

# **TENDER SPECIFICATION**

**BHEL: PSSR: SCT: 1577**

**FOR**

**CONSTRUCTION OF CIVIL, STRUCTURAL AND ARCHITECTURAL WORKS IN THE MAIN PLANT AREA AT UNIT-12 OF 1 X 800MW AT KOTHAGUDEM TPS STAGE-VII, KOTHAGUDEM, KHAMMAM DISTRICT, TELANGANA STATE**

## **CORRIGENDUM-2, dt: 19/3/2015**

**CORRIGENDUM-2 - Consists of**

- BHEL's Clarification
- Additional Rate Schedule (BOQ)



**BHARAT HEAVY ELECTRICALS LIMITED**

(A Government of India Undertaking)

Power Sector – Southern Region

690, Anna Salai, Nandanam, Chennai – 600 035.

**Name of Work : Construction of Civil, Structural and Architectural works in the main plant area at unit-12 of 1 x 800MW at Kothagudem TPS Stage-VII, Kothagudem, Khammam District, Telangana State**

**BHEL's clarifications are furnished below for information against some of the bidder's query sought vide letters/email or in Pre Bid discussion held on 5/3/2015 at BHEL PSSR in the Tender No.BHEL : PSSR : SCT : 1577**

Sl. No.	Reference Cl. No. of Bidding Document	Description of existing provision of NIT	Bidders questionnaire for clarification sought / modification proposed towards existing provision of NIT.	Reply by BHEL
1	Item No.A502	Rigid Insulation (Extruded Polystyrene Blocks)	Please provide the size of each block and also the density of blocks to be used.	Please refer IS 4671 : 1984 for detail
2	Item No.B506	Separation Layer	Please specify whether this separation layer will be used in between Polystyrene blocks and Elastomeric layer.	Bidder to quote rate for item irrespective of placement of separation layer.
3	Item No.A508	Precast Concrete Tiles	Size of tiles may please be changed to 250x250 / 300x300 mm instead of 600x600 mm due to ready availability as-well-as easy handling at site. Please confirm.	Please follow the item description.
4	Item No.914	PVC doors	Please specify whether cost of PVC Door Frame is to be included or not.	PVC Door Frame is included in the item.
5	Item No.920	Roof sky light structure	Please provide us the tender drawings (plan & elevation) for Roof Sky Light Structure.	Drawing shall be furnished during detailed engg stage.
6	Item No.A1003	Brick Work in partition walls	* Please replace the unit of item as 'Sqm' instead of 'Cum'. * 6 mm dia MS bars in brickwork will be paid separately in item no.ST-406. Please confirm.	The quantity of item A1003 shall be read in 'SQM'. 6mm dia MS bar in brickwork shall be paid in item A1003.
7	Item No.1303, 1304 & 1305	Various painting works	Plaster of Paris is not in the scope of these items. Please confirm.	Confirmed.
8	Item no.1401	50 mm thick Heavy Duty C.C. Flooring	Aluminium strips not in the scope of this item. Please confirm.	Al strips are included in item 1401.
9	Item no.A1401	Heavy Duty C.C Flooring	* Please check the overall floor thickness since thickness of under layer and top layer are given as 28 mm and 12 mm respectively. * Also check the scope of Aluminium Strip.	Please read thk. of under layer as 38 mm. Al strips are included in item A1401.
10	Item no.1501	Metal Decking of 0.70 mm thick	Unit & quantity not mentioned. Please clarify.	This item description is deleted.
11	Item no.A1505 and B1505	Inner Sheet of metal cladding	Please specify whether these two items are alternative item or not. Otherwise, these items will be operated in two separate areas. Please clarify.	The item is clear w.r.t. material description. The applicability shall be intimated during detailed engineering stage.
12	General	General	Soft copy of BOQ / Revised BOQ in excel format may please be given. Please confirm.	BOQ can be downloaded from BHEL web site.Excel form can not be provided

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13	Item no.2601	Cutting of Trees	If permission required for cutting of trees, it will be arranged by BHEL / Owner. Please confirm.	Within the plant on clearance from BHEL, tree cutting can be taken up
14	Item no.2610	Carriage of Earth	It is mentioned extra over ST No.1 to 9. Please check it.	Item may be read as Extra over Item 2601 to A2609
15	General	General	HT Lines inside the premises of site will be shifted / dismantled before start of the work. Please confirm.	HT lines inside the premises will be shifted/dismantled before start of work in that particular area.
16	General	General	One extra point of Construction Power and Water each may please be provided free of cost at Batching Plant Area. Please confirm.	For construction water : Tender Prevails. For construction Power :One point inside the plant boundary and one point in the area outside the boundary will be provided by BHEL.
17	TCC sl.no.4 (Chapter-IV)	T&P to be deployed by Contractor	2 nos. Batching Plant of capacity 30 Cum./Hr. each will be installed instead of 1 no. 60 Cum/Hr. - Please confirm.	Accepted
18	Material supplied by the Contractor	Cement	Please specify the type of Cement to be used in the subject work.	Cement as per Technical specification 12.02.01
19	Price Bid (Volume-II)	BOQ	BOQ <b>appears twice</b> in the Price Bid (Volume-II) of the tender document. Please clarify and rectify accordingly.	<b>Duly filled one set of Rate Schedule in the price bid ( BOQ ) may be submitted and the other set in the price bid may be ignored.Also Please quote the total price for the contract in the space provided in additional price bid.Submit original price bid and addl price bid in the same Envelope III.</b>
20	Item No. ST-2423	Bitumen Impregnated Board in joint filler	Please specify the depth of bitumen board since the unit of this item is in 'Rm'.	The depth of bitumen board shall be in the range of 200 mm -250 mm.
21	Item No.ST-2424	Bitumen Sealing Compound	Please sepcify the size of gap to be filled by sealing compound.	Size of gap shall be as per relavent IS code mentioned in the item description.
22	Item No.ST-2308	Supply, fab, ere & alignment of factory made Galvanised welded grating unit .... incl. 2 coats of red oxide Zinc Chromate Primer	We assume the item refers to supply, fabrication, erection & alignment of factory made welded grating unit including 2 coats of red oxide Zinc Chromate Primer instead of galvanisation. Please confirm.	Galvanisation is not included in item 2308.

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23	General	Due date of submission of bid	The subject tender comprises of multidisciplinary works with involvement of various specialized sub-vendors. Considering the quantum off items involved, consequent interaction with sub-vendors and arriving at the reasonable price of bought-out items, we need some more time. Moreover, please note that our sub-vendors are asking for some more time for analyzing the impact of recent Union Budget on their product before submission of offers to us. In addition to above, we also need reasonable time after getting all clarifications towards bidders queries from you for incorporating the same in compilation and preparation of our competitive offer. In view of above, <b>we request you to kindly extend the date of submission of bid for at least 15 (fifteen) days i.e. upto 27-03-2015</b> enabling us to participate and submit our competitive offer. Please confirm.	Refer Corrigendum 1 dated 10.03.2015
24	Backfilling	Item 110(a), 110(b) & A2611(a)	Around 1.82 lakh cum of soil has to be borrowed by the bidder. Clarify whether BHEL has identified the land for the same.	Soil has to be made available by the bidder.
25	TCC	Clause 1.7.3	Existing clause : 5% retention money : 2.5% along with final bill and 2.5% after gaurantee period Revision proposed : 5% retention money to be released agaisnt BG in each RA Bill	Tender prevails
26	SCC	Clause 10.5	Existing clause : 60% of RA Bill will be released within 15 days and balance 35% within 30 days. Revision Proposed : 75% of RA Bill will be released within 7 days and balance 20% within 21 days.	Tender prevails
27	TCC	Clause 3.1.6 & 3.2 & 3.2.4	Price variation to be made applicable for all components with base date as date from submission of tender.	Tender prevails
28	TCC/VOL-IA; PART – I/ CH-VII/CL.1.7.2	Interest bearing advance for Mobilization . . . . will be paid against submission of bank guarantee . . .	We request you to release the mobilisation advance as Interest free. We request you to provide us the present rate of interest for Mobilisation Advance and also confirm us the interest rate shall be uniform for this work.	Tender prevails
29	TCC/VOL-IA; PART – I/ CH-VII/CL.1.7.2	Interest bearing advance for Mobilization, limited to 5% of the contract value will be paid . . . . which will be recovered from the first running bill onwards.	We request you amend the value as 10% of the contract value and recovery of the same should start after 4th Running Bill.	Tender prevails
30	TCC/VOL-IA; PART – I / CH-VII/ Cl. 1.7.5 Payment Terms	The Balance 5% of the item rate / lumpsum rate shall be released as under after completion of all works & on completion of material reconciliation and certified by BHEL Engineer.	We earnestly request you to allow us to submit Retention-Cum-Performance Guarantee for the job of 5% of the contract value in the form of Bank Guarantee valid till DLP during the execution period and hence no cash deduction shall be made from our monthly R.A. Bills on this account.	Tender prevails

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31	TCC/VOL-IA; PART – I/ CH-VII/CL.1.8.4 Other Taxes & Levies	1.8.4.1 Any other taxes and duties (except VAT & Service Tax) if any, as applicable, viz. Entry Tax, Octroi, Licenses, Deposits, Royalty, Stamp Duty, other charges / levies, etc. prevailing / applicable on the date of opening of technical bids and any variation thereof during the tenure of the contract are in the scope of bidder. In case BHEL is forced to pay any such taxes, BHEL shall have the right to recover the same from the bidder either from running bills or otherwise as deemed fit.	We request you to kindly reimburse the difference in case of any variation for all other taxes and duties (including VAT & Service Tax) if any, as applicable, viz. Entry Tax, Octroi, Licenses, Deposits, Royalty, Stamp Duty, other charges / levies, etc. at actual on submission of documentary proof of payment. Please confirm.	Tender prevails
32	TCC/VOL-IA; PART – 1/ CH-XI/ CL.1.11.1	Issue & Reconciliation of Steel	We request you to consider rolling margin in your account as the supply of steel is in your scope. Please confirm.	Tender prevails
33	TCC/VOL-IA; PART – II/ CH-I/CL.1.15.13	PRICE VARIATION COMPENSATION for LABOUR, HIGH SPEED DIESEL OIL, and MATERIALS	We request you to pay PVC for LABOUR, HIGH SPEED DIESEL OIL, and MATERIALS for the entire original contract period and extended period if any.	Tender prevails
34	TCC/VOL-IA; PART – I/ CH-III/CL.1.3.1.3.2.1	Construction Water Making the water available at single point	We request you to provide us Water at least two points (Each at batching Plant & Construction site)	Tender prevails
35	TCC/VOL-IA; PART – I/ CH-III/CL.1.3.1.2.1.1	Construction Power Single point source	We request you to provide us Power at least three points (One at batching Plant & two at Construction site)	One point inside the plant boundary and one point in the area outside the boundary will be provided by BHEL.
36		Geotechnical/ soil investigation report	Please furnish the complete copy of soil investigation report together with laboratory test results thereof together with the bore hole location plan, indicating thereon the bore hole numbers vis-à-vis the location of the proposed structures.	Report is available at Chennai HQ. Bidder can have a look at the report.
37	General Conditions of Contract; 2.7.9	Max. Ceiling limit for Liquidated damage is 10% of the contract value for the project.	We request you to amend the maximum limit to 5% of the contract value for the project, as most of the PSUs are considering the ceiling limit as 5%.	Tender prevails
38	Tender Notification	Earnest Money Deposit	We understand that One Time EMD is acceptable for this tender package. Please confirm.	Yes.
39	General Condition; PART – I/ CH-II/CL.1.2.3	The area of work shall be cleared of all vegetation, rubbish and other objectionable matter and materials removed . . . included in the unit rates rendered for the different items under bill of quantities.	We request you to kindly provide the levelled ground with free of vegetation, rubbish and other objectionable matter.	Tender prevails

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40	General Condition		Please confirm the area available for laydown within plant boundary. Also request you to provide us the key plan indicating the distances of various locations (viz. Steel yard & site, Site and laydown area / Batching Plant etc.)	Modification to clause 1.3.3 of TCC : 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. <b>Land may be provided outside the plant boundary located at a distance of 2 km from the plant.</b> The existing land shall be shared by all erection 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 fabrication, batching plant, office, storage area 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.
41	Volume - 2 Price Bid		We request you to allow us to submit our Price Bid in printed form as there are many items and space for writing is insufficient. Please confirm.	BOQ can be downloaded from BHEL web site.Excel form can not be provided
42	Tender Notification	Last date of submission of Bid is scheduled on 12-03-2015.	Considering the scope of work, we earnestly request you to extend the due date for submission of tender bids by atleast 45 days after receiving of last Addendum / clarification / errata.	Refer Corrigendum 1 dated 10.03.2015
43	NIT: Salient Features, Sl. No-V	DUE DATE & TIME OF OFFER SUBMISSION - 12/3/2015.	We request you to extend this offer submission date by two (2) weeks in view of submitting a competitive offer. Please consider	Refer Corrigendum 1 dated 10.03.2015
44	VOLUME-IA PART – I CHAPTER-VI TIME SCHEDULE - Clause no 1.6.1.2	The entire work of Civil and Architectural works for main plant, Levelling and Grading of entire plant, Roads and Drains, of KOTHAGUDEM -1 x 800 MW as detailed in the Tender Specification shall be completed within 30 (Thirty) months from the date of commencement of work at site.	We request you to extend the completion time from 30 months to 36 months. Please consider	Tender prevails
45	VOLUME-IA PART – I CHAPTER – II SCOPE OF WORKS, Clause no-1.2.3	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	Micro grading ( $\pm 150$ mm) if any required during execution stage shall be in contractor's scope. Any major jungle clearance, Site grading and levelling, shifting of rubbish and objectionable matter shall be paid as per the relevant BOQ item or Extra item. Please clarify.	Yes.

