO. PE-TS-999-603-002 AND PE-DC-K52-602-C002.
12. DO NOT SCALE THIS DRAWING.

GEOTECHNICAL INVESTIGATION LEGEND:

1. BOREHOLE (BH / IBH)
2. CYCLIC PLATE LOAD TEST (CPLT / ICPLT)
3. TRIAL PIT (TP)
4. PRESSURE METER TEST (PMT / IPMT).
5. CROSSHOLE SHEAR TEST (CST / ICST).
6. ELECTRICAL RESISTIVITY TEST (ERT / IERT)
7. PLATE LOAD TEST (PLT / IPLT)
8. BLOCK VIBRATION TEST (BVT)
9. SEISMIC REFRACTION TEST (SRT)

REF DRG :

PE–DG–417–100–M001, REV–01 "PLOT PLAN".

BORE HOLE (BH)			DEPTH (M) (REFER NOTE–2)
MARKING	CO–ORDINATES		
BH–159	961 S	890 E	10
BH–160	1040 S	1021 E	10
BH–161	434 S	1627 E	15
BH–162	314 S	1182 E	10
BH–163	1413 S	1173 E	10

TRIAL PIT (TP)			DEPTH (M)
MARKING	CO–ORDINATES		
TP–1	851 N	194 E	1.5
TP–2	357 N	445 E	1.5
TP–3	64 S	29 W	1.5
TP–4	64 S	99 E	1.5
TP–5	64 S	396 E	1.5
TP–6	64 S	659 E	1.5
TP–7	236 S	236 E	1.5
TP–8	748 S	1309 E	1.5
TP–9	32 S	931 E	1.5
TP–10	318 S	1693 E	1.5
TP–11	280 S	1 E	1.5
TP–12	280 S	432 E	1.5
TP–13	280 S	585 E	1.5
TP–14	313 S	361 W	1.5
TP–15	404 S	899 E	1.5
TP–16	482 S	926 E	1.5

BORE HOLE (BH)			DEPTH (M) (REFER NOTE–2)
MARKING	CO–ORDINATES		
BH–1	0.0 N/S	100 W	10
BH–2	0.0 N/S	20 W	20
BH–3	0.0 N/S	29 E	15
BH–4	0.0 N/S	99 E	10
BH–5	69 S	112 W	10
BH–6	69 S	29 E	10
BH–7	99 S	137 W	10
BH–8	99 S	71 W	20
BH–9	99 S	70 E	20
BH–10	99 S	136 E	10
BH–11	128 S	22 W	10
BH–12	126 S	105 E	10
BH–13	157 S	69 W	20
BH–14	157 S	71 E	20
BH–15	191 S	105 W	10
BH–16	191 S	38 W	10
BH–17	191 S	36 E	10
BH–18	191 S	105 E	10
BH–19	205 S	70 W	15
BH–20	205 S	70 E	15
BH–21	220 S	144 W	10
BH–22	232 S	104 W	10
BH–23	232 S	36 W	15
BH–24	233 S	0.00 E/W	10
BH–25	232 S	36 E	10
BH–26	232 S	105 E	15
BH–27	232 S	141 E	10
BH–28	263 S	74 W	15
BH–29	263 S	68 E	15
BH–30	283 S	98 W	15
BH–31	283 S	55 W	20
BH–32	283 S	43 E	15
BH–33	283 S	87 E	20
BH–34	279 S	135 E	10
BH–35	283 S	182 E	15
BH–36	302 S	74 W	15
BH–37	302 S	68 E	15
BH–38	329 S	3 W	10
BH–39	330 S	110 E	10
BH–40	357 S	149 W	10
BH–41	356 S	88 W	10
BH–42	360 S	45 E	15
BH–43	369 S	5 W	10
BH–44	0.0 N/S	334 E	10
BH–45	0.0 N/S	408 E	10
BH–46	0.0 N/S	454 E	20
BH–47	0.0 N/S	530 E	10
BH–48	0.0 N/S	627 E	15
BH–49	0.0 N/S	666 E	20
BH–50	487 S	1295 E	10
BH–51	69 S	317 E	15
BH–52	69 S	454 E	10
BH–53	69 S	604 E	15
BH–54	69 S	711 E	10
BH–55	83 S	284 E	10
BH–56	545 S	1231 E	15
BH–57	99 S	361 E	20
BH–58	99 S	501 E	20
BH–59	99 S	569 E	10
BH–60	99 S	644 E	20
BH–61	126 S	406 E	15
BH–62	126 S	548 E	15
BH–63	126 S	691 E	15
BH–64	157 S	362 E	15
BH–65	157 S	502 E	15
BH–66	157 S	645 E	20
BH–67	191 S	327 E	15
BH–68	196 S	361 E	20
BH–69	191 S	395 E	15
BH–70	191 S	467 E	15
BH–71	191 S	536 E	15
BH–72	191 S	610 E	15
BH–73	191 S	679 E	15
BH–74	205 S	501 E	20
BH–75	205 S	644 E	10
BH–76	229 S	273 E	10
BH–77	232 S	327 E	15
BH–78	232 S	396 E	15
BH–79	232 S	431 E	10
BH–80	232 S	468 E	15
BH–81	232 S	536 E	15
BH–82	235 S	574 E	10
BH–83	232 S	611 E	10
BH–84	232 S	679 E	15
BH–85	241 S	822 E	10
BH–86	263 S	358 E	15
BH–87	263 S	501 E	15
BH–88	263 S	642 E	15
BH–89	287 S	290 E	10
BH–90	283 S	334 E	15
BH–91	283 S	377 E	20
BH–92	283 S	477 E	15
BH–93	283 S	520 E	20
BH–94	283 S	618 E	15
BH–95	283 S	661 E	20
BH–96	302 S	358 E	15
BH–97	302 S	501 E	15
BH–98	302 S	642 E	15
BH–99	330 S	431 E	10
BH–100	330 S	541 E	10
BH–101	357 S	341 E	10
BH–102	357 S	479 E	10
BH–103	357 S	599 E	10
BH–104	350 S	877 E	10
BH–105	363 S	695 E	10
BH–106	370 S	425 E	10
BH–107	370 S	538 E	10
BH–108	375 S	790 E	15
BH–109	908 N	226 E	10
BH–110	416 N	485 E	15
BH–111	272 N	472 E	10
BH–112	141 N	644 E	10
BH–113	129 S	443 W	15
BH–114	187 S	294 W	10
BH–115	196 S	461 W	15
BH–116	214 S	529 W	10
BH–117	246 S	412 W	15
BH–118	269 S	244 W	15
BH–119	359 S	443 W	15
BH–120	328 S	228 W	15
BH–121	426 S	461 W	15
BH–122	355 S	325 W	10
BH–123	444 S	529 W	10
BH–124	476 S	412 W	15
BH–125	527 S	692 W	15
BH–126	586 S	283 W	10
BH–127	615 S	440 W	10
BH–128	336 S	1073 E	15
BH–129	404 S	1055 E	15
BH–130	422 S	987 E	10
BH–131	453 S	1104 E	10
BH–132	468 S	778 E	15
BH–133	510 S	18 W	10
BH–134	500 S	312 E	10
BH–135	530 S	428 E	10
BH–136	532 S	543 E	10
BH–137	574 S	580 E	10
BH–138	596 S	19 E	10
BH–139	675 S	30 W	10
BH–140	673 S	57 E	10
BH–141	662 S	428 E	10
BH–142	685 S	543 E	10
BH–143	643 S	885 E	10
BH–144	564 S	1117 E	10
BH–145	611 S	870 E	15
BH–146	629 S	802 E	10
BH–147	631 S	1099 E	15
BH–148	660 S	919 E	10
BH–149	649 S	1031 E	10
BH–150	915 S	1400 E	10
BH–151	681 S	1148 E	10
BH–152	830 S	1155 E	10
BH–153	74 N	997 E	10
BH–154	113 S	1200 E	10
BH–155	911 S	1164 E	15
BH–156	823 S	1571 E	10
BH–157	200 S	1400 E	15
BH–158	1178 S	1122 E	15

ELECTRICAL RESISTIVITY TEST (ERT)		
MARKING	CO–ORDINATES	
ERT–1	965 S	1040 E
ERT–2	828 S	307 W
ERT–3	534 S	692 W
ERT–4	410 S	126 W
ERT–5	357 S	80 W
ERT–6	374 S	11 W
ERT–7	536 S	79 E
ERT–8	400 S	182 E
ERT–9	386 S	369 E
ERT–10	324 S	463 E
ERT–11	359 S	501 E
ERT–12	354 S	689 E
ERT–13	480 S	771 E
ERT–14	927 S	1496 E
ERT–15	341 S	226 W
ERT–16	290 S	97 W
ERT–17	283 S	54 E
ERT–18	289 S	283 E
ERT–19	296 S	355 E
ERT–20	281 S	488 E
ERT–21	265 S	636 E
ERT–22	181 S	233 W
ERT–23	238 S	70 W
ERT–24	218 S	70 E
ERT–25	205 S	361 E
ERT–26	180 S	501 E
ERT–27	151 S	644 E
ERT–28	621 S	1299 E
ERT–29	125 S	143 W
ERT–30	114 S	140 E
ERT–31	101 S	285 E
ERT–32	78 S	568 E
ERT–33	93 S	711 E
ERT–34	13 S	0.00 E/W
ERT–35	13 N	431 E
ERT–36	226 N	532 E
ERT–37	922 N	261 E
ERT–38	492 S	319 E
ERT–39	542 S	544 E
ERT–40	606 S	378 E
ERT–41	642 S	528 E
ERT–42	590 S	13 E
ERT–43	673 S	21 E
ERT–44	18 N	138 W
ERT–45	37 N	213 E
ERT–46	24 S	299 E
ERT–47	478 S	1232 E
ERT–48	367 N	473 E

PRESSURE METER TEST (PMT)		
MARKING	CO–ORDINATES	
PMT–1	382 S	485 W
PMT–2	211 S	36 E
PMT–3	600 S	1071 E
PMT–4	211 S	467 E
PMT–5	211 S	610 E
PMT–6	283 S	77 W
PMT–7	25 N	0.00 E/W
PMT–8	283 S	355 E
PMT–9	25 N	431 E
PMT–10	283 S	639 E

CROSSHOLE SHEAR TEST (CST)		
MARKING	CO–ORDINATES	
CST–1	30 S	0.00 E/W
CST–2	30 S	431 E
CST–3	30 S	644 E
CST–4	211 S	35 W
CST–5	211 S	538 E
CST–6	211 S	679 E
CST–7	290 S	62 W
CST–8	290 S	80 E
CST–9	290 S	371 E
CST–10	290 S	514 E
CST–11	290 S	655 E

CYCLIC PLATE LOAD TEST (CPLT)			DEPTH (M)
MARKING	CO–ORDINATES		
CPLT–1	0.0 N/S	70 W	1.5
CPLT–2	27 S	615 E	1.5
CPLT–3	152 S	90 E	1.5
CPLT–4	148 S	523 E	1.5
CPLT–5	151 S	666 E	1.5
CPLT–6	210 S	397 E	1.5
CPLT–7	262 S	101 E	1.5
CPLT–8	0.0 N/S	70 E	1.5
CPLT–9	0.0 N/S	361 E	1.5
CPLT–10	0.0 N/S	501 E	1.5

BORE HOLE FOR ISG SCOPE(IBH)			DEPTH (M) (REFER NOTE–2)
MARKING	CO–ORDINATES		
IBH–1	1008 N	127 W	20
IBH–2	952 N	116 W	10
IBH–3	930 N	552 W	15
IBH–4	913 N	186 W	20
IBH–5	868 N	427 W	15
IBH–6	769 N	114 W	10
IBH–7	746 N	155 W	10
IBH–8	720 N	72 W	10
IBH–9	659 N	361 W	10
IBH–10	649 N	172 E	10
IBH–11	635 N	99 E	10
IBH–12	624 N	729 W	10
IBH–13	597 N	650 W	10
IBH–14	545 N	26 W	15
IBH–15	544 N	321 W	10
IBH–16	526 N	198 E	10
IBH–17	510 N	125 E	10
IBH–18	479 N	625 W	10
IBH–19	439 N	209 W	10
IBH–20	437 N	705 W	10
IBH–21	419 N	11 W	15
IBH–22	401 N	225 E	10
IBH–23	395 N	415 W	10
IBH–24	385 N	152 E	10
IBH–25	341 N	672 W	10
IBH–26	329 N	314 E	10
IBH–27	327 N	124 W	10
IBH–28	288 N	249 E	10
IBH–29	271 N	389 W	10
IBH–30	242 N	176 E	10
IBH–31	232 N	572 W	10
IBH–32	216 N	646 W	10
IBH–33	193 N	57 W	10
IBH–34	182 N	252 W	10
IBH–35	119 N	548 W	10
IBH–36	116 N	417 W	10
IBH–37	74 N	615 W	10
IBH–38	69 N	142 E	10
IBH–39	20 N	249 E	10
IBH–40	13 N	139 W	10
IBH–41	158 S	0.0 E/W	10
IBH–42	158 S	431 E	10
IBH–43	1578 S	38 W	10
IBH–44	144 S	867 E	10
IBH–45	167 S	154 W	10
IBH–46	158 S	94 W	10
IBH–47	166 S	579 E	10
IBH–48	2110 S	140 E	10

S.No.	DESCRIPTION	CONFIG.
1	POWER HOUSE BLDG	-
2	BOILER	-
3	ESP	-
4	CHIMNEY	2+2+1
5	TRANSFORMER YARD	-
6	SWITCHYARD (CONT. ROOM)	-
7	SERVICE BLDG.	COMMON
8	DG BUILDING	2 Nos
9	COOLING TOWER(NDCT)	-
10	DM PLANT & CPU REGEN.	COMMON
11	FUEL OIL UNLOADING	COMMON
12	FUEL OIL COMPLEX	COMMON
13	PRE-TREATMENT PLANT	COMMON
14	CLARIFIED WATER TANK	COMMON
15	FIRE WATER TANK	COMMON
16	CLARIFIED CUM FIRE WATER P/H	COMMON
17	SIDE STREAM FILTERATION	2 + 3
18	H2 GEN. PLANT & CYLINDERS SHED	COMMON
19	CW P/H & FOREWAY	2 + 3
20	CHLORINATION & CW TREAT. PLANT	2 + 3
21	EFFLUENT TREAT. PLANT	COMMON
22	SEWAGE TREAT. PLANT	COMMON
23	ADMIN. BUILDING	COMMON
24	FIRE STATION BUILDING	COMMON
25	CANTEEN	2NOs
26	FLY ASH SILO AREA	COMMON
27	CHEMICAL LAB	COMMON
28	WORKSHOP	COMMON
29	COMPRESSOR HOUSE	2 + 3
30	COAL STOCK AREA	COMMON
31	MARSHLING YARD (BY TSGENCO)	COMMON
32	GATE COMPLEX CUM SECURITY BLDG.	COMMON
33	PERMANENT STORES (15MX30M)	1B+1
34	AUXILIARY BOILER	-
35	CHP MCC	4 NOs
36	CHEMICAL LAB (PCRI)	COMMON
37	AAQMS (4MXM SHED)	4 NOs
38	CST + PUMP HOUSE	2 + 3
39	AWRP/H & MCC	1
40	NDCT	5
41	RAW WATER RESERVOIR	COMMON
42	PYLON/FOUNDATION STONE	-
43	ASH DYKE AREA	-

PLATE LOAD TEST (PLT)			DEPTH (M)
MARKING	CO–ORDINATES		
PLT–1	177 N	552 E	1.5
PLT–2	118 S	105 W	1.5
PLT–3	124 S	600 E	1.5
PLT–4	568 S	1299 E	1.5
PLT–5	221 S	227 W	1.5
PLT–6	262 S	113 W	1.5
PLT–7	279 S	252 E	1.5
PLT–8	262 S	681 E	1.5
PLT–9	513 S	63 E	1.5
PLT–10	600 S	477 E	1.5
PLT–11	1121 S	1142 E	1.5