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46	VOLUME-IA PART- I CHAPTER-VII TERMS OF PAYMENT, Clause no-1.7.2	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. 1.7.2.2 - 2% after receipt of initial Security Deposit as per relevant clauses in the GCC and approval of bar chart for execution along with unqualified acceptance of detailed letter of intent. 1.7.2.3 - 3% at the end of second month from date of fax LOI on completion of site Mobilization of Machinery & T&P as given below and on certification by site incharge for compliance.	We request you to provide Intrest free mobilization advance of 5% of the Contact value in a single phase. Please consider.	Tender prevails
47	VOLUME-IA PART – II CHAPTER –I, Clause no: 3.2.4	Base date shall be first of the consecutive first month to the month in which contract period completes. (Explanatory statement: PVC shall not be plicable for the contract period and also for the portion of the days remaining after the contract period in the contract completion month. For example if the contract period completes in any day in the month of June 2014 the PVC shall be applicable July onwards with base index of July 2014.)	We request you to allow Price variation clause for labour & materials, during both the contract period and extended period. Please consider	Tender prevails
48	VOLUME-IA PART – II CHAPTER –I, SI no: 4.0	1. Overrun Compensation is applicable as per the clauses available in 2.12 in GCC except clause 2.12.3, which is revised as under: 2. The amount of increase payable per month due to rate revisions is subject to a minimum of Rs 1,00,000/- (One lakh) per month and a maximum of Rs 5,00,000/- (Five Lakhs) per month.	We request you to delete the ceiling of maximum of Rs.5,00,00/- & instead contractor shall be paid value as per actual quantum of work done and increased rates beyond the original contract period.	Tender prevails
49	VOLUME-IA PART – I CHAPTER VIII, TAXES AND OTHER DUTIES, Clause no-1.8.6.1	Statutory variations are applicable only in the cases of Value Added Tax and Service Tax on direct transactions with BHEL. The changes implemented by the Central / State Government in the VAT Act / Service Tax 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.	We request you allow other statutory variation for direct as well as indirect transaction to be considered for reimbursement besides VAT & Service taxes.	Tender prevails
50	VOLUME-IA PART – I CHAPTER – III, Clause no-1.3.4.6	Contractor has to make his own arrangements for his electricity requirement for his labour colony at his cost.	Request you to provide the electricity free of cost/chargeable at one point to the labour colony also. If chargeable please provide the unit charges.	Tender prevails

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51	VOLUME-IA PART – I CHAPTER – III, Clause no-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. Contractor has to make his own arrangements for his water requirement for his labour colony at his cost.	Please confirm whether construction of bore hole shall be permitted at labour colony for water purpose.	Any clearance required from the statutory authorities is in the bidder scope.
52	VOLUME-IA PART – I CHAPTER – VI, 1.6.7.1of TCC	The bidder must submit a detail schedule (area wise) for completion of work to meet the following project schedule within 15 days from the date of issue of LOI	Please let us have the tentative list of release of drawing schedule to prepare the construction schedule.	List will be provided after the award of work to the bidder.
53	SCC Chapter – VII, Drawings and documents, Clause no-7.4	The data furnished in various annexure enclosed with this tender specification are only approximate and for guidance. However, the change in the design and in the quantity may occur as is usual in any such large scale of work. The contractors quoted rates shall be inclusive of the above factor.	Such clauses are not applicable for Unit rate contract (applicable for Design build contracts/Lumpsum/EPC) - Requested to delete this clause.	Design is not in bidder scope.
54	GCC: Clause 2.7.8	In the unforeseen event of inordinate delay in receipt of materials, drawings, fronts etc., due to which inordinate discontinuity of work is anticipated, BHEL at its discretion may consider contractor's request to short close the contract.....	In this case please confirm whether any additional compensation will be paid to contractor as we will be mobilizing our resources, equipments, etc. considering the total quantity and execution of complete works.	Tender prevails
55	GCC, Clause no-2.24.1	Warranty	We request to consider the warranty period to start for each structure separately from the date they are made use of by BHEL	Tender prevails
56	General	No limitation of liability or consequential damages clause provided in the tender documents	Request BHEL to add such clauses	Clause cannot be added.
57	General	Change in Law	We request that any cost incurred due to change in Law during the tenure of the contract may please be reimbursed	Tender prevails
58	General	Employer store	Please indicate the distance between Employer store location and the project site for shifting of free issue materials by client.	Please refer to reply for point 40
59	General	Re-routing of existing lines	Re-routing of Overhead and underground existing lines shall be in the client's scope. Please consider	Re routing of over head line if any is in BHEL/TSGENCO scope. Re routing of underground line if any will be by the bidder and payment for the same will be in line with the BOQ.
60	General	Drawings	Kindly provide the Overall plot plan, Contour map & general arrangement drawings for the major structures.	Overall Plot Plan is available in the Tender
61	General	Scope of work	The Scope work in the VOLUME-IA PART – I CHAPTER – II, SCOPE OF WORKS is different to the VOLUME : VII-A GENERAL SPECIFICATION AND DESIGN CRITERIA FOR CIVIL AND STRUCTURAL WORKS Clause no.2.0 Please clarify.	Scope of work to be read in line with Clause 1.2.0 of TCC

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62	VOLUME-IA PART – II CHAPTER – I, Clause no-3.2.9.3	The total amount of PVC shall not exceed 20% of the cumulatively executed contract value. Executed contract value for this purpose is exclusive of PVC, Supplementary/Additional Items and Extra works.	We understand this ceiling of PVC is only for labour, HSD oil and material and does not include cement. Please Clarify.	Tender prevails
63	VOLUME-VIIIA Clause no-12.02.01 (V)	Structures requiring grade of concrete of M25 and above excluding water-retaining structures.	Kindly specify the type of cement ( OPC,PPC) should be used for RCC Water retaining structure.	Cement as per Technical specification 12.02.01
64	Volume II Price Bid	BOQ Item no - 216	Please change the unit of measurement in CUM.	Item description and UOM is clear. Bidder to quote accordingly.
65	Volume II Price Bid	BOQ Item no - 218	Please change the unit of measurement in CUM.	Item description and UOM is clear. Bidder to quote accordingly.
66	Volume II Price Bid	BOQ Item no - 301	Request you to allow the steel shutter form work for below Ground Level concrete works.	Item description and UOM is clear. Bidder to quote accordingly.
67	Volume II Price Bid	BOQ Item no - 401, 406, 2422	Please confirm the supply of reinforcement steel for the mentioned items are free issue or not.	Item description and UOM is clear. Bidder to quote accordingly.
68	Volume II Price Bid	BOQ Item no - 705	Please change the unit of measurement in RM.	Bidders to quote rate as per unit mentioned in item
69	Volume II Price Bid	BOQ Item no - 1813 & 1814	Kindly provide the Sizes & drawings for these items.	Shall be furnished during detail engg stage
70	SCT1577_VOLUME II PRICE BID 700 MS Embedments	Supply of MS Pipes, PVC, UPVC Pipes	Please provide the approved vendor list for Pipes & fittings.	No separate approved vendor list is available. Supply as per BOQ item description, technical specification and relevant IS. Approval shall be obtained case to case basis from BHEL/TSGENCO.
71	SCT1577_VOLUME II PRICE BID 1500 Roofing/Side Cladding	Designing, providing and fixing permanently color coated galvanised MS troughed metal sheet decking plate of approved colour and conforming to class3 of IS 14246 over roof purlins for cast-in-situ roof slab as per relevant IS code and specification. Bare metal thickness of deck plate shall be minimum 0.7mm with minimum trough depth of 44 mm having minimum yield strength of 250 MPa	Please provide the approved vendor list for Sheeting works. Also Since this is an item rate contract, please confirm whether design shall be part of our scope or not?	No separate approved vendor list is available. Supply as per BOQ item description, technical specification and relevant IS. Approval shall be obtained case to case basis from BHEL/TSGENCO. Item description is clear regarding design.
72	SCT1577_VOLUME II PRICE BID 1506Insulation	Providing and fixing insulation of resin bonded mineral wool of 50 mm nominal thickness conforming to IS 8183 having a density of 32 kg/cum glass wool or 48 kg/cum for rock wool, for cladding/under deck insulation including application of glue and tying with lacing wire, for glass/rock wool as per manufacturer's recommendations.	Please provide the approved vendor list for Insulation works	No separate approved vendor list is available. Supply as per BOQ item description, technical specification and relevant IS. Approval shall be obtained case to case basis from BHEL/TSGENCO.
73	SCT1577_VOLUME II PRICE BID 1700 Rainwater down take pipes	Supply of GI, HDPE & UPVC Pipes	Please provide the approved vendor list for Pipes & fittings	
74	SCT1577_VOLUME II PRICE BID A2104Galvanised MS Pipes	Providing and fixing Galvanised MS pipes class B medium class conforming to IS:1239 pipes	Please provide the approved vendor list for Pipes & fittings	

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75	SCT1577_VOLUME II PRICE BID 2105GI Pipes	Providing and fixing GI pipes class B complete for exter0l work with GI sockets, unions, elbows, tees, nipples etc	Please provide the approved vendor list for Pipes & fittings	
76	SCT1577_VOLUME II PRICE BID A2302	Extra over ST NO. 2301 for surface preparation by sand blasting in accordance with IS 1477 (part I & II) and applying 2 or more coats of primer of epoxy resin based zinc rich primer in coats of minimum 25 micron (DFT) at shop and 25 micron (DFT) after erection, instead of primer coat of red oxide zinc- chromate, including touch-up painting etc all complete...	Since our quoted rates in SI no.2301 are inclusive of 2 coats of red oxide zinc-chromate primer, how the rate adjustment for the same will take place? Please clarify.	The rate for A2302 to be the differential rate as per item description.
77	SCT1577_VOLUME II PRICE BID 2306	Providing, laying and clamping of crane rails over the crane girder at all elevations as per IS 3443 including all fixtures, clamps, testings etc. all complete as per drawing and specification.	Please provide the size of rails & dimensions etc., need to consider.	The unit is in "MT". The size and dimensions of the rail shall be furnished during detail engg stage.
78	SCT1577_VOLUME II PRICE BID 2307	Supplying, fabrication, erection and alignment of factory made electroforgedgalvanised grating units with mild steel (having minimum galvanisation of 610 g/sqm) conforming to IS:2062 in flooring, platforms, drain and trench covers, walk-ways, passages, staircases with edge binding strips and anti-skid nosing in treads etc. including fixing clamps, fittings, fixtures, all taxes, duties, packing, grinding, drilling, welding, edge preparation, etc. all complete..	Please provide the type of gratings to be used.	Item description is clear.
79	SCT1577_VOLUME II PRICE BID 2308	Supplying, fabrication, erection and alignment of factory made galvanised welded grating units with mild steel conforming to IS:2062 in flooring, platforms, drain and trench covers, walk-ways, passages, staircases with edge binding strips and anti-skid nosing in treads etc. including 2 coats of redoxide zinc-chromate primer (one coat at shop and one coat after erection), fixing clamps, fittings, fixtures, all taxes, duties, packing, grinding, drilling, welding, edge preparation, etc. all complete.	Item description is clear.	Item description is clear.
80	SCT1577_VOLUME II PRICE BID A2309	Extra over above ST NO. 2301/2308 for finishing the grating units with hot dipped galvanisation @ 1000 gm/sqm over blast cleaned steel surfaces instead of painting with two coats of red oxide zinc- chromate primer all complete.	Since our quoted rates in SI no.2301/2308 are inclusive of 2 coats of red oxide zinc-chromate primer, how the rate adjustment for the same will take place? Please clarify	The rate for A2309 to be the differential rate as per item description.
81	SCC: Clause 1.7.6 of Page 5	Preservation / Re-conservation of all the components during storage / erection / commissioning till handling over.	Please provide the specifications for Preservation / Re-conservation for equipment wise or system wise.	
82	SCC: Clause 2.3 of Page 6	Transport of material to their respective places of erection and erection of the complete plant & equipment as supplied under this specifications	Please provide the distance from storage area / yard to erection site	This clause pertain to BHEL supplied equipment and T&P

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83	SCC: Clause 4.2.2.16 (c) of Page 15	In case BHEL cranes are not covered under AMC of BHEL. In case BHEL cranes are covered under AMC of BHEL.	Please confirm which option needs to be considered.	
84	SCC: Clause 4.2.2.17 (d) of Page 16	The construction and dismantling of the foundations required for the construction/elevator lifts is included in the scope of the contractor	Please provide the details for the same.	This clause pertains to construction lifts/elevators provided by BHEL
85	GCC: Clause 2.7.8 of Page 67	In the unforeseen event of inordinate delay in receipt of materials, drawings, fronts etc., due to which inordinate discontinuity of work is anticipated, BHEL at its discretion may consider contractor's request to short close the contract.	In this case please confirm whether any additional compensation will be paid to contractor as we would be mobilized all our resources, equipments, etc. with respect to total quantity and established site infrastructure completely at the site.	Clause is clear. Clause to be read fully to understand
86	GCC: Clause 2.11.3 of Page 71	However if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty / LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take at the risk and cost of contractor.	In case the delay in completion of works attributable to delay in supply of free issue materials from BHEL, contractor shall be suitably compensated for the same. Kindly Confirm	As per the terms of tender
87	GCC: Clause 2.22.2 (ii) of Page 79	Balance 50% of retention amount shall be retained towards 'Performance Guarantee for Workmanship' and shall become refundable after expiry of Guarantee Period, provided all the defects noticed during the guarantee period have been rectified by BHEL Site Engg.	Please provide Performance Guarantee Period or Defects Liability Period	Kindly refer to clause 1.6.6 of TCC
88		tender specification has given the specification for construction of chimney. However "volume-II price bid" does not contain the BOQ items of chimney.	Kindly clarify the scope of work for subject tender and please inform us tentative date of chimney tender for subject power plant.	Scope of work to be read in line with Clause 1.2.0 of TCC
89	TERMS OF PAYMENT Clause 1.7.0	These payment terms mentioned under 1.7.0 is applicable for only civil works or for both civil and structures works.		The title in clause 1.7.3, VOLUME-IA, PART – I CHAPTER-VII for TERMS OF PAYMENT in TCC may be read as "Interim Payment".
90	Clause no 8.0.0 of Section -IX, Technical specification for Fabrication of Structural steel work	Please clarify whether these payment terms will be applicable against Fabrication works or not ?	Unless mentioned otherwise in the tender / contract document, for fabricated materials delivered to Site, the Contractor shall be entitled to 90% of the value of the materials supplied and the balance 10% shall be paid only after the final erection, and aligning of the fabricated materials. In addition, the Security Money as stipulated in the Contract, shall be deducted from each payment.	Tender prevails. Terms of payment as per clause 1.7.0 of TCC