BLOCK VIBRATION TEST (BVT)			DEPTH (M)
MARKING	CO–ORDINATES		
BVT–1	283 S	547 E	1.5
BVT–2	283 S	31 W	1.5
BVT–3	180 S	72 E	1.5
BVT–4	180 S	644 E	1.5
BVT–5	221 S	70 W	1.5

SEISMIC REFRACTION TEST (SRT)	
S.NO	PROFILE
1	30 S / 99 W TO 30 S / 675 E
2	196 S / 99 W TO 196 S / 675 E
3	283 S / 99 W TO 283 S / 675 E
4	30 S / 99 W TO 283 S / 99 W
5	30 S / 70 E TO 283 S / 70 E
6	30 S / 361 E TO 283 S / 361 E
7	30 S / 498 E TO 283 S / 498 E
8	30 S / 675 E TO 283 S / 675 E

CYCLIC PLATE LOAD TEST FOR ISG SCOPE (ICPLT)			DEPTH (M)
MARKING	CO–ORDINATES		
ICPLT–1	608 N	705 W	1.5
ICPLT–2	158 S	326 E	1.5
ICPLT–3	158 S	36 W	1.5

PLATE LOAD TEST FOR ISG SCOPE (IPLT)			DEPTH (M)
MARKING	CO–ORDINATES		
IPLT–1	744 N	364 W	1.5
IPLT–2	518 N	271 E	1.5
IPLT–3	508 N	490 W	1.5
IPLT–4	305 N	228 W	1.5
IPLT–5	0.0 N/S	143 E	1.5
IPLT–6	1607 S	62 W	1.5
IPLT–7	207 S	192 E	1.5
IPLT–8	198 S	261 E	1.5

PRESSURE METER TEST FOR ISG SCOPE (IPMT)		
MARKING	CO–ORDINATES	
IPMT–1	1027 N	155 W
IPMT–2	969 N	338 W
IPMT–3	834 N	611 W
IPMT–4	409 N	2 W

CROSSHOLE SHEAR TEST (ICST)		
MARKING	CO–ORDINATES	
ICST–1	639 N	753 W
ICST–2	613 N	674 W

ELECTRICAL RESISTIVITY TEST FOR ISG SCOPE (IERT)		
MARKING	CO–ORDINATES	
IERT–1	808 N	111 W
IERT–2	793 N	231 W
IERT–3	482 N	279 E
IERT–4	396 N	709 W
IERT–5	54 N	139 W
IERT–6	20 N	301 E
IERT–7	23 S	208 E
IERT–8	101 S	199 E
IERT–9	1591 S	110 W
IERT–10	232 S	184 E

REV.	DATE	ALTD	CHD	APPD
02	09.04.18 PK –sd–		–sd– TMSR/AKV	–sd– CPK
	DRAWING IS GENERALLY REVISED AS PER REVISED PLOT PLAN.			
01	13.11.15 PK –sd–		–sd– TMSR	–sd– CPK
	DRAWING REVISED DUE CHANGE IN PLOT PLAN. REVISION MARKED △1 THUS.			

TELANGANA STATE POWER GENERATION CORPORATION LIMITED
HYDERABAD, TELANGANA STATE

TSGENCO–YADRADRI TPS
THERMAL POWER PLANT 5X800 MW
AT VEERLAPALEM , VILLAGE,DAMERACHERLA MANDAL
NALGONDA DISTRICT, TELANGANA STATE

JOB NO. 417
STATUS CONTRACT
DISTRIBUTION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE	NAME	SIGN	DATE
DRN	S.ND	–sd–	24.08.2015
C DESN	V.K	–sd–	24.08.2015
CHD	M.M	–sd–	24.08.2015
APPD	C.P.K	–sd–	24.08.2015

TITLE
GEOTECHNICAL INVESTIGATION LAYOUT

DEPT. SCALE 1:1600 DRAWING NO. PE–DG–417–602–C001
SIGN
SHEET 1 OF 1 REV. 02
SIZE-A0

COMPUTER FILE NAME:

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)

EARTHING NOTES :-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. ROUTING OF CONDUCTOR IS DIAGRAMMATIC ONLY & MARGINAL SHIFTING OF CONDUCTOR TO AVOID INTERFERENCES OF STRUCTURE/FDN., CABLE TRENCHES ETC SHALL BE DONE AT SITE.
3. ALL EQUIPMENTS AND STRUCTURES SHALL, IN GENERAL, BE GROUNDED AT TWO POINTS AT OPPOSITE CORNERS WHETHER SHOWN IN DRG. OR NOT AND THESE SHALL BE CONNECTED TO DIFFERENT PARTS OF THE GROUND MAT WHEREVER POSSIBLE.
4. GROUNDING CONDUCTORS IN OUTDOOR AREAS SHALL BE BURIED 1000MM BELOW FINISHED GROUND LEVEL.
5. WHENEVER A GROUNDING CONDUCTOR CROSSES ROADS, CABLE TRENCHES, UNDERGROUND SERVICE DUCTS, PIPES, TUNNELS, RAILWAY TRACKS, OIL RECOVERY TANKS, TRANSFORMER SOAK PIT ETC. IT SHALL BE LAID AT LEAST 300MM BELOW THEM, SHALL BE REROUTED ROUND THE EQUIPMENT/STRUCTURE FOUNDATIONS.
6. GROUNDING CONDUCTOR AROUND THE BUILDING SHALL BE BURIED IN GROUND AT A MINIMUM DISTANCE OF 1500MM FROM THE OUTER BOUNDARY OF THE BUILDING.
7. GROUNDING CONDUCTORS EMBEDDED IN CONCRETE SHALL HAVE APPROXIMATELY 50MM CONCRETE COVER. IF GROUNDING CONDUCTOR IS REQUIRED TO BE EMBEDED IN MAJOR FOUNDATIONS, THEN IT SHALL BE LAID IN A SLEEVE.
8. CONNECTION BETWEEN EQUIPMENT EARTHING LEADS AND MAIN GROUND CONDUCTORS SHALL BE BOLTED TYPE. THE CONNECTION FOR GI FLAT FROM EQUIPMENT & MS ROD SHALL BE WELDED TYPE AND SHALL BE COATED WITH COLD GALVANISING/ WEATHER RESISTANT PAINTS.
9. ALL GROUND CONNECTIONS SHALL BE MADE BY ELECTRIC ARC WELDING. ALL WELDED JOINTS SHALL BE ALLOWED TO COOL DOWN GRADUALLY TO ATMOSPHERIC TEMPERATURE BEFORE PUTTING ANY LOAD ON THEM. ARTIFICIAL COOLING SHALL NOT BE ALLOWED.
10. BENDING OF LARGE DIAMETER ROD/THICK CONDUCTOR SHALL BE DONE PREFERABLE BY GAS HEATING OR ANY OTHER APPROVED METHOD.
11. ALL ARC WELDING OF LARGE DIAMETER CONDUCTORS SHALL BE DONE BY LOW HYDROGEN CONTENT ELECTRODES.
12. LOCATION OF ROD ELECTRODE ARE SHOWN TENTATIVELY, ELECTRODES FOR LA'S, PEAK TOWERS, LM'S & CVT'S SHALL BE LOCATED NEAREST TO RESPECTIVE EQUIPMENT (AS PRACTICABLE).
13. ALL ELECTRODES SHALL BE 40ø x 3000MM LONG M.S. ROD. ELECTRODES FOR PEAK TOWERS & LM SHALL BE PROVIDED WITH TEST PIT. ELECTRODES FOR LA & CVT SHALL BE PROVIDED WITHOUT TEST PIT.
14. GROUNDING CONDUCTORS ALONG THEIR RUN ON CABLE TRENCH, LADDER, COLUMN, BEAMS, WALLS, ETC. SHALL BE SUPPORTED BY SUITABLE WELDING/ CLEATING AT INTERVALS OF 1000 MM. GROUNDING CONDUCTORS ALONG CABLE TRENCHES SHALL BE ON THE WALL NEAR TO THE EQUIPMENT WHERE EVER GALVANIZED IRON ENDS OF THE SLEEVES SHALL BE PROVIDED FOR THE PASSAGE OF THE CONDUCTOR. BOTH ENDS OF THE SLEEVES SHALL BE SEALED TO PREVENT THE PASSAGE OF WATER THROUGH THE SLEEVES.
15. ALL STEEL COLUMNS, METALLIC STAIRS ETC. SHALL BE CONNECTED TO THE NEAREST GROUNDING CONDUCTOR BY GROUNDING LEADS. ELECTRICAL CONTINUITY SHALL BE ENSURED BY BONDING THE DIFFERENT SECTION OF HAND RAILS AND METALLIC STAIRS.
16. A SEPARATE GROUNDING CONDUCTOR SHALL BE PROVIDED FOR GROUNDING LIGHTING FIXTURES, RECEPTACLES, SWITCHES, JUNCTION BOXES, LIGHTING CONDUITS ETC.
17. WHEREVER GROUNDING CONDUCTORS CROSSES OR RUNS ALONG METALLIC STRUCTURES SUCH AS GAS/WATER/STEAM CONDUIT/PIPES ETC. AND STEEL OF CONCRETE IT SHALL BE BONDED TO THE SAME.
18. LIGHTING POLES, JUNCTION BOXES ON THE POLES CABLE BOXES/GLANDS, LOCKOUT SWITCHES ETC. SHALL BE CONNECTED TO THE GROUNDING CONDUCTOR RUNNING ALONGWITH THE SUPPLY CABLE WHICH, INTURN, SHALL BE CONNECTED TO THE GROUNDING GRID CONDUCTOR AT LEAST TWO POINTS WHEATHER SPECIFICALLY SHOWN OR NOT.
19. 50x6MM GALVANISED STEEL FLAT SHALL BE USED FOR EARTHING OF CABLE TRENCHES & CONTROL PANELS. ALL TRENCHES SHALL BE EARTHED AT INTERVALS OF 10 MTRS. ALONG THE LENGTH OF THE TRENCH & AT ALL ENDS OF THE TRENCHES. RISER SHALL BE PROVIDED FOR TRENCH EARTHING AT EVERY 10 MTRS & AT ALL ENDS (WHERE REQUIRED).
20. THE RISER CONNECTION TO EARTHMAT WILL BE 40mm DIA ROD. THE RISER TO EQUIPMENT CONNECTION WILL BE BY 75x10mm G.I. FLAT & RISER TO EQUIPMENT JUNCTION BOXES CONNECTION WILL BE BY 50x6mm G.I. FLAT.
21. AUXILIARY EARTHING MESH OF CLOSELY SPACED (300mm x 300mm) OF SIZE 1500mm x 1500mm CONDUCTOR SHALL BE PROVIDED BELOW THE OPERATING HANDLES OF ISOLATORS MOM BOX AND ITS EARTH SWITCH MOM BOXES AND CIRCUIT BREAKER OPERATING MECH BOX AT A DEPTH OF 300mm BELOW GROUND LEVEL.
22. EARTHMAT SHOULD BE LAID 1.5m BEYOND FENCE ON ALL SIDES. FENCE WITHIN THE GROUND GRID SHALL BE BOUNDED TO THE MAIN EARHTMAT AT REGULAR INTERVAL NOT EXCEEDING TEN (10) METRES. FENCE GATE SHALL BE SEPARATELY GROUNDED WITH FLEXIBLE CONNECTION TO PERMIT MOVEMENT.
23. FOR EQUIPMENT EARTHING, REFER EQUIPMENT EARTHING DETAILS DOCUMENT REF NO. TB-3-387-316-010.
24. ALL EARTHING WILL BE DONE IN ACCORDANCE WITH IS-3043 UNLESS OTHERWISE SPECIFIED IN THE ABOVE TECHNICAL DETAILS.
25. SWITCHYARD EARTHMAT GROUNDING CONDUCTOR SHALL BE CONNECTED TO TRANSFORMER YARD EARTHMAT GRID AT TWO POINTS.

BILL OF QUANTITY:-

DESCRIPTION	ESTIMATED QTY.
40MMø MS ROD (MAIN EARTHMAT+RISERS)	66KM (651MT)
75X10MM GI FLAT	20.36KM (120MT)
50X6MM GI FLAT	13.75KM (33MT)
40MMø MS ROD ELECTRODES	75 NOS.
40MMø PIPE ELECTRODES	4 NOS.

LEGEND :-

———	BELOW GROUND LEVEL SHALL BE M.S. ROD. (40ø)
●	RISER LOCATION (INDICATIVE) APPLICABLE FOR CONNECTION FROM RISER TO EQUIPMENT
(RE)	INDICATES 40ø ROD ELECTRODE
(PE)	INDICATES 40ø PIPE ELECTRODE (FOR 125MVAR BUS REACTIR)

ग्राहक/परियोजना का नाम NAME OF CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD. TELANGNA, INDIA 5 x 800 MW YADADRI TPS, NALGONDA
OWNER'S CONSULATANT:	TATA CONSULTING ENGINEERS LTD. BANGALORE

भारत हेवी इलेक्ट्रिकल्स लिमिटेड ट्रांसमिशन परियोजना विभाग
BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION

	नाम /NAME	हस्ता./SIGN.	दि./DATE
बनाया DRAWN	PK		28.02.2020
जँचा CHECKED	NK		28.02.2020
स्वीकृत APPROVED	SKS/AG		28.02.2020

JOB NO.
STATUS
DISTRIBUTION

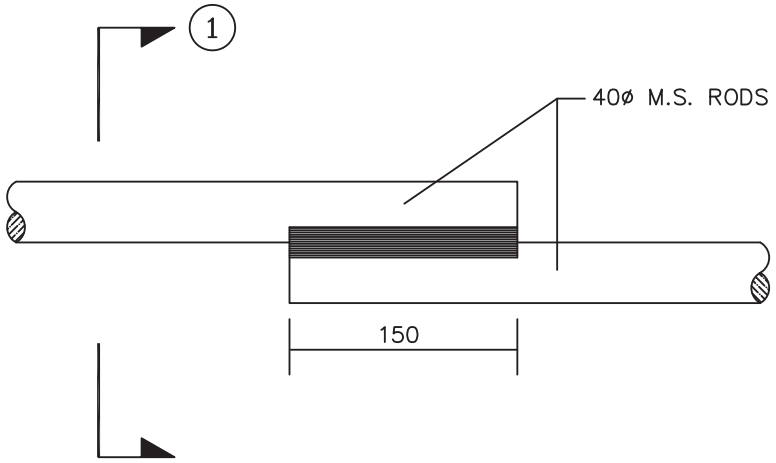
REV.	DATE	ALTERED / CHECKED / APPROVED
ZONE		

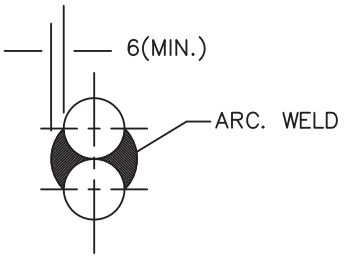
शीर्षक/TITLE: **EARTHMAT LAYOUT OF 400kV SWITCHYARD**

DEPT. | SIGN. | अनुपात / SCALE | ड्राईग.क्र./DRAWING NO. TB-0-387-316-004 | पुनः/REV. 00