Sl. No.	Reference Cl. No. of Bidding Document	Description of existing provision of NIT	Bidders questionnaire for clarification sought / modification proposed towards existing provision of NIT.	Reply by BHEL
91	clause no 8.0.0 of Section -X, Technical specification for Erection of Structural steel work	clarify whether these payment terms will be applicable against Erection works or not	Unless mentioned otherwise in the Tender/Contract document for fabricated materials erected, aligned, plumbed, levelled and grouted, the Contractor shall be paid 95% (ninety-five percent) of the value of erection. the balance 5% (five percent) shall be paid after acceptance of the structure withstanding necessary tests in accordance with the Contract. Necessary deductions towards Security Money shall be made from all bills of the Contractor in accordance with the Contract.	Tender prevails. Terms of payment as per clause 1.7.0 of TCC
92	SI No 3, TCC, Vol1A, Part II, PVC	PVC is applicable for cement in contract period and for labour, HSD, and materials during the extended period.	Request you to kindly include atleast Labour Component during the contract period. Secondly to include cement component (30%) during the extended period to make it 85% as well.	Tender prevails
93	Price Bid (Volume-II)		Request you to provide MS Excel sheet	BOQ can be downloaded from BHEL web site.Excel form cannot be provided
94	Tender Drawings		Request you to kindly provide tender drawings for structures to be executed during the contract.	Plot plan is available in the tender
95	SL No 5, due date of submission		Kindly extend the date of bid submission by 7 days; i.e upto 19.03.2015	Refer Corrigendum 1 dated 10.03.2015
96	General	Cement	The scope of supply of cement is in bidder's scope as per tender provision. Please provide us the names and address of approved manufacturer of Cement. Also specify the type of Cement to be used in structures.	No separate approved vendor list is available. Cement as per Technical specification 12.02.01
97	General	Technical Specifications of Work	In the tender document Technical Specifications of BHEL has not been provided. Please clarify.	Work is to be done in line with the technical specification provided.
98	TCC Cl. No. 3.1,3.1.6,3.2.4,3.2.8	Price variation compensation	Pl. Clarify, PVC is applicable for entire contract period.	Tender condition is clear.
99	TCC Cl. No. 1.3.4	Construction power by BHEL.	It is requested to provided construction power at 2 points free of cost at 415 V.	One point inside the plant boundary and one point in the area outside the boundary will be provided by BHEL.
100	TCC Cl. No. 1.4.2	1no. automatic concrete batching plant with printing facility (60 Cum/Hr)	As the tender RCC quantity is @ 60000 cum , it is requested to allow batching plant of 45 cum/Hr.	Accepted
101	BOQ Item no. 2610	Extra over ST No. 1 to 9 for carriage of unserviceable material/earth for every. ....	Kindly provide the maximum lead of transportation of excess excavated material	Disposal point outside the plant to be located by bidder. Rate quoted will be for every km.
102	BOQ Item no. 2602,2603,2604	Earthwork in excavation upto any depth below ground level in all types of soil .....	Pl. clarify, Whether we have to transport the excavated soil within plant premises of 1 KM	Bidder to quote in line with item description
103	BOQ Item no. 2402 & 2611A	Earth work in filling upto any depth below ground level for .....	The good excavated soil can be use or we have to borrow murrum Pl. clarify.	Bidder to quote in line with item description
104	BOQ Item No. & 2601	Cutting of trees having girth more than 300 mm measured .....	Pl. specify the girth of trees or maximum girth size.	Bidder to visit site and quote in line with item specification
105	BOQ Item No. 109	Extra over ST No. 101 and 103 to 107 for carriage of excavated earth/selected materials for every 1 km or part thereof	Pl. clarify, Whether Transportation required for backfilling will be paid extra under Item no. 109	Bidder to quote in line with item description
106	BOQ Item No. 200	Concrete..	The admixtures/ plasticizer/super plasticizer required for concreting will be paid under which item	Bidder to quote in line with item description

Sl. No.	Reference Cl. No. of Bidding Document	Description of existing provision of NIT	Bidders questionnaire for clarification sought / modification proposed towards existing provision of NIT.	Reply by BHEL
107	BOQ Item No. 2301 & A2302	Fabrication and erection of structural steel with mild steel rolled section.....	Pl. clarify whether 2 coats of red oxide zinc chromate primer is included in Item no. 2301 as quantity mentioned in item no. A2302 is same.	The rate for A2302 to be the differential rate as per item description.
108	BOQ Item No. A2309	Extra over above ST NO. 2301/2308 for finishing the grating....	Whether item A2309 is extra over above ST no. 2301or 2308 or for both the items.	Bidder to quote in line with item description
109	BOQ Item no. 2308	Supplying, fabrication, erection and alignment of factory made galvanised welded grating units with mild steel conforming.....	Pl. Clarify, that Factory made welded Grating is to be supplied galvanized OR painted.	Bidder to quote in line with item description
110	NIT	The due date of submission is 12/03/2015.	It is requested to extend the due date of submission up to 11/04/2015.	Refer Corrigendum 1 dated 10.03.2015
111	NIT	The due date of submission is 12/03/2015.	It is requested to extend the due date of submission up to 27/03/2015.	Refer Corrigendum 1 dated 10.03.2015
112	NIT	The due date of submission is 12/03/2015.	It is requested to extend the due date of submission up to 19/03/2015.	Refer Corrigendum 1 dated 10.03.2015
113	1.7.3	Interim Payment	We request you to release interim payments upto 100% of the item rate upon submission of the quality check formats/documents as per the quality plan for the quantum of work billed and duly certified by Engineer.	Tender prevails
114	1.7.4 & 1.7.4.2	Final Bill and Retention Amount ( Retention Money )	We request you to accept for Bank Gaurantee @2.5% of the item rate in lieu of cash retention from RA Bills which is valid until final bill/ virtual completion of the project.	Tender Prevails
115	1.7.4.3	Final Bill and Retention Amount ( Performance Gaurantee)	We request you to accept for Bank Gaurantee @2.5% of the item rate in lieu of cash retention from RA Bills which is valid upto Defects Liability Period towards Performance Gaurantee	Tender Prevails
116	1.7.2 & 1.7.2.1	Advance for mobilisation	We request you to provide interest free mobilisation advance of 10% of Contract Value. The said advance shall be recovered on pro rata basis commencing after first ten percent (10%) of the gross value of the work is executed and paid and entire advances is rejected by the time eighty percent of the gross value of the contract is executed and paid.	Tender Prevails
117	1.7.2.2	Initial Security Deposit	Initial Security deposit may not be applicable, as security towards mobilisation advance in the form of BG @110% is submitted. Please clarify.	Tender Prevails
118	1.7.2.3	Mobilisation of machinery & T&P	We request you to accept Batching Plant of 30cum/hr capacity of 2 Nos. in place of 1 number of 60 Cum/hr	Accepted
119	Item 215	Item description change	Earlier Item description : Dismantling concrete work for all types of structures at all levels including stacking of servicable material to a lead of 500 m and disposal of unservicable material upto a lead of 2 km, cutting of reinforcement, labour, equipment, safety precautions etc all complete as per drawings, specification and instructions of engineer in charge.	Revised Item description : Dismantling concrete work for all types of structures at all levels including stacking of servicable material to a lead of 500 m and disposal of unservicable material upto a lead of 2 km, cutting of reinforcement, labour, equipment, safety precautions etc all complete as per drawings, specification and instructions of engineer in charge. Bidder to quote the rate taking into account the cost of serviceable materials including the reinforcement steel, hard and soft rock which he will be getting from the dismantled concrete.

Sl. No.	Reference Cl. No. of Bidding Document	Description of existing provision of NIT	Bidders questionnaire for clarification sought / modification proposed towards existing provision of NIT.	Reply by BHEL
120		PVC clause	SI No:3.2.9.3 in Volume 1A Part-2,Chapter-1	PVC clause SI No:3.2.9.3 in Volume 1A Part-2,Chapter-1 is deleted
121		PVC clause SI No:3.1.6 in Volume 1A Part-2,Chapter-1	<b>Existing:</b> SI No: <b>3.1.6</b> PVC shall be applicable for the entire original contract period and extended period if any	<b>Revised:</b> SI No: <b>3.1.9</b> PVC shall be applicable for the entire original contract period and extended period if any
122		Geotechnical/ soil investigation report		Revised Geotechnical Report attached for information
123		BHEL T&P Mobilisation hire charges	As per Volume-1A,part-1,Chapter-V,clause:1.5.5 BHEL Corporate hire charges are not provided.	Attached
124	Consortium agreement(revised) Form F 22,clause no:16 in TCC	It is agreed between the parties that the reconciliation of materials, T&Ps, consumables etc received from the employer / owner shall be the responsibility of the partner with intimation to bidder	Partner cannot be responsible on behalf of prime bidder also.Hence "for its respective area of work " needs to be added after the word partner in the clause.	Tender prevails
125	BOQ item no:A2302	... for surface preparation by sand blasting....	Sand blasting is not permitted now as it is hazardous.Will it still be so?	Bidder to quote as per BOQ, bidder has to carry out sand blasting as per BOQ
<b>All other conditions remain unchanged</b>				
<b>GM/HR&amp;SCT</b>				



**BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR (HQ)- FINANCE**

**MOST IMPORTANT**

<b>FROM:</b> ASISH K. DAS AGM/FINANCE	<b>FOR:</b> AS PER DISTRIBUTION LIST
<b>REF NO.:</b> PWR:FAX:T&P HIRE:2013-15	
<b>Dated :</b> 3rd June, 2013	

**Subject: REVISION OF HIRE CHARGES ON ISSUE OF CAPITAL TOOLS & PLANTS:**

The rates of hire charges for Capital Tools and Plants and Operator's charges circulated vide our letter no.PW:FM:T&P Hire 2011-12 dated 25.5.2011 were valid up to 31.05.2013. **The Revised Rates effective from 01.06.2013 are enclosed as detailed below:**

- (i) **Annexure C1 & T1 :** Rates of hire charges applicable to contractors working for BHEL.
- (ii) **Annexure C2 & T2 :** Rates of hire charges applicable to outside agencies other than contractors working for BHEL.
2. **The Crane Operator's charges will be Rs. 5700/- (Rupees five thousands seven hundred only) per day of 8 hours.** For services less than 4 hours, half of per day rate will be charged. For services for 4 hours or more but up to 8 hours, full day rate will be charged. Overtime Allowance (OTA) will be charged at double the rate on hourly basis.
3. The hire charges of Capital Tools & Plants are exclusive of operating expenses (including fuel & consumables). **As such all OPERATING EXPENSES WILL BE EXTRA TO USER'S ACCOUNT.**
4. All other terms and conditions / aspects governing the "Issue of T & P on Hire" will remain the same as already circulated vide our letter of even number dated 22.01.1992 – (copy enclosed).
5. **The revised rates will be effective from 01.06.2013 and will remain valid upto 31.5.2015 and will be subject to revision thereafter.**
6. For any additional item not appearing in the enclosed lists, rate of hire charges will be worked out on receipt of specific request (with necessary details) from the regions.

Encl.: As above

03/06/2013  
AGM (Finance)

*Asish K. Das*  
AGM

*M. Srinivasan*  
F&P



**POWER SECTOR (HQ)-FINANCE. ASIAD NEW DELHI**

**SUB: Rates of hire charges on issue of capital Tools & Plants**

**REF: AGM (FIN)/POWER SECTOR LETTER NO. PWR: FAX:T&P-  
HIRE:2013-15 DATED 03.06.2013**

**Distribution :**

1. ED / PS ER, KOLKATA
2. ED / PS NR, NOIDA
- ✓3. ED / PS SR, CHENNAI
4. ED / PS WR, NAGPUR
5. ED / PS-TS, NOIDA
6. AGM (FIN) / PS ER, KOLKATA
7. AGM (FIN) / PS WR, NAGPUR
8. AGM (FIN) / PS NR, NOIDA
9. Sr.DGM (FIN) / PS SR, CHENNAI
10. AGM (FEX) / PS ER, KOLKATA
11. AGM (FEX) / PS SR, CHENNAI
12. AGM (FEX) / PS WR, NAGPUR
13. Sr.DGM(FEX) / PS NR, NOIDA

**CC:**

ED / PS MSX & IT, MM, Safety & Qly  
SA to Director (Power)