पृष्ठ क्र/SHEET No. 01 | अगला पृष्ठ/NEXT SHEET --

SIZE-A0

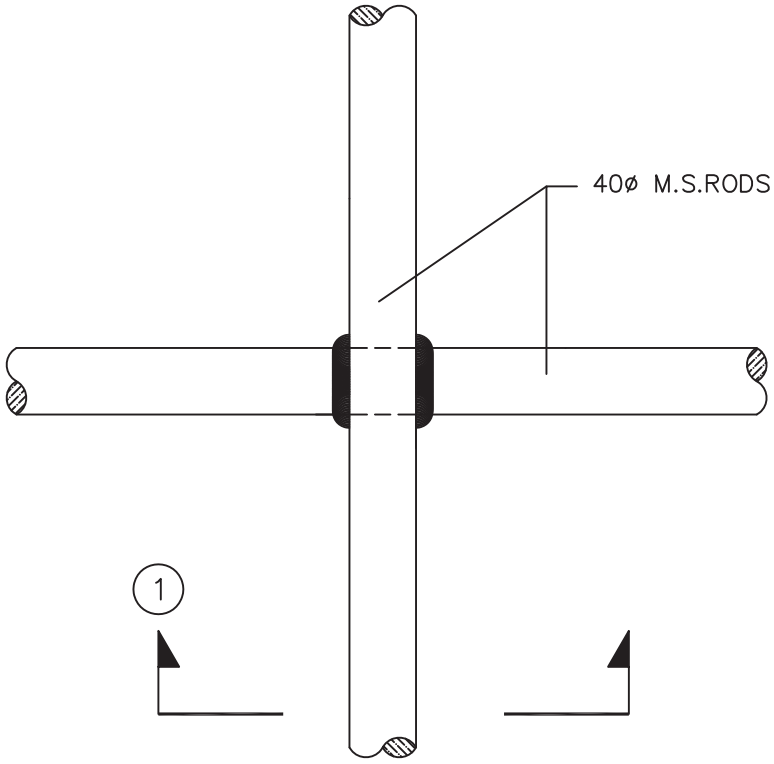


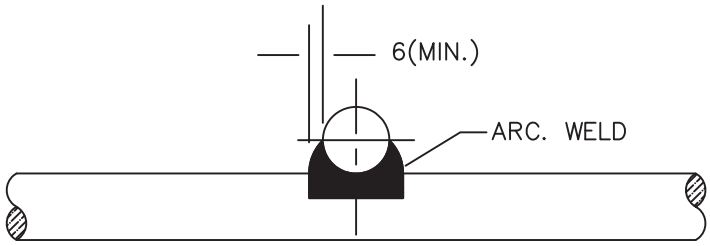


SECTION – 1

LAP JOINT
BETWEEN M.S. RODS

TITLE	BHEL DRAWING No.
TYPICAL BELOW GROUND EARTHING DETAILS	PE-DG-417-509-E005
	REV. No. 03
	SHEET 2 OF 9





SECTION – (1)

CROSS JOINT
BETWEEN M.S. RODS

TITLE

TYPICAL BELOW GROUND EARTHING DETAILS

BHEL DRAWING No.
PE-DG-417-509-E005
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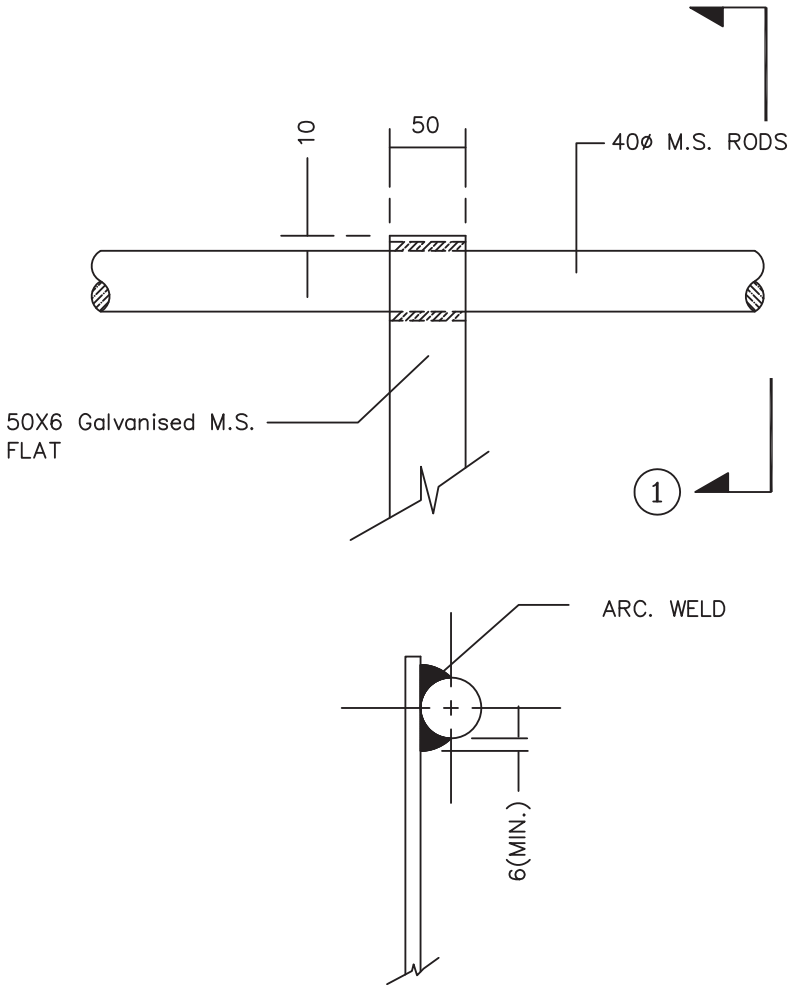

SECTION – 1

CROSS JOINT
BETWEEN M.S. ROD & GALVANISED M.S. FLATS

TITLE	BHEL DRAWING No.
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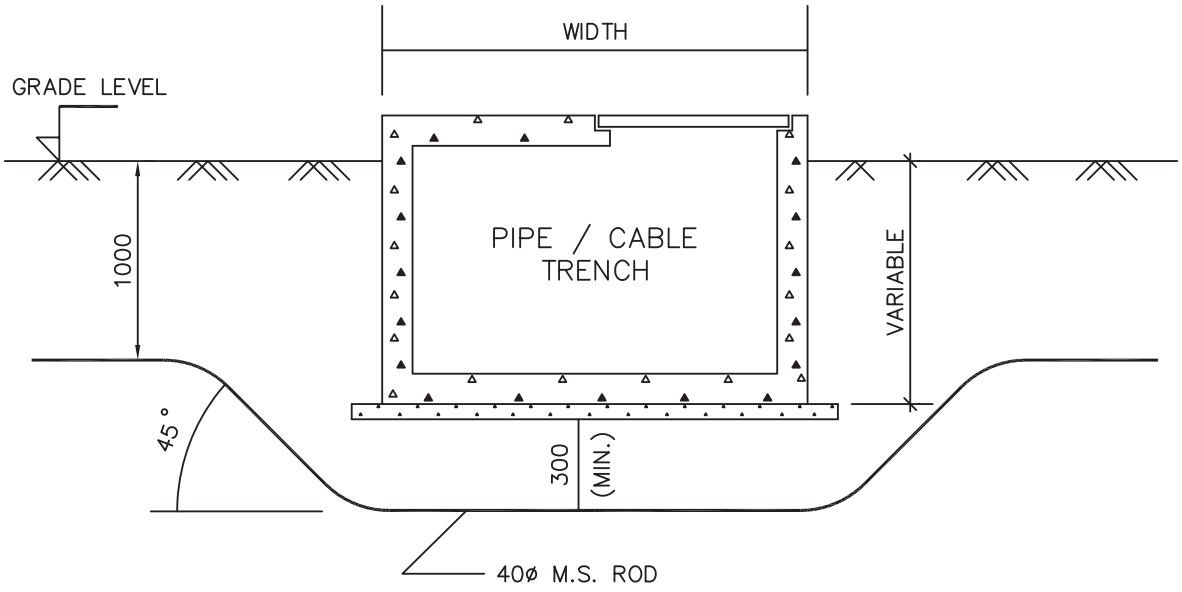

TRENCH CROSSING
OF GROUNDING CONDUCTOR

TITLE	BHEL DRAWING No.
TYPICAL BELOW GROUND EARTHING DETAILS	PE-DG-417-509-E005
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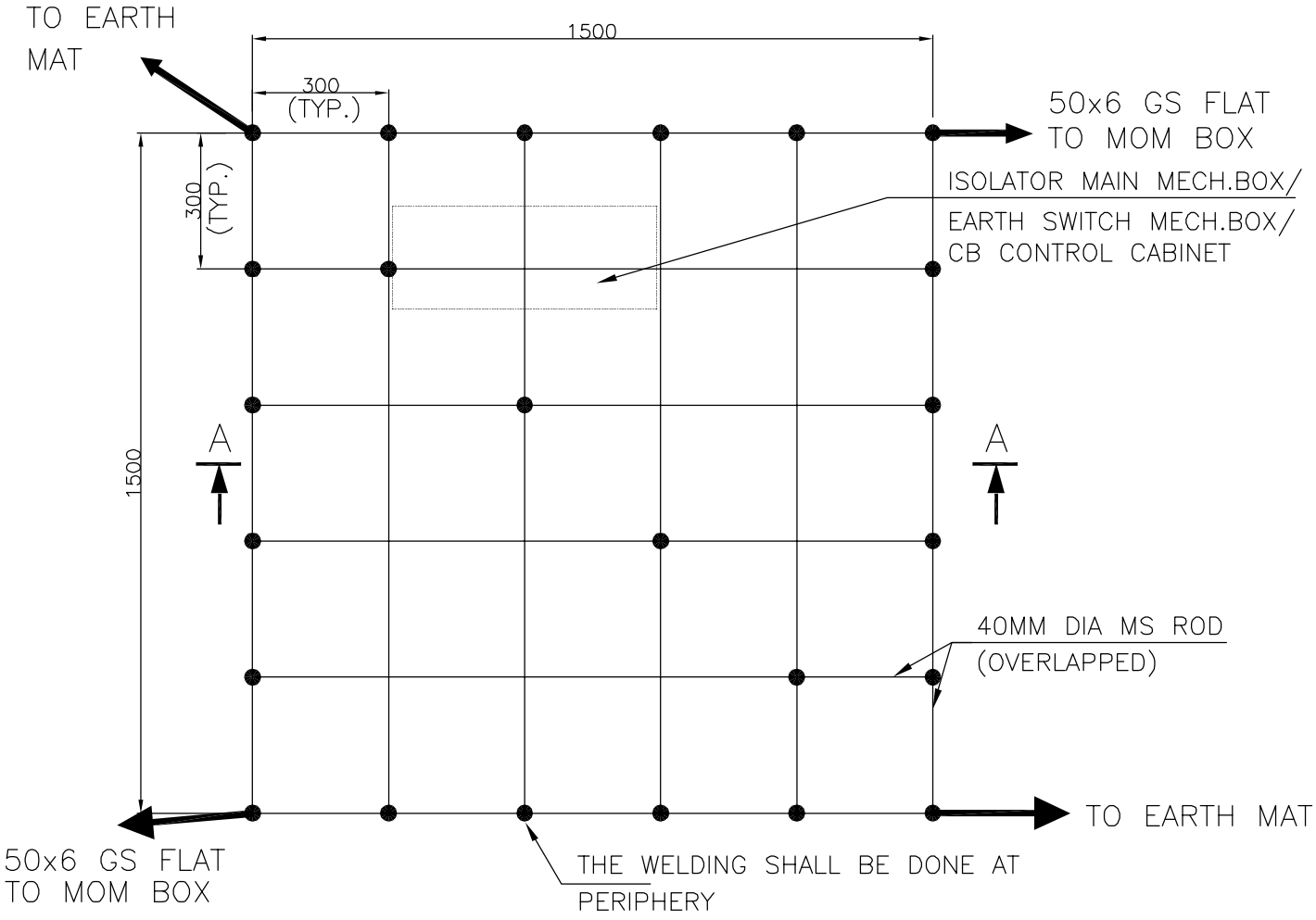
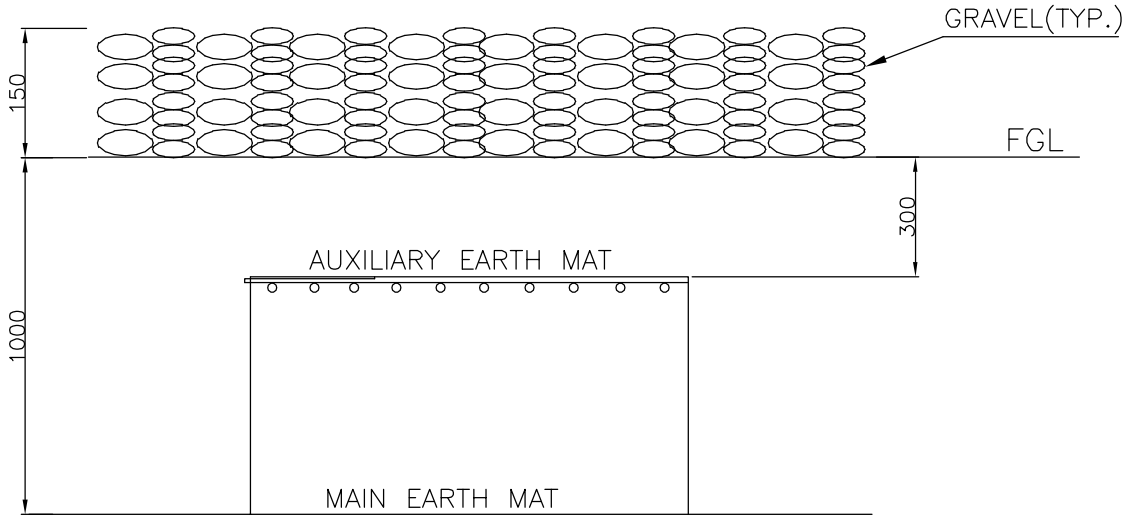
GENERAL NOTES:

1. ALL ELECTRICAL EQUIPMENTS SHALL BE EARTHED BY TWO SEPARATE AND DISTINCT EARTH CONNECTIONS AND SHALL BE CONNECTED TO DIFFERENT CONDUCTORS OF EARTHING GRID.
2. THE MAIN GROUND GRID SHALL BE BURIED IN EARTH AT A MINIMUM DEPTH OF 1000MM BELOW GROUND LEVEL.
3. THE GROUND GRID CONDUCTOR BELOW GROUND LEVEL SHALL BE OF BARE 40MM ø MILD STEEL ROD. GROUND ELECTRODE SHALL BE 40MM ø X 3000 MM LONG MILD STEEL ROD, DRIVEN INTO THE GROUND AND CONNECTED TO THE GROUND GRID CONDUCTOR.
4. RISER/PIGTAIL FROM THE GROUND GRID SHALL BE 40MM ø MILD STEEL ROD AND SHALL PROJECT 300 MM ABOVE FINISHED GROUND/CONCRETE FLOOR LEVEL.
5. ALL GROUND CONNECTIONS BELOW GROUND SHALL BE MADE BY ELECTRIC ARC WELDING WITH LOW HYDROGEN CONTENT ELECTRODE. BENDING OF THE CONDUCTOR WHERE NECESSARY SHALL BE DONE BY GAS HEATING.
6. GROUND CONDUCTOR CONNECTIONS ABOVE GROUND SHALL BE GENERALLY MADE BY ELECTRIC ARC WELDING. THE CONNECTION SHALL BE COATED WITH COLD GALVANISING/WEATHER RESISTANT PAINTS.
6. CONNECTIONS BETWEEN EQUIPMENT EARTHING LEADS AND BETWEEN MAIN EARTHING CONDUCTORS SHALL BE OF BOLTED TYPE. THE CONNECTION FOR GI FLAT FROM EQUIPMENT AND MS ROD SHALL BE WELDED TYPE & SHALL ALSO BE COLD GALVENISED AND WEATHER PROOF PAINTED.
7. CONNECTION TO ALL EQUIPMENT SHALL BE BY BOLTED JOINTS. CONTACT SURFACES SHALL BE THOROUGHLY CLEANED BEFORE CONNECTIONS. EQUIPMENT BOLTED CONNECTIONS AFTER BEING TESTED AND CHECKED SHALL BE PAINTED WITH ANTI CORROSIVE PAINT/COMPOUND.
8. 40MMøX3000MM LONG MILD STEEL GROUND ROD ELECTRODES SHALL BE PROVIDED AT CONNECTIONS WITH LIGHTNING ARRESTERS, CVT NEUTRALS, SHIELD WIRE TOWER'S & LM'S.
9. THE GROUNDING INSTALLATION WORK SHALL CONFORM TO THE REQUIREMENTS OF THE INDIAN ELECTRICITY RULES AND CODE OF PRACTICE FOR EARTHING (IS:3043) AS AMENDED UP–TO–DATE IN INDIA.
10. 40 DIA MS ROD RISERS SHOULD BE BROUGHT CLOSE TO EQUIPMENTS FOUNDATION.
11. ALL THE EQUIPMENTS SHALL BE EARTHED AT TWO POINTS WITH 75x10 mm. G.S. FLAT EVEN THOUGH THEY ARE SHOWN OR NOT IN THE DRAWING DUE TO CLARITY.
12. EARTHING CONDUCTORS FROM EQUIPMEMT STRUCTURES SHALL BE CONNECTED TO THE NEAREST POSSIBLE EARTH MAT RISER.
13. GI FLAT SHALL BE RUN FROM BOTH THE RISERS TO STRUCTURE & EQUIPMENT EARTHING TERMINAL.
14. REACTOR & AUX. TRANSFORMER NEUTRAL SHALL BE DONE BY 40NB DIA PIPE ELECTRODE AND CABLE OF SUITABLE SIZE.