REVISED RATES OF T&P HIRE CHARGES FOR CRANES & TRAILERS ETC. FOR  
SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Hour) valid from 01/06/2013 to 31/5/2015.
<b>I.</b>	<b>CRANES :-</b>	
1	Portal Gantry Crane 500T	20240.00
2	100MT Crawler Crane ZOOMLION CRANE-QUY-100	8430.00
3	Heavy Lift Crawler Crane 600MT Class DEMAG Model CC2800	53980.00
4	PORTAL CRANE, 360T	15600.00
5	600MT Class Crawler Crane- Manitowoc Model 18000	60780.00
6	600MT Class Crawler Crane- Liebherr Model LR1600-2	53980.00
7	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH RINGER)	33730.00
8	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH-OUT RINGER)	21080.00
9	MANITOWOC M-250T TRUCK CRANE	30360.00
10	275MT Class Crawler Crane- Manitowoc Model 2250	30360.00
11	300MT Crane Crawler Crane LIEBHERR Model LR-1350/1	25300.00
12	250MT Class Mid range Crawler Crane- Kobelco Model CKE2500-2	21920.00
13	LINKBELT LS- 248H CRAWLER CRANE (180T)	16860.00
14	MANITOWAC MODEL 888 CRAWLER CRANE (200 MT)	21920.00
15	CRAWLER CRANE SUMITOMO, 150T	13490.00
16	All Terrain Crane, 150MT- Liebherr Model LTM1150	15180.00
17	CRAWLER CRANE , 90 T (1055 BLC)	3470.00
18	CRAWLER CRANE ,100 T Fushun Model QUY120	10890.00
19	CRAWLER CRANE 135MT Kobelco Model CK1350	13490.00
20	CRAWLER CRANE 120MT - Tata-Sumitomo Model SCX1200-2	11800.00
21	CRAWLER CRANE 100 T (KH 500)	10120.00
22	Hydraulic Crawler Crane 80MT, Fushun Model QUY 80B	5440.00
23	ROUGH TERRAIN CRANE 75T (RT880)	6760.00
24	CRAWLER CRANE, 75T -Tata Model 955ALC/TFC280	5640.00
25	Mobile Crane, 55MT (TIL)	4830.00
26	CRAWLER CRANE, 25T -Tata Model TFC75	2170.00
27	MOBILE CRANE, 20MT (TIL)	2170.00
28	MOBILE CRANE, 20MT (ESCORTS)	2170.00
29	CRAWLER CRANE, 18T (Tata Model 320)	1730.00
30	MOBILE CRANE ESCORTS- 14MT	710.00
31	HYDAULIC PICK & CARRY CRANE, 8/9/10/11/12 MT	390.00
32	ELECTRIC GANTRY CRANE 3T	430.00
33	ELECTRIC GANTRY CRANE 5T	540.00
34	ELECTRIC GANTRY CRANE 30T	3650.00
35	FORK LIFT 5T	720.00
36	FORK LIFT 3T	540.00
<b>II</b>	<b>MATERIAL HANDLING VEHICLES:-</b>	
1	TRACTOR AND TRAILER 30T	890.00
2	TRACTOR AND TRAILER 20T	770.00
3	TRAILER, 15T	270.00
4	TRAILER, 10T/12T	270.00
5	TRACTOR FOR TRAILOR 15T/10T/12T	420.00
6	TRUCK, 10T/8T	360.00

**Annexure C2**

DATE:31/05/2013

**REVISED RATES OF T&P HIRE CHARGES FOR CRANES & TRAILERS ETC. FOR  
OUTSIDE AGENCIES**

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Hour) valid from 01/06/2013 to 31/5/2015
<b>I.</b>	<b>CRANES :-</b>	
1	Portal Gantry Crane 500T	22490.00
2	100MT Crawler Crane ZOOMLION CRANE-QUY-100	9370.00
3	Heavy Lift Crawler Crane 600MT Class DEMAG Model CC2800	59970.00
4	PORTAL CRANE, 360T	17330.00
5	600MT Class Crawler Crane- Manitowoc Model 18000	67530.00
6	600MT Class Crawler Crane- Liebherr Model LR1600-2	59970.00
7	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH RINGER)	37480.00
8	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH-OUT RINGER)	23420.00
9	MANITOWOC M-250T TRUCK CRANE	33730.00
10	275MT Class Crawler Crane- Manitowoc Model 2250	33730.00
11	300MT Crane Crawler Crane LIEBHERR Model LR-1350/1	28110.00
12	250MT Class Mid range Crawler Crane- Kobelco Model CKE2500-2	24360.00
13	LINKBELT LS- 248H CRAWLER CRANE (180T)	18740.00
14	MANITOWAC MODEL 888 CRAWLER CRANE (200 MT)	24360.00
15	CRAWLER CRANE SUMITOMO, 150T	14990.00
16	All Terrain Crane, 150MT- Liebherr Model LTM1150	16860.00
17	CRAWLER CRANE , 90 T (1055 BLC)	3860.00
18	CRAWLER CRANE ,100 T Fushun Model QUY120	12090.00
19	CRAWLER CRANE 135MT Kobelco Model CK1350	14990.00
20	CRAWLER CRANE 120MT - Tata-Sumitomo Model SCX1200-2	13120.00
21	CRAWLER CRANE 100 T (KH 500)	11240.00
22	Hydraulic Crawler Crane 80MT, Fushun Model QUY 80B	6040.00
23	ROUGH TERRAIN CRANE 75T (RT880)	7510.00
24	CRAWLER CRANE, 75T -Tata Model 955ALC/TFC280	6270.00
25	Mobile Crane, 55MT (TIL)	5360.00
26	CRAWLER CRANE, 25T -Tata Model TFC75	2410.00
27	MOBILE CRANE, 20MT (TIL)	2410.00
28	MOBILE CRANE, 20MT (ESCORTS)	2410.00
29	CRAWLER CRANE, 18T (Tata Model 320)	1930.00
30	MOBILE CRANE ESCORTS- 14MT	790.00
31	HYDAULIC PICK & CARRY CRANE, 8/9/10/11/12 MT	430.00
32	ELECTRIC GANTRY CRANE 3T	480.00
33	ELECTRIC GANTRY CRANE 5T	600.00
34	ELECTRIC GANTRY CRANE 30T	4050.00
35	FORK LIFT 5T	800.00
36	FORK LIFT 3T	600.00
<b>II</b>	<b>MATERIAL HANDLING VEHICLES:-</b>	
1	TRACTOR AND TRAILER 30T	990.00
2	TRACTOR AND TRAILER 20T	850.00
3	TRAILER, 15T	300.00
4	TRAILER, 10T/12T	300.00
5	TRACTOR FOR TRAILOR 15T/10T/12T	470.00
6	TRUCK, 10T/8T	400.00

**Job No: 3421**

**PRELIMINARY REPORT ON  
GEOTECHNICAL INVESTIGATION WORK FOR  
1 x 800MW KOTHAGUDAM THERMAL POWER STATION  
STAGE VII, UNIT-12 AT KHAMMAM DISTRICT,  
TELANGANA STATE**

***Clients :***

**M/s. Bharat Heavy Electricals Limited  
Power Sector – Southern Region  
690, Annasalai, Nandanam, Chennai - 600035**

***Foundation Consultants :***

**C. E. Testing Company Pvt. Limited  
An ISO 9001, 14001& OHSAS 18001 Certified Company  
NABL Accredited Laboratory  
124A, N.S.C. Bose Road : Kolkata - 700 092  
Phones: 2428-6221/6222/6223 Fax: (033) 2428-6220  
Email: cetest@cetestindia.com**

**February - 2015**

**PRELIMINARY REPORT ON  
GEOTECHNICAL INVESTIGATION WORK FOR  
1 x 800MW KOTHAGUDAM THERMAL POWER STATION  
STAGE VII, UNIT-12 AT KHAMMAM DISTRICT,  
TELANGANA STATE**

## **1. INTRODUCTION**

The **Telangana State Generation Corporation Limited** has proposed 1 x 800MW Kothagudam Thermal Power Station, Stage – VII, Unit - 12 & the job was awarded to **M/s. Bharat Heavy Electricals Limited**. For designing of Foundation Structures coming under this project, it was necessary to conduct a Detailed Geotechnical Investigation Work and **M/s Bharat Heavy Electricals Limited**, in turn awarded the job to **M/s. C. E. Testing Company Pvt. Ltd., Kolkata**.

The scope of the work comprised of sinking 68 nos. bore holes. The scope also includes PLT (Plate Load Tests – 5Nos.), CPLT (Cyclic Plate Load Tests – 5Nos.), TP (Trial Pit – 10Nos.), ERT (Electrical Resistivity Tests – 20Nos.), CST (Cross Hole Tests – 4Nos.), PMT (Pressure meter Test – 3Nos.), BVT (Block Vibration Test – 2Nos.), SCPT (Static Cone Penetration Tests – 5Nos.), DCPT (Dynamic Cone Penetration Tests – 10Nos.), Field Permeability – 2Nos., Field CBR – 4Nos.

The site work is in progress. **This preliminary report is prepared based on 13nos. boreholes (BH-19, 25, 26, 32, 34, 37, 42, 48, 57, 58, 62, 63 & 66) only.**

## 2. CHOICE OF FOUNDATION AND FOUNDING LEVEL

Considering the nature of the subsoil and the type of structures to be constructed at the present site, it is suggested to go for open foundation. Such foundations should be placed at 1.00m or more below EGL depending on requirement. The determination of bearing capacity is presented below.

### DETERMINATION OF BEARING CAPACITY AT COOLING TOWER LOCATION:

Let us consider BH-19.

Let us place the foundation at 1.50m below FGL (FGL= 101.500M).

The founding level falls inside hard clay layer.

Design N = 33, So, estimated cohesion from "N" value = 1.22 kg/sqcm

In absence of any laboratory test results, Use C = 1.10 kg/sqcm &  $\Phi = 0^\circ$ .

### Evaluation of Strength & Deformation Parameters:

#### FOR HARD CLAY FROM 0.00M TO 4.18M

Total soil modulus,  $E_s = 4.4 \times N = 145.2$  kg/sqcm

[Ref. to "History of Soil penetration testing" by B. B. Broms & N. Flodin in "Penetration Testing 1988", ISPT-1: vol.1, p – 185]

Undrained Young's modulus,  $E_u = K \times C = 500 \times 1.10 = 550$  kg/sqcm

Again,  $1/E_s = 1/E_u + 1/E_d$  giving drained young's modulus,  $E_d = 197.28$  kg/sqcm

Now, we have,  $E_d = E_u/3 = 183.33$  kg/sqcm

[Refer to "Cone Penetration Testing" by A.C.Meigh, pp. No. – 53]

Considering the above, let us use  $E_d = 190$  kg/sqcm

From  $E_d$ ,  $m_{vc} = 1/G.E_d = 0.0088$  sqcm/kg [Geological Factor,  $G = 0.60$  &  $\mu = 0.35$ ]

Again from SPT "N",  $m_{vc} = 1/5N = 0.0061$  sqcm/kg

[Refer to "Standard Penetration Test, State-of-the-art-Report" by Ivan K. Nixon in "Penetration testing 1" Edited by A.Verrujt, F.L.beringen & E.H.De Leeuw, pp. No. 11]

Therefore, average  $m_{vc} = [0.0088 + 0.0061]/2 = 0.0075$  sqcm/kg

#### Rock layer

The 'E' value for fissured and jointed rock varies from a minimum of 1500 kg/sqcm to a maximum of 30000 kg/sqcm whereas for sound rock the same is 30000 kg/sqcm or more.

Let us use lowest probable E value of layer **V** (CR=0% to 25%), **VI** (25%<CR≤50%) & **VII** (CR>50%) = 1000kg/sqcm, 2000kg/sqcm & 4000kg/sqcm respectively.

[Refer to "Soil Mechanics and Foundation Engineering" 4<sup>th</sup> Edition by Prof. V. N. S. Murthy, pp – 271]

**Calculation of Safe Bearing Capacity:**Use depth of foundation = 1.50M below FGL

The Net Ultimate Bearing Capacity is given as:

$$q_{nu} = C \cdot N_c \cdot S_c \cdot D_c + q \cdot N_q \cdot S_q \cdot D_q + 0.5 \gamma \cdot B \cdot N_\gamma \cdot S_\gamma \cdot D_\gamma - q$$

Where,

 $N_c$ ,  $N_q$  and  $N_\gamma$  are bearing capacity factors, $S_c$ ,  $S_q$  and  $S_\gamma$  are shape factors, $D_c$ ,  $D_q$  and  $D_\gamma$  are depth factors,

And

C = Cohesion

q = Effective Overburden pressure,

B = Width of foundation,

 $\gamma$  = Effective density below foundation.**For 4m x 6m Isolated Footing**

Cohesion, C = 11.00 t/sqm

Using  $\phi = 0$  degree, the bearing capacity factors are:

$$N_c = 5.14$$

$$N_q = 1.00$$

$$N_\gamma = 0.00$$

Use,

Depth of Foundation =  $D_f = 1.5$  M below FGL

Width of Foundation = B = 4 M

Length of Foundation = L = 6 M

Overburden Pressure =  $q = 1.500$  (Depth)  $\times$  0.90 (Submerged density) = 1.35 t/sqm (assuming water table is flushing with the ground)

The Shape factors are [ IS:6403 - 1981 ]

$$S_c = 1.13$$

$$S_q = 1.13$$

$$S_\gamma = 0.73$$

The Depth factors are [ IS:6403 - 1981 ]

$$D_c = 1.08$$

$$D_q = 1.00$$

$$D_\gamma = 1.00$$

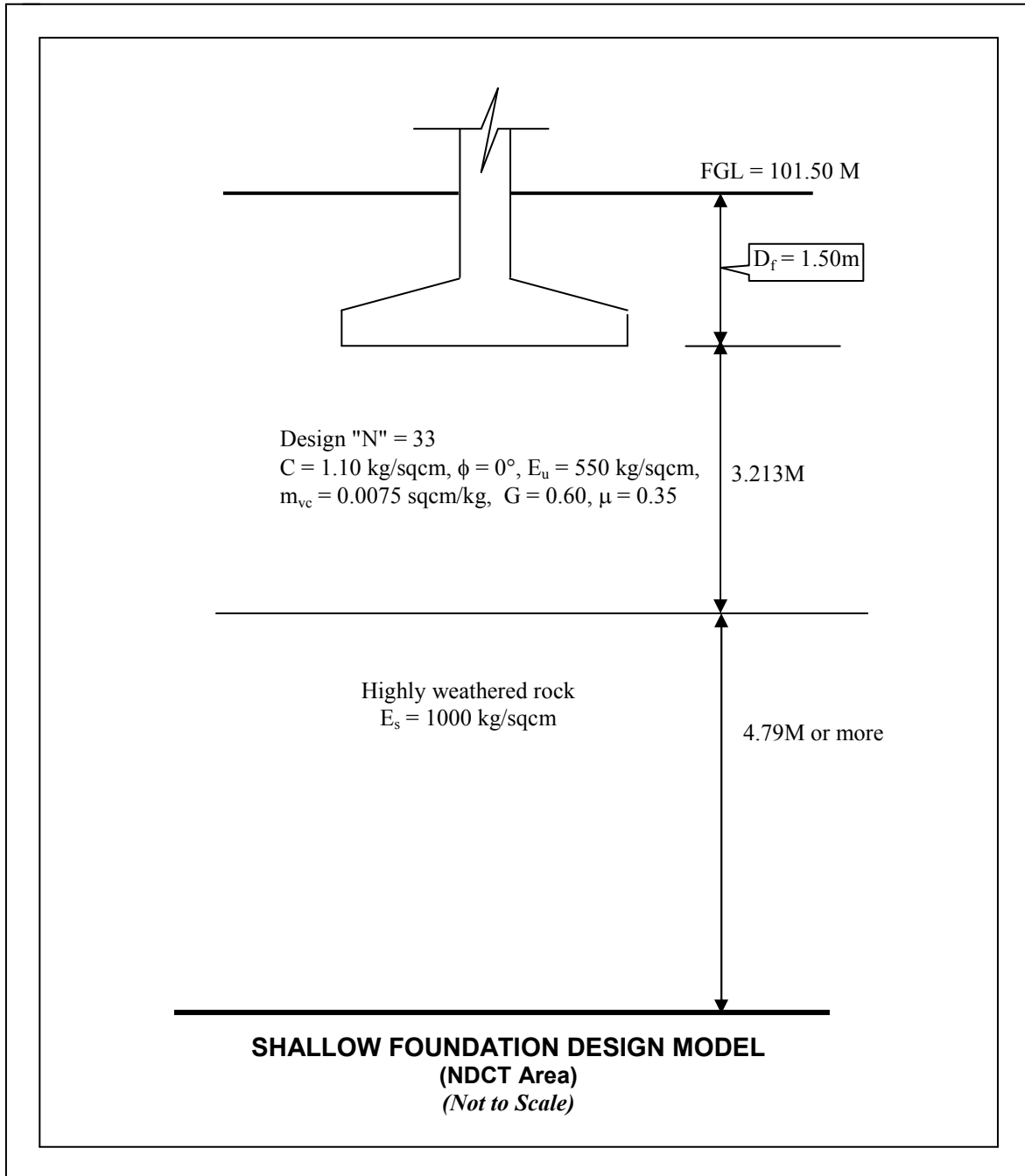
Computed Net Ultimate Bearing Capacity = 69.12 t/sqm

**Using a factor of safety of 2.5, Net Safe Bearing Capacity = 27.65 t/sqm****For 10m x 15m Isolated Footing**

Computed Net Ultimate Bearing Capacity = 66.23 t/sqm

**Using a factor of safety of 2.5, Net Safe Bearing Capacity = 26.49 t/sqm**

The above bearing capacity should be checked against settlement criteria. This is shown below.



## SETTLEMENT CALCULATION

### Settlement Analysis for 4m x 6m foundation

#### A) General Data:

Width of foundation =	4.0	m
Length of foundation =	6.0	m
Depth of foundation =	1.5	m
Net Base Pressure =	2.5	kg/sqcm

#### B) Subsoil Properties:

##### Layer - III

Young's Modulus =	550	kg/sqcm
Poisson Ratio, $\mu$ =	0.35	
Top of Stratum =	1.50	m
End of Stratum =	4.71	m
Geological factor, G =	0.60	
$m_{vc}$ =	0.0075	sqcm/kg

##### Layer - V

Young's Modulus =	1000	kg/sqcm
Poisson Ratio, $\mu$ =	0.25	
Top of Stratum =	4.71	m
End of Stratum =	9.50	m
Geological factor, G =	1.00	
$m_{vc}$ =	0.0000	sqcm/kg

#### C) Calculation of Immediate Settlement:

##### Settlement at center

$$M = L' / B' = 1.500$$

$$N = H / B' = 1.607$$

$$I_1 = 0.237$$

$$I_2 = 0.094$$

$$I_s = I_1 + \{(1-2\mu) / (1-\mu)\} I_2 = 0.281$$

$$\text{Immediate settlement } S_i = 0.895 \text{ cm}$$

$$[q_o \times B \times (1 - \mu^2) \times m \times I_s] / E_s$$

##### Settlement at center

$$M = L' / B' = 1.277$$

$$N = H / B' = 1.327$$

$$I_1 = 0.195$$

$$I_2 = 0.091$$

$$I_s = I_1 + \{(1-2\mu) / (1-\mu)\} I_2 = 0.255$$

$$\text{Immediate settlement } S_i = 0.312 \text{ cm}$$

$$[q_o \times B \times (1 - \mu^2) \times m \times I_s] / E_s$$

##### Settlement at corner

$$M = L' / B' = 1.50$$

$$N = H / B' = 0.803$$

$$I_1 = 0.095122$$

$$I_2 = 0.096872$$

$$I_s = I_1 + \{(1-2\mu) / (1-\mu)\} I_2 = 0.140$$

$$\text{Immediate settlement } S_i = 0.223 \text{ cm}$$

##### Settlement at corner

$$M = L' / B' = 1.28$$

$$N = H / B' = 0.664$$

$$I_1 = 0.073$$

$$I_2 = 0.088$$

$$I_s = I_1 + \{(1-2\mu) / (1-\mu)\} I_2 = 0.132$$

$$\text{Immediate settlement } S_i = 0.080 \text{ cm}$$

$$\text{Average } S_i \text{ for Stratum III} = 5.59 \text{ mm}$$

$$\text{Total immediate settlement} = 7.55 \text{ mm}$$

$$\text{Average } S_i \text{ for Stratum V} = 1.96 \text{ mm}$$

(for both the layer)

#### D) Calculation of Consolidation Settlement:

Strata	From (M)	To (M)	Thickness (M)	Mid depth (M)	$\Delta P$ (kg/sqcm)	$m_{vc}$ sqcm/kg	G	$S_c$ (cm)
Layer - III	1.50	3.11	1.61	0.80	1.84	0.0075	0.60	1.33
	3.11	4.71	1.61	2.41	1.11	0.0075	0.60	0.80
Layer - V	4.71	7.11	2.39	4.41	0.69	0.0000	1.00	0.00
	7.11	9.50	2.39	6.80	0.43	0.0000	1.00	0.00

$$\text{Hence, Total Consolidation Settlement} = 21.32 \text{ mm}$$

$$\text{So, Total Settlement} = 28.87 \text{ mm}$$

$$\text{Foxe's Depth correction Factor} = 0.92$$

$$\text{Applying Rigidity correction Factor} = 0.80$$

$$\text{Corrected total settlement} = 21.22 \text{ mm}$$

With reference to the above and considering the subsoil condition around each bore hole, the following bearing capacity values may be used.

Name of Structure	Foundation Location	Depth of Foundation below FGL (m)	Net Allowable Bearing Capacity (t/sqm)	
			Isolated / Strip	Raft
NDCT (FGL = 101.50M)	BH-19, 25, 26	1.50	25	22
		4.00	40	40
		5.50	45	45
ESP (FGL = 99.00M)	BH-32, 57, 58, 66	4.00	25	25
		5.00	40	40
		6.00	45	45
Power House (FGL = 99.00M)	BH-34 & 37	1.00	20	20
		2.00	22	22
		3.50	30	30
		4.00	40	40
		5.50	45	45
Boiler & Mill Bunker Bay Area (FGL = 99.00M)	BH-42, 48	5.50	40	40
		6.50	45	45
Chimney (FGL = 99.00M)	BH-62 & 63	6.00	40	40
		7.00	45	45

**Note:** Limiting settlement in soil is considered as 25mm for Isolated / Strip and 40mm for Raft foundation.

### 3. SUMMARY & RECOMMENDATIONS

Based on the field tests and the foregoing discussion the following are summarised.

1. The subsoil is characterised by stiff to very stiff clayey silt / silty clay followed by a layer of hard clayey silt / silty clay or very dense silty sand layer. After that weathered rock layer was struck and continues upto the terminating depth of all the boreholes.
2. The standing water level was found from 0.60m to a maximum depth of 5.50m during the time of investigation. So, construction of open foundation, placed at a depth of 1.00m or more, may create a problem. However, ordinary surface operated pump will be able to tackle the situation for dewatering.
3. The determination of bearing capacity is discussed in the previous section. However, this is further presented below.

Name of Structure	Foundation Location	Depth of Foundation below FGL (m)	Net Allowable Bearing Capacity (t/sqm)	
			Isolated / Strip	Raft
NDCT (FGL = 101.50M)	BH-19, 25, 26	1.50	25	22
		4.00	40	40
		5.50	45	45
ESP (FGL = 99.00M)	BH-32, 57, 58, 66	4.00	25	25
		5.00	40	40
		6.00	45	45
Power House (FGL = 99.00M)	BH-34 & 37	1.00	20	20
		2.00	22	22
		3.50	30	30
		4.00	40	40
		5.50	45	45
Boiler & Mill Bunker Bay Area (FGL = 99.00M)	BH-42, 48	5.50	40	40
		6.50	45	45
Chimney (FGL = 99.00M)	BH-62 & 63	6.00	40	40
		7.00	45	45

**Note:** Limiting settlement in soil is considered as 25mm for Isolated / Strip and 40mm for Raft foundation.

**For C. E. Testing Company Private Limited,**

**Prepared By**

**Checked By**

**Approved By**

**( S. SARKAR )**

**( S. NATH )**

**( DR. M. NAYAK )**



Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 12/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 19** Co-ordinates E=467900.081 N=1946824.434

Field Test	Nos	Samples	Nos	Commencement Date : 24/01/15
Penetrometer (SPT)	14	Undisturbed (UDS)	1	Completion Date : 29/01/15
Cone (Pc)		Penetrometer (SPT)	14	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 100.967 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 3.6 m.

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES	
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)
0.00m								DS-1	0.50
Hard, brownish grey, silty clay. Obs. whitish grey, moorum.		4	5	5	8	33	11	SPT-1	1.00-1.45
						>100		UDS-1	2.00-2.45
		5	9	19	34	50		SPT-2	3.00-3.34
						>100			
Completley weathered, whitish grey, medium grained, highly fractured rock. (Decomposed & disintegrated rock particle collected as sludge on R2 & R3).	4.18m	19	33	50				SPT-3	4.00-4.18
						3.0 cm Penth.		R1	CR=09% RQD=NIL
		15	27	50		>100		SPT-4	4.75-4.94
						4.0 cm Penth.		R2	CR=NIL RQD=NIL
		22	38	50		>100		SPT-5	5.50-5.68
						3.0 cm Penth.		R3	CR=NIL RQD=NIL
		24	45	50		>100		SPT-6	6.25-6.44
						4.0 cm Penth.		R4	CR=11% RQD=NIL
		39	50			>100		SPT-7	7.00-7.10
						2.5 cm Penth.		R5	CR=07% RQD=NIL
Highly weathered, light grey, medium grained, highly fractured rock.	9.25m	40	50			>100		SPT-8	7.25-7.36
						3.5 cm Penth.		R6	CR=09% RQD=NIL
		50				Refusal		SPT-9	8.50-8.54
						4.0 cm Penth.		R7	CR=09% RQD=NIL
						Refusal		SPT-10	9.25-9.30
		50						R8	CR=20% RQD=NIL
								R9	CR=23% RQD=NIL
NX rotary drilling from 4.18m to 25.00m									10.00
								R10	CR=16% RQD=NIL
		50				Refusal		SPT-11	11.50-11.53
					3.0 cm Penth.		R11	CR=17% RQD=NIL	
	50				Refusal		SPT-12	12.25-12.29	
					4.0 cm Penth.		R12	CR=15% RQD=NIL	
13.00m									13.00



Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 12/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 19** Co-ordinates E=467900.081 N=1946824.434

Field Test	Nos	Samples	Nos	Commencement Date : 24/01/15
Penetrometer (SPT)	14	Undisturbed (UDS)	1	Completion Date : 29/01/15
Cone (Pc)		Penetrometer (SPT)	14	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	2	Level Of Ground : 100.967 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 3.6 m.

DESCRIPTION	SYMBOL	N-VALUE				SAMPLES	
		EACH DIVN. = 7.5cm.				Ref. No	Depth (m)
13.00m Highly weathered, light grey, medium grained, highly fractured rock.	↖	50	Refusal	3.0 cm Penth.	Refusal	SPT-13 R13	13.00-13.03 13.00 CR=16% RQD=NIL
13.75m Highly to moderately weathered, steel grey, medium grained, highly to moderately fractured rock.		50	Refusal	4.0 cm Penth.		SPT-14 R14	13.75-13.79 13.75 CR=33% RQD=NIL
						R15	14.50 CR=40% RQD=NIL
						R16	15.25 CR=49% RQD=NIL
						R17	16.00 CR=57% RQD=32%
						R18	16.75 CR=80% RQD=14%
						R19	17.75 CR=62% RQD=10%
						R20	19.00 CR=57% RQD=NIL
						R21	20.00 CR=62% RQD=32%
						R22	21.00 CR=64% RQD=NIL
						R23	22.00 CR=64% RQD=NIL
						R24	23.00 CR=28% RQD=NIL
23.00m Highly weathered, steel grey, medium grained, highly fractured rock.						R25	24.00 CR=29% RQD=NIL
25.00m							25.00





Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 12/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 25** Co-ordinates E=467956.000 N=1046821.000

Field Test	Nos	Samples	Nos	Commencement Date : 11/01/15
Penetrometer (SPT)	11	Undisturbed (UDS)	1	Completion Date : 02/02/15
Cone (Pc)		Penetrometer (SPT)	11	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 101.631 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 4.4 m.

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES	
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)
0.00m								DS-1	0.50
Very stiff to hard, deep yellowish brown, silty clay with kankars & calcareous nodules.		5	5	5	5	<u>22</u>	6	SPT-1	1.00-1.45
		6	5	6	9	<u>51</u>	18	SPT-2	2.00-2.45
		24	38	50	5.0 cm Penth.			SPT-3	4.50-4.70
		29	52	50	4.0 cm Penth.			SPT-4	4.80-4.99
4.99m Completely weathered, whitish grey, medium grained, decomposed & disintegrated rock particle collected as sludge.		54	50	4.5 cm Penth.			SPT-5	5.99-6.11	
		50	50	3.5 cm Penth.			SPT-6	6.99-7.10	
		17	45	50	4.0 cm Penth.			SPT-7	7.99-8.18
7.99m Completely weathered, whitish grey with blackish spot, medium grained, decomposed & disintegrated rock particle collected as sludge.		23	39	50	3.0 cm Penth.			SPT-8	8.99-9.17
		37	42	50	4.0 cm Penth.			SPT-9	9.99-10.18
		50	50	4.5 cm Penth.			SPT-10	10.99-11.11	
		50	Refusal			SPT-11	12.00-12.04		
12.00m Highly to moderately weathered, light grey with whitish spot, medium grained, highly fractured rock.		NX rotary drilling from 4.99m to 30.00m						R8	12.00-12.04
								R9	13.00
								R10	14.00
								R11	15.00
									16.00



Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 12/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 25** Co-ordinates E=467956.000 N=1046821.000

Field Test	Nos	Samples	Nos	Commencement Date : 11/01/15
Penetrometer (SPT)	11	Undisturbed (UDS)	1	Completion Date : 02/02/15
Cone (Pc)		Penetrometer (SPT)	11	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	2	Level Of Ground : 101.631 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 4.4 m.