बीएचईएल BHEL	EQUIPMENT EARTHING DETAILS NOTES		
	DRG. No. TB–3–387–316–010	REV. 03	SHEET No. 1A



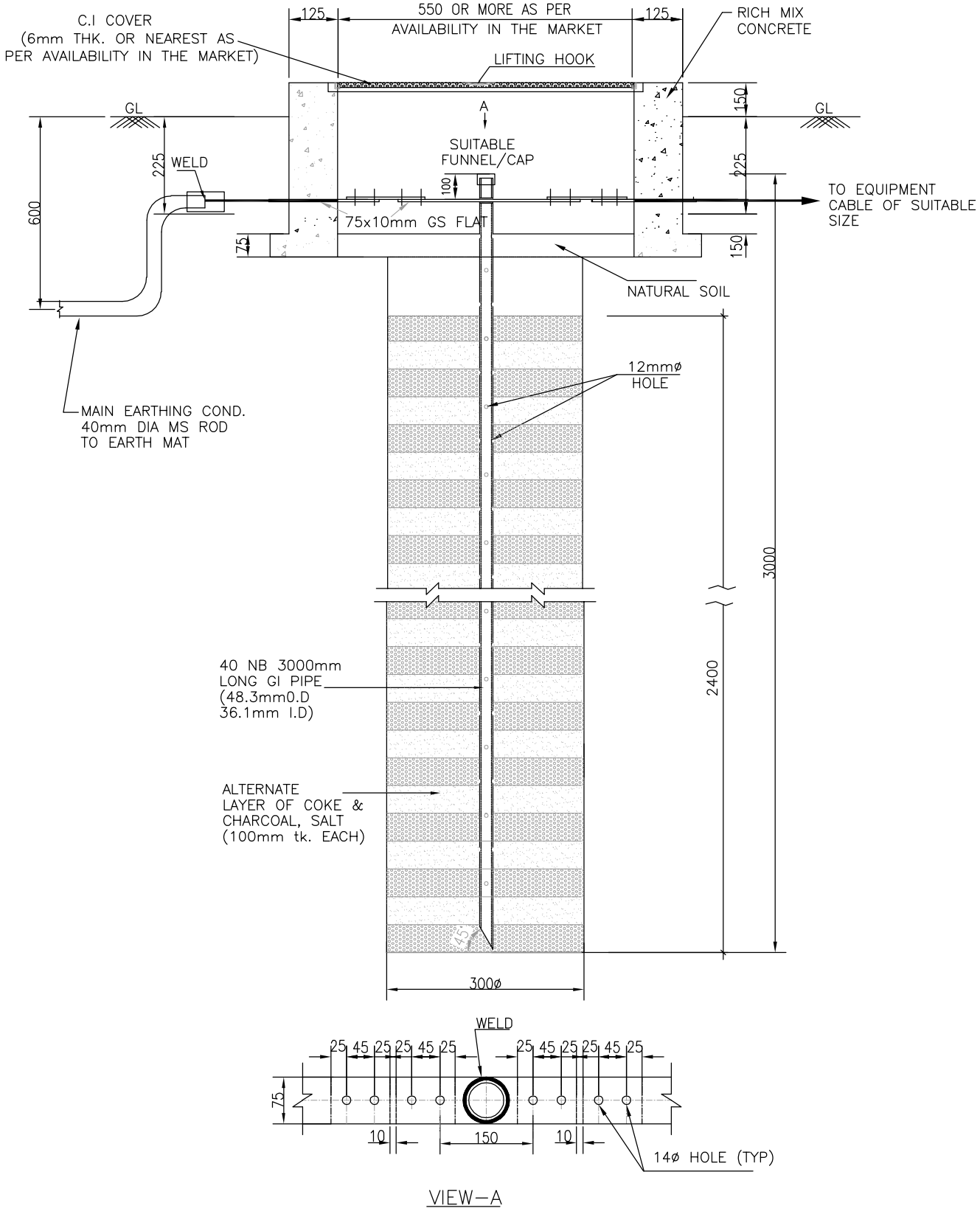


SECTION AA

NOTE:

AUX. EARTH MAT SHALL BE SO POSITIONED THAT THE FOOT OF THE OPERATOR ALWAYS LIE OVER THE AUX. EARTH MAT AREA WHILE ATTENDING/OPERATING THE MECH. BOX. THE CABLE TRENCH ROUTING SHALL BE PLANNED ACCORDINGLY.

BHEL	EQUIPMENT EARTHING DETAILS AUXILIARY EARTH MAT FOR ISOLATOR MAIN MECH., E/S MECH. BOX AND CCB OF CIRCUIT BREAKER	
COMPU. DRG. REF.	Report No. TB-3-387-316-010 REV. 03	SHEET No. 14