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES	
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)
Highly to moderately weathered, light grey with whitish spot, medium grained, highly fractured rock. 16.00m	↖							R12	CR=45% RQD=NIL 17.00
								R13	CR=56% RQD=NIL 18.00
								R14	CR=43% RQD=11% 19.00
								R15	CR=32% RQD=14% 20.00
								R16	CR=26% RQD=NIL 20.60
								R17	CR=38% RQD=NIL 22.00
								R18	CR=45% RQD=NIL 23.00
								R19	CR=28% RQD=11% 24.00
								R20	CR=36% RQD=NIL 25.00
								R21	CR=42% RQD=NIL 26.00
								R22	CR=42% RQD=NIL 27.00
								R23	CR=37% RQD=NIL 28.00
								R24	CR=46% RQD=12% 29.00
Highly to moderately weathered, light grey with whitish spot, medium grained, highly fractured rock. 30.00m								R25	CR=44% RQD=17% 30.00







Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 12/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 26** Co-ordinates E=468028.000 N=1946800.000

Field Test	Nos	Samples	Nos	Commencement Date : 20/01/15
Penetrometer (SPT)	16	Undisturbed (UDS)	1	Completion Date : 23/01/15
Cone (Pc)		Penetrometer (SPT)	16	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	2	Level Of Ground : 102.499 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 5.5 m.

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES		
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)	
Highly weathered, light grey, with whitish spot, medium grained highly fractured rock.	13.00m	⚡						R13	CR=28% RQD=NIL	13.75
								R14	CR=21% RQD=NIL	14.50
								R15	CR=25% RQD=NIL	15.25
								R16	CR=11% RQD=NIL	16.00
								*SPT-15	16.00-16.03	16.00
								R17	CR=15% RQD=NIL	16.75
								*SPT-16	16.75-16.78	16.75
								R18	CR=28% RQD=NIL	17.50
Highly weathered, steel grey, medium to fine grained, highly fractured rock.	16.75m	50	50	3.0 cm	Penth.	Refusal		R19	CR=37% RQD=NIL	18.50
								R20	CR=25% RQD=NIL	19.00
								R21	CR=21% RQD=NIL	19.15
								R22	CR=30% RQD=NIL	20.50
								R23	CR=25% RQD=NIL	21.25
								R24	CR=23% RQD=NIL	22.00
								R25	CR=25% RQD=NIL	22.75
								R26	CR=23% RQD=NIL	23.50
								R27	CR=25% RQD=NIL	24.25
								R28	CR=27% RQD=NIL	25.00
Highly weathered, steel grey, medium to fine grained, highly fractured rock	24.25m									
	25.00m									

N.B. - '\*' means sample could not be recovered.





Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 19/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 32** Co-ordinates E=468067.294 N=1947143.217

Field Test	Nos	Samples	Nos	Commencement Date : 12/02/15
Penetrometer (SPT)	14	Undisturbed (UDS)	1	Completion Date : 13/02/15
Cone (Pc)		Penetrometer (SPT)	14	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 97.997 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 1.3 m.

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES	
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)
0.00m								DS-1	0.50
Hard, deep grey, yellowish brown, silty clay. Obs. calcareous nodules.		7	8	10	12	50	13	SPT-1	1.00-1.45
								UDS-1	2.00-2.45
						92			
3.00m		4	5	6	15	27	44	SPT-2	3.00-3.45
Very dense, light grey, sandy silt with decomposed rock. Obs. calcareous nodules.								SPT-3	4.00-4.35
4.50m		50							
Completely weathered, light grey to whitish grey, medium grained, decomposed & disintegrated rock particle collected as sludge.								*SPT-4	4.50-4.54 4.50
								R1	CR=NIL RQD=NIL
								*SPT-5	5.25-5.28 5.25
								R2	CR=NIL RQD=NIL
								*SPT-6	6.00-6.04 6.00
								R3	CR=NIL RQD=NIL
								*SPT-7	6.75-6.78 6.75
							R4	CR=NIL RQD=NIL	
7.50m		50							
Completely weathered, light grey to whitish grey, medium grained, highly fractured decomposed & disintegrated rock particle collected as sludge.								*SPT-8	7.50-7.53 7.50
								R5	CR=21% RQD=NIL
									8.25
								R6	CR=NIL RQD=NIL
								*SPT-9	9.50-9.53 9.50
Completely weathered, light grey, yellowish brown, medium grained, highly fractured rock.								R7	CR=NIL RQD=NIL
								*SPT-10	9.75-9.78 9.75
								R8	CR=NIL RQD=NIL
11.25m		50							
Completely weathered, light grey, yellowish brown, medium grained, highly fractured rock.								*SPT-11	10.50-10.53 10.50
								R9	CR=NIL RQD=NIL
								*SPT-12	11.25-11.29 11.25
								R10	CR=23% RQD=NIL
14.25m		50							
Highly weathered, light grey, yellowish brown, medium grained, highly fractured rock.								R11	CR=17% RQD=NIL
								*SPT-13	12.75-12.78 12.75
								R12	CR=19% RQD=NIL
15.00m		50							
Highly weathered, light grey, yellowish brown, medium grained, highly fractured rock. N.B. - '*' means sample could not be recovered.								*SPT-14	13.50-13.53 13.50
								R13	CR=20% RQD=NIL
									14.25
								R14	CR=35% RQD=NIL
									15.00





Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 12/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 34** Co-ordinates E=467928.846 N=1947032.886

Field Test	Nos	Samples	Nos	Commencement Date : 03/02/15
Penetrometer (SPT)	12	Undisturbed (UDS)	1	Completion Date : 07/02/15
Cone (Pc)		Penetrometer (SPT)	12	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 98.945 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 2.1 m.

DESCRIPTION	SYMBOL	N-VALUE					SAMPLES	
		EACH DIVN. = 7.5cm.					Ref. No	Depth (m)
0.00m							DS-1	0.50
Very stiff, blackish grey, silty clay.		4	3	5	6	<u>23</u>	SPT-1	1.00-1.45
						6	UDS-1	2.00-2.45
3.00m		6	6	7	13	<u>52</u>	SPT-2	3.00-3.45
Very dense, light grey to yellowish brown, sandy silt with decomposed rock.		5	6	26	39	<u>&gt;100</u>	SPT-3	4.00-4.35
						5.0 cm Penth.		
4.80m		4	20	35	52	<u>&gt;100</u>	SPT-4	4.45-4.80
						5.0 cm Penth.	R1	CR=NIL RQD=NIL
		58	52			<u>&gt;100</u>	SPT-5	5.55-5.67
Completely to highly weathered, deep brownish grey, medium to fine grained, highly fractured rock. (Decomposed & disintegrated rock particle collected as sludge on R1, R9).						4.5 cm Penth.	R2	CR=13% RQD=NIL
		56	50			<u>&gt;100</u>	SPT-6	6.30-6.40
						2.5 cm Penth.	R3	CR=21% RQD=NIL
							R4	CR=24% RQD=NIL
							R5	CR=21% RQD=NIL
							R6	CR=16% RQD=NIL
		50				<u>Refusal</u>	*SPT-7	9.30-9.32
						2.0 cm Penth.	R7	CR=20% RQD=NIL
							R8	CR=20% RQD=NIL
							R9	CR=NIL RQD=NIL
11.55m		50				<u>Refusal</u>	*SPT-8	11.55-11.59
Completely to highly weathered, light grey, medium to fine grained, highly fractured rock with mica.						4.0 cm Penth.	R10	CR=32% RQD=NIL
							R11	CR=28% RQD=NIL
							R12	CR=24% RQD=NIL
							R13	CR=25% RQD=NIL
							R14	CR=NIL RQD=NIL
		50				<u>Refusal</u>	*SPT-9	15.30-15.33
						3.0 cm Penth.	R15	CR=NIL RQD=NIL
16.00m								16.05



Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 12/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 34** Co-ordinates E=467928.846 N=1947032.886

Field Test	Nos	Samples	Nos	Commencement Date : 03/02/15
Penetrometer (SPT)	12	Undisturbed (UDS)	1	Completion Date : 07/02/15
Cone (Pc)		Penetrometer (SPT)	12	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	2	Level Of Ground : 98.945 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 2.1 m.

DESCRIPTION	SYMBOL	N-VALUE			SAMPLES			
		EACH DIVN. = 7.5cm.			Ref. No	Depth (m)		
16.00m Completely to highly weathered, light grey, medium to fine grained, highly fractured rock with mica.	↖	50	Refusal			*SPT-10	16.05-16.09 16.05	
			4.0 cm Penth.			R16	CR=25% RQD=NIL	16.80
						R17	CR=24% RQD=NIL	17.55
						R18	CR=NIL RQD=NIL	18.30
18.30m Highly weathered, light grey, medium to fine grained, highly fractured rock.	→	50	Refusal			*SPT-11	18.30-18.33 18.30	
			3.0 cm Penth.			R19	CR=27% RQD=NIL	19.05
						R20	CR=29% RQD=NIL	19.80
						R21	CR=32% RQD=NIL	20.55
						R22	CR=24% RQD=NIL	21.30
						R23	CR=28% RQD=NIL	22.05
23.55m Highly weathered, greyish brown to steel grey, medium to fine grained, fractured rock with mica.		50	Refusal			*SPT-12	22.80-22.84 22.80	
			4.0 cm Penth.			R25	CR=32% RQD=NIL	23.55
						R26	CR=24% RQD=NIL	24.30
						R27	CR=21% RQD=NIL	25.05
25.80m Moderately weathered, steel grey, medium to fine grained, highly fractured rock.		50				R28	CR=23% RQD=NIL	25.80
						R29	CR=39% RQD=NIL	26.55
						R30	CR=41% RQD=NIL	27.30
						R31	CR=44% RQD=NIL	28.05
						R32	CR=57% RQD=NIL	28.80
						R33	CR=43% RQD=NIL	29.55
29.55m Moderately weathered, steel grey, medium to fine grained, highly fractured rock.		30.00m				R34	CR=60% RQD=NIL	30.05

N.B. - '\*' means sample could not be recovered.





Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 19/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 37** Co-ordinates E=467894.003 N=1947174.015

Field Test	Nos	Samples	Nos	Commencement Date : 13/02/15
Penetrometer (SPT)	13	Undisturbed (UDS)	1	Completion Date : 15/02/15
Cone (Pc)		Penetrometer (SPT)	13	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 99.003 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 1.9 m.

DESCRIPTION	SYMBOL	N-VALUE					SAMPLES	
		EACH DIVN. = 7.5cm.					Ref. No	Depth (m)
0.00m Brownish grey, silty clay with high % of calcareous nodules.							DS-1	0.50
0.80m Hard, brownish grey, silty clay with calcareous nodules & gravels.		8	10	12	15	17	SPT-1	1.00-1.45
2.00m Very dense, brownish grey, silty sand. Obs. decomposed rock.							*UDS-1	2.00-2.15
3.50m Completely weathered, brownish grey, medium to fine grained, decomposed to disintegrated rock collected as sludge.		10	18	29	38	50	SPT-2	2.50-2.85
		52					*SPT-3	3.50-3.54 3.50
							R1	CR=NIL RQD=NIL
		50					*SPT-4	4.25-4.27 4.25
							R2	CR=NIL RQD=NIL
		52					*SPT-5	5.00-5.03 5.00
							R3	CR=NIL RQD=NIL
		51					*SPT-6	5.75-5.77 5.75
							R4	CR=NIL RQD=NIL
		50					*SPT-7	6.50-6.53 6.50
							R5	CR=NIL RQD=NIL
		52					*SPT-8	7.25-7.28 7.25
							R6	CR=NIL RQD=NIL
		50					*SPT-9	8.00-8.02 8.00
							R7	CR=18% RQD=NIL
		50					*SPT-10	8.75-8.76 8.75
							R8	CR=NIL RQD=NIL
		52					*SPT-11	9.50-9.52 9.50
							R9	CR=29% RQD=NIL
10.50m Highly weathered, light brown to whitish brown, medium grained, highly fractured rock.								10.25

NX rotary drilling from 3.50m to 20.00m



Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 19/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 37** Co-ordinates E=467894.003 N=1947174.015

Field Test	Nos	Samples	Nos	Commencement Date : 13/02/15
Penetrometer (SPT)	13	Undisturbed (UDS)	1	Completion Date : 15/02/15
Cone (Pc)		Penetrometer (SPT)	13	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 99.003 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 1.9 m.

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES	
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)
Highly weathered, light brown to whitish brown, medium grained, highly fractured rock.	10.50m							R10	CR=30% RQD=NIL
	11.00m							R11	CR=20% RQD=NIL
Completely to highly weathered, light brown to whitish brown, medium grained, highly fractured rock. Obs. decomposed & disintegrated rock particle collected as sludge on R13.								R12	CR=20% RQD=NIL
		50						*SPT-12	12.50-12.51 12.50
								R13	CR=NIL RQD=NIL
		51						*SPT-13	13.25-13.26 13.25
Highly to moderately weathered, light grey, medium grained, highly fractured rock.	14.00m							R14	CR=22% RQD=NIL
								R15	CR=35% RQD=NIL
								R16	CR=48% RQD=NIL
								R17	CR=37% RQD=NIL
								R18	CR=29% RQD=NIL
								R19	CR=31% RQD=NIL
								R20	CR=46% RQD=NIL
								R21	CR=37% RQD=NIL
								R22	CR=62% RQD=NIL
	20.00m								

N.B. - '\*' means sample could not be recovered.







Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 13/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 42** Co-ordinates E=467990.000 N=1947089.000

Field Test	Nos	Samples	Nos	Commencement Date : 08/02/15
Penetrometer (SPT)	12	Undisturbed (UDS)	1	Completion Date : 10/02/15
Cone (Pc)		Penetrometer (SPT)	12	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 98.545 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level :

DESCRIPTION	SYMBOL	N-VALUE			SAMPLES	
		EACH DIVN. = 7.5cm.			Ref. No	Depth (m)
<p>10.75m</p> <p>Completely weathered, light grey, medium grained, highly fractured rock. # decomposed &amp; disintegrated rock particle collected as sludge on R8 &amp; R9.</p>	↖	50	Refusal		*SPT-9	10.90-10.94 10.90
			4.0 cm Penth.		R9	CR=NIL RQD=NIL
		50	Refusal		*SPT-10	11.65-11.68 11.65
			3.0 cm Penth.		R10	CR=15% RQD=NIL
<p>13.15m</p> <p>Highly weathered, light grey to yellowish grey, medium grained, highly fractured rock.</p>	↔	50	Refusal		*SPT-11	12.40-12.45 12.40
			5.0 cm Penth.		R11	CR=16% RQD=NIL
		50	Refusal		*SPT-12	13.15-13.19 13.15
			4.0 cm Penth.		R12	CR=31% RQD=NIL
					R13	CR=30% RQD=NIL
					R14	CR=28% RQD=NIL
					R15	CR=35% RQD=NIL
					R16	CR=34% RQD=17%
<p>20.00m</p>	↕				R17	CR=30% RQD=NIL
					R18	CR=42% RQD=17%
					R19	CR=25% RQD=NIL
					R20	CR=26% RQD=NIL

N.B. - '\*' means sample could not be recovered.





Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 12/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 48** Co-ordinates E=467993.369 N=1947141.669

Field Test	Nos	Samples	Nos	Commencement Date :	03/02/15
Penetrometer (SPT)	14	Undisturbed (UDS)	1	Completion Date :	08/02/15
Cone (Pc)		Penetrometer (SPT)	14	Bore Hole Diameter :	150 mm. / N.X.
Vane (V)		Disturbed (DS)	4	Level Of Ground :	97.977 m.
		Water Sample (WS)	0	Water Struck At :	
				Standing Water Level :	

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES		
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)	
0.00m		NX rotary drilling from 4.80m to 20.00m						DS-1	0.50	
Medium, brownish grey to dark grey, silty clay.		1	1	1	1	6	2	SPT-1	1.00-1.45	
1.45m								UDS-1	2.00-2.40	
Medium dense, brownish grey, silty sand with clay binder. Obs. decomposed rock.		1	3	5	6	29	10	SPT-2	3.00-3.45	
								SPT-3	4.00-4.35	
		10	18	29	35	>100	50			
		5.0 cm Penth. Refusal						*SPT-4	4.80-4.84 4.80	
4.80m		51	4.0 cm Penth. Refusal						R1	CR=NIL RQD=NIL
		50	3.0 cm Penth. Refusal						DS-2 *SPT-5	5.55-5.58 5.55
Completley weathered, light grey, fine grained, decomposed rock.		52	2.0 cm Penth. Refusal						R2 DS-3 *SPT-6	6.30-6.32 6.30
7.05m		50	2.0 cm Penth. Refusal						R3 DS-4 *SPT-7	7.05-7.07 7.05
Highly weathered, light grey, fine grained, highly fractured rock.		50	1.0 cm Penth. Refusal						R4 *SPT-8	7.80-7.81 7.80
		50	1.0 cm Penth. Refusal						R5 *SPT-9	8.55-8.56 8.55
8.55m		51	4.0 cm Penth. Refusal						R6 *SPT-10	9.30-9.34 9.30
Completley weathered, light grey, fine grained, decomposed rock.		50	1.0 cm Penth.						R7 SPT-11	10.05-10.06 10.05
9.30m		50	1.0 cm Penth.						R8	CR=16% RQD=NIL
Highly weathered, light grey, fine grained, highly fractured rock.										
10.50m										



Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 12/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 48** Co-ordinates E=467993.369 N=1947141.669

Field Test	Nos	Samples	Nos	Commencement Date : 03/02/15
Penetrometer (SPT)	14	Undisturbed (UDS)	1	Completion Date : 08/02/15
Cone (Pc)		Penetrometer (SPT)	14	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	4	Level Of Ground : 97.977 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level :

DESCRIPTION	SYMBOL	N-VALUE				SAMPLES	
		EACH DIVN. = 7.5cm.				Ref. No	Depth (m)
Highly weathered, light grey, fine grained, highly fractured rock.	↘	10.50m	50	Refusal			
				2.0 cm Penth.		*SPT-12	10.80-10.82 10.80
						R9	CR=17% RQD=NIL
Highly to moderately weathered, light grey, fine grained, highly fractured rock. Obs. water stain.	→	12.30m	50	Refusal			
				1.0 cm Penth.		*SPT-13	11.55-11.56 11.55
						R10	CR=14% RQD=NIL
Fresh, light grey, fine grained, highly fractured rock. Obs. water stain.	←	15.30m	50	Refusal			
				2.0 cm Penth.		*SPT-14	12.30-12.32 12.30
						R11	CR=50% RQD=28%
						R12	CR=38% RQD=NIL
						R13	CR=37% RQD=NIL
						R14	CR=49% RQD=NIL
						R15	CR=62% RQD=NIL
						R16	CR=85% RQD=18%
						R17	CR=82% RQD=NIL
						R18	CR=75% RQD=NIL
				R19	CR=46% RQD=NIL		
		20.00m					

N.B. - '\*' means sample could not be recovered.





Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 12/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 57** Co-ordinates E=468074.000 N=1947191.000

Field Test	Nos	Samples	Nos	Commencement Date : 03/02/15
Penetrometer (SPT)	11	Undisturbed (UDS)	1	Completion Date : 06/02/15
Cone (Pc)		Penetrometer (SPT)	11	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	9	Level Of Ground : 97.212 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level :

DESCRIPTION	SYMBOL	N-VALUE					SAMPLES		
		EACH DIVN. = 7.5cm.					Ref. No	Depth (m)	
0.00m Top soil consists of deep grey, silty clay. Obs. gravels & sand mixture.							DS-1	0.50	
1.20m Medium dense, light grey / brownish grey, clayey sandy silt / silty sand. OBs. calcareous nodules.		2	2	3	4	16 4	SPT-1	1.00-1.45	
3.00m Very dense, light grey / brownish grey, silty sand with decomposed rock.		23	47	50	>100 Refusal		SPT-2	3.00-3.19	
3.40m		52			4.0 cm Penth.		*SPT-3	3.40-3.43 3.40	
Completely weathered, light grey with brownish grey, medium to fine grained, decomposed & disintegrated rock collected as sludge.		53			3.0 cm Penth.		R1 DS-2 *SPT-4	4.15-4.19 4.15	
		52			4.0 cm Penth.		R2 DS-3 *SPT-5	4.90-4.93 4.90	
		54			3.0 cm Penth.		R3 DS-4 *SPT-6	5.65-5.68 5.65	
		52			3.0 cm Penth.		R4 DS-5 *SPT-7	6.40-6.42 6.40	
		52			2.0 cm Penth.		R5	CR=31% RQD=NIL	
6.40m Highly weathered, whitish grey, medium to fine grained, highly fractured rock.		NX rotary drilling from 3.40m to 25.00m					R6	CR=37% RQD=NIL	7.15
7.90m					Refusal		R7 DS-6 *SPT-8	8.65-8.68 8.65	
Completely weathered, light brownish grey to whitish grey, medium to fine grained, decomposed & disintegrated rock collected as sludge.		52			3.0 cm Penth.		R8 DS-7 *SPT-9	9.40-9.44 9.40	
		53			4.0 cm Penth.		R9 DS-8 *SPT-10	10.15-10.18 10.15	
		52			3.0 cm Penth.		R10 DS-9 *SPT-11	10.90-10.92 10.90	
10.90m		51			2.0 cm Penth.		R11	CR=24% RQD=NIL	11.65
Highly weathered, whitish grey, medium grained, highly fractured rock.							R12	CR=23% RQD=NIL	12.40
	13.00m						R13	CR=20% RQD=NIL	



Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 12/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 57** Co-ordinates E=468074.000 N=1947191.000

Field Test	Nos	Samples	Nos	Commencement Date :	03/02/15
Penetrometer (SPT)	11	Undisturbed (UDS)	1	Completion Date :	06/02/15
Cone (Pc)		Penetrometer (SPT)	11	Bore Hole Diameter :	150 mm. / N.X.
Vane (V)		Disturbed (DS)	8	Level Of Ground :	97.212 m.
		Water Sample (WS)	0	Water Struck At :	
				Standing Water Level :	

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES	
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)
Highly weathered, whitish grey, medium grained, highly fractured rock.	↖							R14	13.15 CR=21% RQD=NIL
Highly weathered, light grey to brownish grey, coarse to fine grained, highly fractured rock.								R15	13.90 CR=34% RQD=NIL
Highly weathered, light grey to brownish grey, coarse to fine grained, highly fractured rock.								R16	14.65 CR=61% RQD=NIL
								R17	15.40 CR=57% RQD=21%
								R18	16.15 CR=50% RQD=NIL
								R19	16.90 CR=55% RQD=15%
Moderately to slightly weathered, light brownish grey to steel grey, medium to fine grained, moderately fractured rock.								R20	17.65 CR=89% RQD=58%
								R21	18.40 CR=84% RQD=51%
								R22	19.15 CR=80% RQD=NIL
								R23	20.00 CR=87% RQD=15%
								R24	21.50 CR=82% RQD=NIL
								R25	22.00 CR=80% RQD=NIL
Slightly weathered, steel grey to yellowish brown, medium to fine grained, highly fractured rock.								R26	23.50 CR=78% RQD=18%
									25.00

N.B. - '\*' means sample could not be recovered.





Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 19/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 58** Co-ordinates E=468123.336 N=1947180.259

Field Test	Nos	Samples	Nos	Commencement Date : 07/02/15
Penetrometer (SPT)	6	Undisturbed (UDS)	1	Completion Date : 11/02/15
Cone (Pc)		Penetrometer (SPT)	6	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 97.738 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 2.4 m.

DESCRIPTION	SYMBOL	N-VALUE							SAMPLES	
		EACH DIVN. = 7.5cm.							Ref. No	Depth (m)
0.00m									DS-1	0.50
Very stiff, deep grey, silty clay with fine sand. Obs. gravels & kankars.		2	2	3	4	22	6	9	SPT-1	1.00-1.45
									UDS-1	2.00-2.45
3.00m		3	4	6	14	61	14	27	SPT-2	3.00-3.45
	Hard, light grey to yellowish brown, silty clay. Obs. calcareous nodules.	42	49	50	>100				SPT-3	4.00-4.20
									5.0 cm Penth.	
4.30m		50	Refusal						*SPT-4	4.30-4.34 4.30
	Highly weathered, blackish grey, coarse to fine grained, highly fractured rock.								R1	CR=21% RQD=NIL
									4.0 cm Penth.	5.00
6.50m		50	NX rotary drilling from 4.30m to 20.00m						R2	CR=22% RQD=NIL
									Refusal	5.75
8.00m		50	Refusal						*SPT-5	6.50-6.53 6.50
	Highly weathered, light grey, medium grained, moderately fractured rock.								R3	CR=12% RQD=NIL
									3.0 cm Penth.	
10.25m		50	Refusal						R4	CR=13% RQD=NIL
	Moderately weathered, light grey, medium grained, moderately fractured rock.								*SPT-6	7.25-7.29 7.25
									R5	CR=25% RQD=NIL
11.00m									4.0 cm Penth.	8.00
	Slightly weathered, light grey, fine grained, moderately fractured rock.								R6	CR=51% RQD=NIL
									8.75	
									R7	CR=60% RQD=32%
									9.50	
									R8	CR=62% RQD=16%
									10.25	
									R9	CR=81% RQD=20%
									11.00	





Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 19/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 58** Co-ordinates E=468123.336 N=1947180.259

Field Test	Nos	Samples	Nos	Commencement Date : 07/02/15
Penetrometer (SPT)	6	Undisturbed (UDS)	1	Completion Date : 11/02/15
Cone (Pc)		Penetrometer (SPT)	6	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 97.738 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 2.4 m.

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES		
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)	
Slightly weathered, light grey, fine grained, moderately fractured rock.	11.00m							R10	CR=84% RQD=20%	11.75
								R11	CR=82% RQD=NIL	13.00
								R12	CR=87% RQD=25%	14.50
								R13	CR=89% RQD=47%	16.00
								R14	CR=88% RQD=40%	17.50
								R15	CR=88% RQD=41%	19.00
								R16	CR=76% RQD=18%	20.00
	20.00m									

N.B. - '\*' means sample could not be recovered.





Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 13/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 62** Co-ordinates E=468147.467 N=1947259.150

Field Test	Nos	Samples	Nos	Commencement Date : 31/01/15
Penetrometer (SPT)	16	Undisturbed (UDS)	0	Completion Date : 05/02/15
Cone (Pc)		Penetrometer (SPT)	16	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	1	Level Of Ground : 96.743 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level :

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES	
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)
0.00m Top soil consists of deep greyish brown, silty clay with gravels & kankars.								DS-1	0.50
0.90m Very dense, light grey, silty sand / sandy silt.		19	17	13	15	14	13	SPT-1	1.00-1.45
2.00m Very dense, light grey to yellowish brown, silty sand with calcareous nodules & clay binders.		7	8	14	14	26	22	SPT-2	2.00-2.45
		9	13	14	16	23	34	SPT-3	3.00-3.45
		37	42	50				SPT-4	4.00-4.20
4.40m Completely weathered, light grey to brownish grey, coarse to fine grained, highly fractured rock.		52						*SPT-5	4.40-4.44 CR=18% RQD=NIL
		50						*SPT-6	5.00-5.04 CR=12% RQD=NIL
		50						*SPT-7	5.75-5.78 CR=16% RQD=NIL
		50						*SPT-8	6.50-6.53 CR=15% RQD=NIL
		50						*SPT-9	7.25-7.29 CR=19% RQD=NIL
		50						*SPT-10	8.00-8.04 CR=17% RQD=NIL
		50						*SPT-11	8.75-8.78 CR=17% RQD=NIL
		50						*SPT-12	9.50-9.54 CR=15% RQD=NIL
		50						*SPT-13	10.25-10.29 CR=17% RQD=NIL
		50						*SPT-14	11.00-11.03 CR=15% RQD=NIL
		50						*SPT-15	11.75-11.79 CR=17% RQD=NIL
12.50m Highly weathered, light grey, medium grained, highly fractured rock.		50						*SPT-16	12.50-12.53 CR=20% RQD=NIL
14.00m Moderately weathered, light grey, medium grained, highly fractured rock.								R13	CR=24% RQD=NIL
14.75m Moderately to slightly weathered, light grey, medium grained, highly to moderately fractured rock.								R14	CR=47% RQD=NIL
								R15	CR=58% RQD=NIL
								R16	CR=55% RQD=NIL

NX rotary drilling from 4.40m to 30.00m



Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 13/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 62** Co-ordinates E=468147.467 N=1947259.150

Field Test	Nos	Samples	Nos	Commencement Date : 31/01/15
Penetrometer (SPT)	16	Undisturbed (UDS)	0	Completion Date : 05/02/15
Cone (Pc)		Penetrometer (SPT)	16	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	2	Level Of Ground : 9.743 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level :

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES	
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)
Moderately to slightly weathered, light grey, medium grained, highly to moderately fractured rock.	16.00m	↘						R17	16.25 CR=67% RQD=NIL
								R18	17.00 CR=72% RQD=NIL
								R19	17.75 CR=85% RQD=15%
								R20	18.50 CR=80% RQD=NIL
								R21	20.00 CR=78% RQD=08%
								R22	21.50 CR=87% RQD=NIL
								R23	23.00 CR=88% RQD=25%
								R24	24.50 CR=47% RQD=NIL
Slightly weathered, steel grey, medium grained, moderately fractured rock.	21.00m	→						R25	26.00 CR=53% RQD=NIL
								R26	27.00 CR=73% RQD=18%
								R27	28.00 CR=54% RQD=NIL
								R28	29.00 CR=85% RQD=NIL
Moderately to slightly weathered, light grey, medium grained, moderately fractured rock.	24.50m							R29	30.00
N.B. - '*' means sample could not be recovered.	30.00m								





Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 13/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 63** Co-ordinates E=468159.000 N=1947239.000

Field Test	Nos	Samples	Nos	Commencement Date :	07/02/15
Penetrometer (SPT)	10	Undisturbed (UDS)	1	Completion Date :	09/02/15
Cone (Pc)		Penetrometer (SPT)	10	Bore Hole Diameter :	150 mm. / N.X.
Vane (V)		Disturbed (DS)	3	Level Of Ground :	
		Water Sample (WS)	0	Water Struck At :	
				Standing Water Level :	1.4 m.

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES		
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)	
0.00m								DS-1	0.50	
Stiff, deep grey, silty clay with gravels. Obs. calcareous nodules.		2	2	3	4	15	4	SPT-1	1.00-1.45	
								UDS-1	2.00-2.45	
3.00m		5	8	10	9	77	21	SPT-2	3.00-3.45	
Very dense, steel grey with yellowish brown, sandy silt with decomposed rock.						>100		SPT-3	4.00-4.20	
		27	38	52	5.0 cm Penth.					
4.30m		53	4.0 cm Penth.			Refusal			*SPT-4	4.30-4.34 4.30
Completely weathered, steel grey, medium to fine grained, decomposed & disintegrated rock collected as sludge.			3.0 cm Penth.			Refusal			R1	CR=NIL RQD=NIL
		52	2.0 cm Penth.			Refusal			*SPT-5	5.05-5.08 5.05
		53	1.0 cm Penth.			Refusal			R2	CR=NIL RQD=NIL
6.50m		52	2.0 cm Penth.			Refusal			DS-2	
Highly weathered, brownish grey, medium to fine grained, highly fractured rock.			1.0 cm Penth.			Refusal			*SPT-6	5.80-5.82 5.80
		51	2.0 cm Penth.			Refusal			R3	CR=NIL RQD=NIL
			2.0 cm Penth.			Refusal			DS-3	
10.25m		53	2.0 cm Penth.			Refusal			*SPT-7	6.50-6.51 6.50
Highly to moderately weathered, light grey to brownish grey, medium to fine grained, moderately fractured rock.			2.0 cm Penth.			Refusal			R4	CR=17% RQD=NIL
		52	3.0 cm Penth.			Refusal			*SPT-8	7.25-7.27 7.25
			3.0 cm Penth.			Refusal			R5	CR=20% RQD=NIL
11.00m			3.0 cm Penth.			Refusal			R6	CR=13% RQD=NIL
			2.0 cm Penth.			Refusal			*SPT-9	8.75-8.77 8.75
			2.0 cm Penth.			Refusal			R7	CR=15% RQD=NIL
			3.0 cm Penth.			Refusal			*SPT-10	9.50-9.53 9.50
			3.0 cm Penth.			Refusal			R8	CR=24% RQD=NIL
			3.0 cm Penth.			Refusal			R9	CR=30% RQD=NIL
			NX rotary drilling from 4.30m to 20.00m							10.25
										11.00



Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 13/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 63** Co-ordinates E=468159.000 N=1947239.000

Field Test	Nos	Samples	Nos	Commencement Date : 07/02/15
Penetrometer (SPT)	10	Undisturbed (UDS)	1	Completion Date : 09/02/15
Cone (Pc)		Penetrometer (SPT)	10	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	5	Level Of Ground :
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 1.4 m.

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES	
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)
Highly to moderately weathered, light grey to brownish grey, medium to fine grained, moderately fractured rock.	↖							R10	CR=35% RQD=NIL 11.00m
								R11	CR=43% RQD=NIL 11.75
								R12	CR=39% RQD=NIL 12.50
								R13	CR=33% RQD=NIL 13.25
								R14	CR=37% RQD=NIL 14.00
								R15	CR=34% RQD=NIL 14.75
								R16	CR=39% RQD=NIL 15.50
								R17	CR=48% RQD=NIL 16.25
								R18	CR=57% RQD=NIL 17.00
								Moderately weathered, light grey to brownish grey, medium to fine grained, moderately fractured rock.	
R20	CR=53% RQD=NIL 18.50								
R21	CR=52% RQD=NIL 19.25								
		20.00							

N.B. - '\*' means sample could not be recovered.





Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 18/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 66** Co-ordinates E=468081.000 N=1947238.000

Field Test	Nos	Samples	Nos	Commencement Date : 10/02/15
Penetrometer (SPT)	10	Undisturbed (UDS)	1	Completion Date : 12/02/15
Cone (Pc)		Penetrometer (SPT)	10	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	6	Level Of Ground : 97.324 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 0.8 m.

DESCRIPTION	SYMBOL	N-VALUE						SAMPLES	
		EACH DIVN. = 7.5cm.						Ref. No	Depth (m)
0.00m Top soil consists of deep grey, silty clay with gravels, calcareous nodules.								DS-1	0.50
0.80m Very stiff to hard, yellowish brown, silty clay with sand mixture, gravels & kankars.		5	5	7	7	22 4	4	SPT-1	1.00-1.45
3.00m Very dense, light brownish grey, sandy silt (decomposed rock).		25	34	42	52	>100 2.5 cm Penth.		SPT-2	3.00-3.25
3.50m Completely weathered, pinkish grey, fine grained, highly fractured rock.		53				Refusal		*SPT-3	3.50-3.53 3.50
4.25m Completely weathered, light brownish grey, medium to fine grained, decomposed & disintegrated rock, collected as sludge.		52				3.0 cm Penth. Refusal		R1	CR=NIL RQD=NIL
6.50m Completely weathered, pinkish grey, medium to fine grained, highly fractured rock.		51				3.0 cm Penth. Refusal		*SPT-4	4.25-4.28 4.25
8.00m Completely weathered, deep brownish grey, medium to fine grained, decomposed & disintegrated rock collected as sludge.		50				3.0 cm Penth. Refusal		R2	CR=NIL RQD=NIL
9.50m Highly to moderately weathered, light brownish grey, medium to fine grained, moderately fractured rock.		51				4.0 cm Penth. Refusal		DS-2 *SPT-5	5.00-5.04 5.00
10.50m								R3	CR=NIL RQD=NIL
								DS-3 *SPT-6	5.75-5.78 5.75
								R4	CR=NIL RQD=NIL
								DS-4 *SPT-7	6.50-6.53 6.50
								R5	CR=23% RQD=NIL
									7.25
								R6	CR=10% RQD=NIL
								*SPT-8	8.00-8.03 8.00
								R7	CR=NIL RQD=NIL
								DS-5 *SPT-9	8.75-8.77 8.75
								R8	CR=NIL RQD=NIL
								DS-6 *SPT-10	9.50-9.54 9.50
								R9	CR=28% RQD=NIL
									10.25



Project : Geotech. Inv. Work for 1x800MW KTPS at Khammam Dist. Telangana. **CETEST**

Job No : 3421 Created by : Chandrani Created on : 18/02/2015 Sheet No:

**BORE LOG DATA SHEET** **BORE HOLE NO. 66** Co-ordinates E=468081.000 N=1947238.000

Field Test	Nos	Samples	Nos	Commencement Date : 10/02/15
Penetrometer (SPT)	10	Undisturbed (UDS)	1	Completion Date : 12/02/15
Cone (Pc)		Penetrometer (SPT)	10	Bore Hole Diameter : 150 mm. / N.X.
Vane (V)		Disturbed (DS)	6	Level Of Ground : 97.324 m.
		Water Sample (WS)	0	Water Struck At :
				Standing Water Level : 0.8 m.

DESCRIPTION	SYMBOL	N-VALUE						Ref. No	SAMPLES	
		EACH DIVN. = 7.5cm.							Depth (m)	
Highly to moderately weathered, light brownish grey, medium to fine grained, moderately fractured rock.	↘							R10	CR=51% RQD=13%	10.50m
								R11	CR=56% RQD=NIL	11.00
								R12	CR=48% RQD=NIL	11.75
								R13	CR=45% RQD=15%	12.50
								R14	CR=37% RQD=NIL	13.25
								R15	CR=21% RQD=NIL	14.00
Highly weathered, light brownish grey, medium to fine grained, highly fractured rock.	→							R16	CR=29% RQD=NIL	14.75
								R17	CR=27% RQD=NIL	15.50
								R18	CR=29% RQD=NIL	16.25
								R19	CR=32% RQD=NIL	17.00
								R20	CR=21% RQD=NIL	17.75
								R21	CR=23% RQD=NIL	18.50
Highly weathered, light brownish grey, medium to fine grained, highly fractured rock.								R22	CR=24% RQD=NIL	19.25
										20.00

N.B. - '\*' means sample could not be recovered.



**Tender Specification BHEL PSSR SCT 1577**

**Additional Rate Schedule for Kothagudem 1x800 MW - Civil, Structural and Architectural works for Main plant civil, road and drains (part) & levelling and grading**

ST. NO	DESCRIPTION OF ITEM	UNIT	Quantity	RATE		AMOUNT	
				In fig	In words	In fig	In words
2701	Providing and fixing Unitized <b>Structural Glazing</b> to fixed panels (no aluminum section exposed from outside and only glass panels with silicon joint visible from outside). The system specially designed with aluminum sections of grade 63400 WP IS: 733 and IS: 1285 with pure polyester powder coating of 30 microns, as per AAMA 2604 in approved color ,with mullion fixed to beams / columns through adequately designed MS powder coated members and bracket, which shall be fixed with appropriate bolts and expansion fasteners, so as to withstand the dead load of the structural glazing as well as stresses due to wind pressure. The Structural glazing system shall be designed as per IS code for required wind pressure( IS: 875 part III ) and building profiles and use of aluminum section alloy as per IS : 8147. The System shall be designed for thermal movements, air infiltration, water penetration, seismic movement and structural movement. Silicon sealant structural grade and weathering grade shall be GE/Dow corning/Sika or Equivalent. (The item includes cost of material such as cleats, sleeves, screws etc. necessary for fabrication of extruded aluminum frame work. Nothing extra shall be paid on this account.) The structural glazing panels shall be factory glazed with structural silicon as per standard practice and under the strict supervision of the engineering staff (on site glazing is not permitted, except for replacement of damaged/broken glasses). The contractor shall submit the structural stability report of the structural glazing system to be get approved by the engineer in-charge.	Kg	1182				
2702	Vision Glass of total 24mm thick (6mm+12air gap+6mm) double insulated with outer 6 mm thick heat reflecting type, toughened hard coated CVD on line process glass with blue tinted low E coating on surface#2 and 6 mm thick clear toughened float low E glass on inner surface as per specification.	SQM	330				
2703	Openable glazing panel with two point locking with friction stays, as per design required.	SQM	50				
2704	Providing and fixing G. I. flashing at soffit level / sill level made out of 1.5mm Thick G.I. Sheet with powder coated bent to required profile and shape to seal the soffit area.	SQM	20				
2412	Supplying and laying 400mmx150mmx350mm deep <b>precast concrete kerb stone</b> of grade M-20 with 20 mm nominal size stone aggregate and of shape as per detailed drawing including fixing with cement mortar (1:2) in 13mm thick joints, finishing of joints with neat cement paste, making drainage opening where required etc all complete.	RM	5832				
	<b>SUB TOTAL(in fig and words)</b>						
	<b>Total of original price bid(in fig and words)</b>						
	<b>TOTAL (in fig and words)</b>						
	<b>Note: Please quote the total price for the contract in this sheet in the space provided above.Submit original price bid and addl price bid in the same <a href="#">Envelope III</a>.</b>						