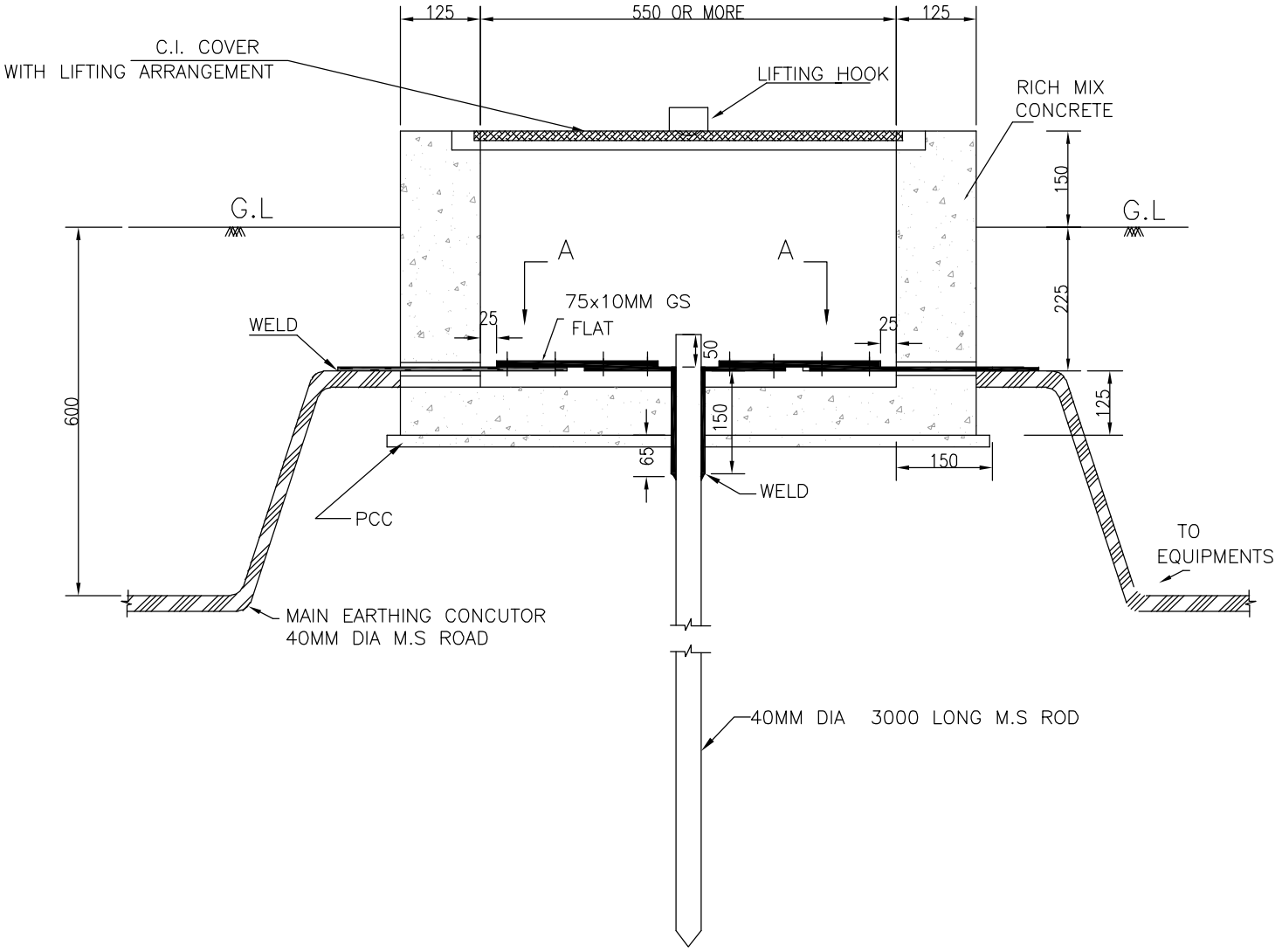


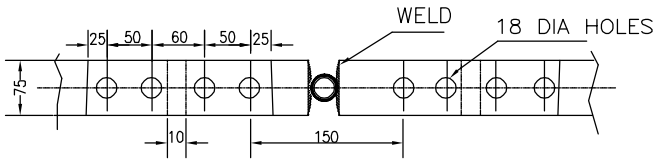
VIEW–A

NOTE:

1. ALL NUTS, BOLTS AND WASHERS SHALL BE GALVANISED AS PER SPECIFICATION.
2. TO BE USED FOR CONNECTING NEUTRAL OF TRANSFORMER/REACTOR.

BHEL	EQUIPMENT EARTHING DETAILS PIPE EARTH ELECTRODE WITH TREATED PIT		
COMPU. DRG. REF.	DRG. No. TB–3–387–316–010	REV. 03	SHEET No. 12A





VIEW–'A'

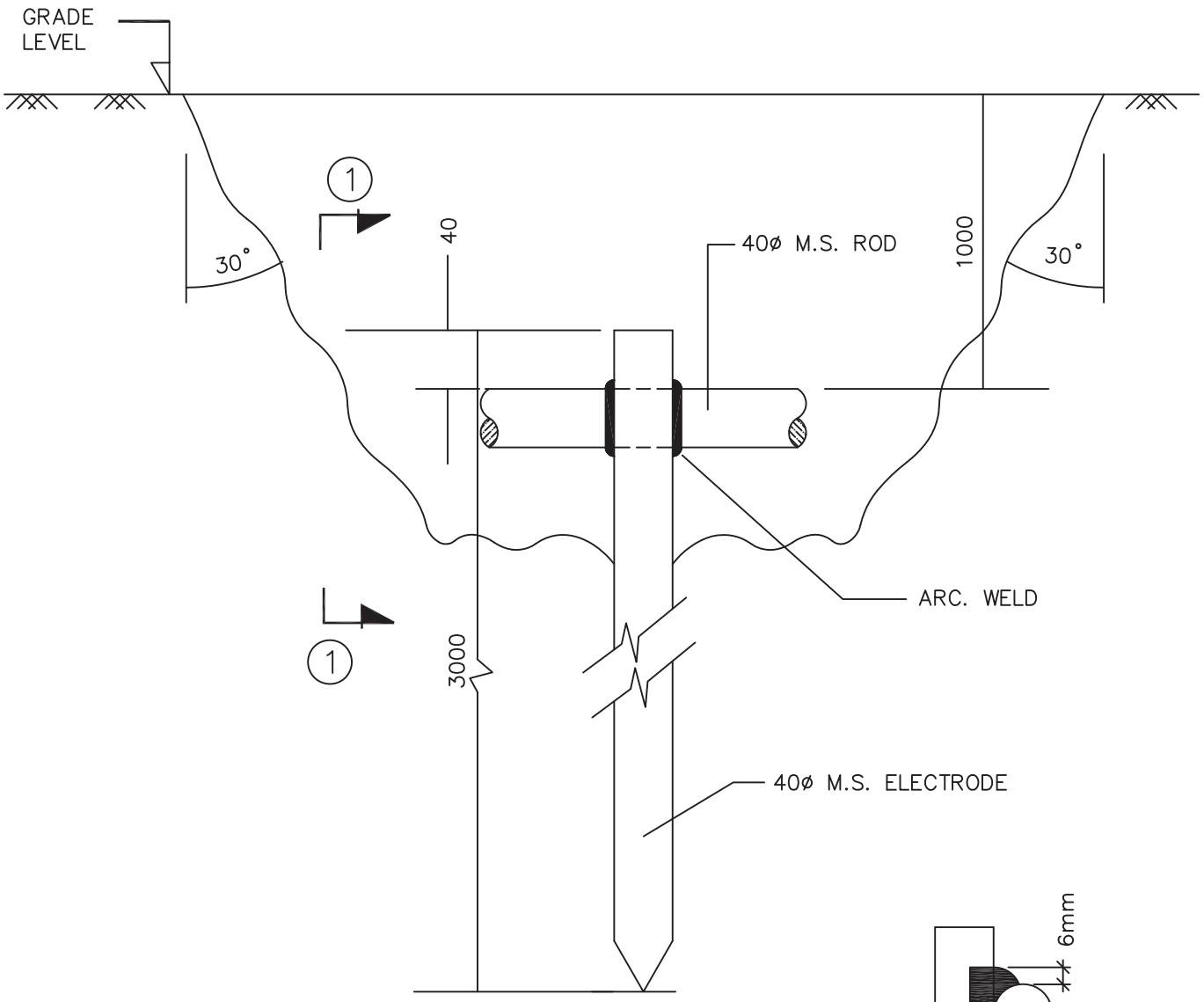
NOTES:–

1. SUPPLY OF FIXING BOLTS NUTS & WASHERS FOR GI FLAT EARTHING CONDUCTOR ALSO FORMS PART OF THE SCOPE.
2. TO BE USED FOR CONNECTING DOWN CONDUCTOR OF LIGHTINING MASTS & TOWERS WITH PEAK AND INTERCONNECTIONS WITH POWER HOUSE EARTHING GRID.

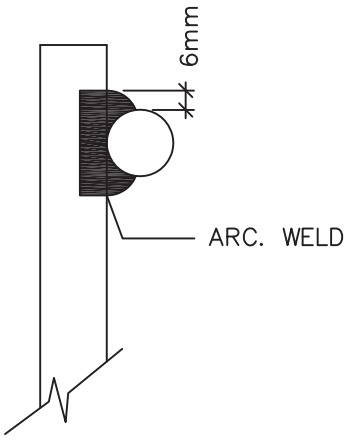
EQUIPMENT EARTHING DETAILS

ROD EARTH ELECTRODE WITH TEST PIT

COMPU. DRG. REF.	DRG. No.	REV.	SHEET No.
	TB–3–387–316–010	03	12



GROUND ELECTRODE



SECTION – (1)

TITLE

TYPICAL BELOW GROUND EARTHING DETAILS

BHEL DRAWING No.
PE-DG-417-509-E005

REV. No. 03

SHEET 5 OF 9