

TENDER SPECIFICATION

BHEL: PSSR: SCT: 1578

FOR

Supply, Erection, Testing, Commissioning, operation and maintenance of Construction Power Supply and yard lighting at Kothagudem Thermal Power station, 1 x 800 MW, Paloncha, Telangana

VOLUME – I BOOK – I



BHARAT HEAVY ELECTRICALS LIMITED

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

Book- I Consists of

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

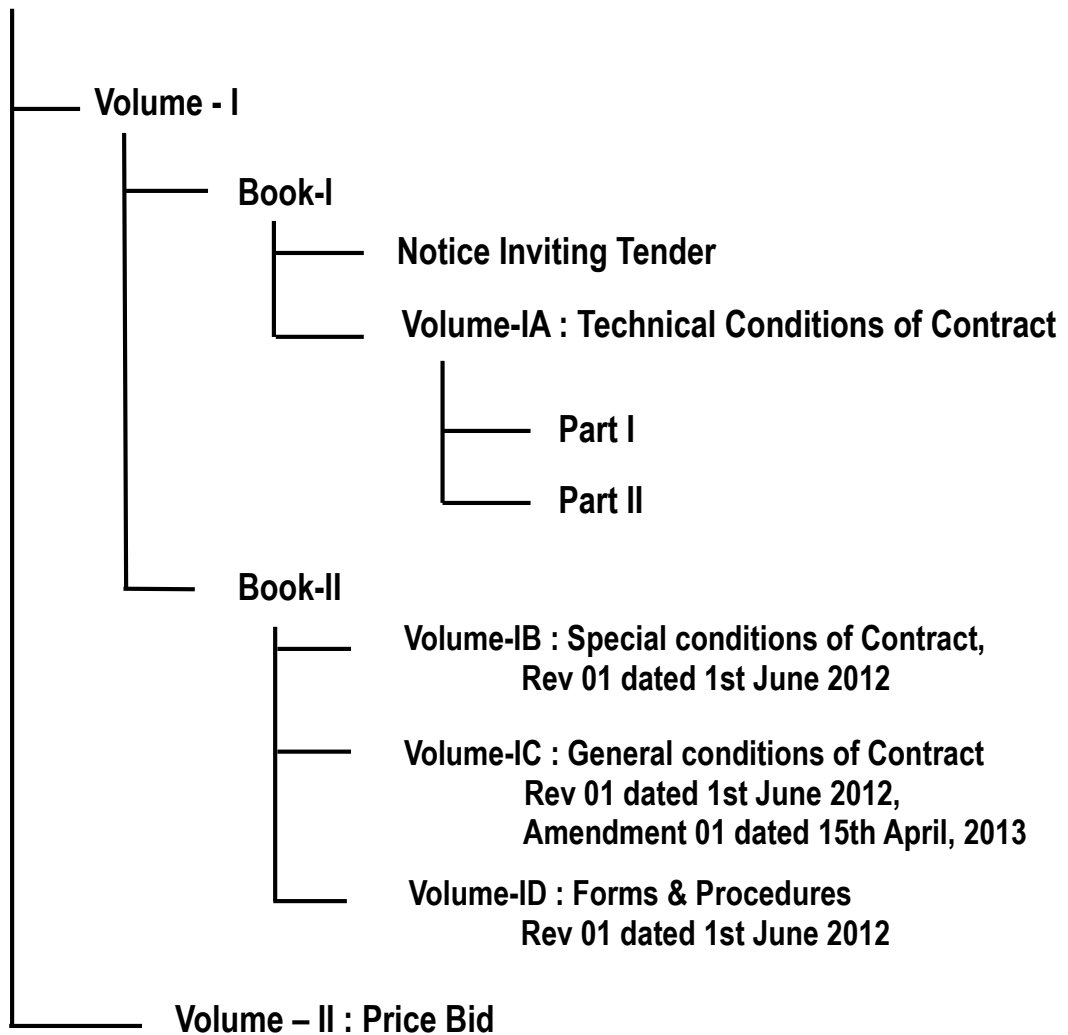
Book-II consists of

- Volume-IB : Special conditions of Contract,
Rev 01 dated 1st June 2012
- Volume-IC : General conditions of Contract
Rev 01 dated 1st June 2012,
Amendment 01 dated 15th April, 2013
- Volume-ID : Forms & Procedures
Rev 01 dated 1st June 2012

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

TENDER SPECIFICATION CONSISTS OF

Tender Specification



BHARAT HEAVY ELECTRICALS LIMITED
(A Government of India Undertaking)
Power Sector, Southern Region
690, Anna Salai, Nandanam, Chennai – 35

Tender Specification No. BHEL: PSSR: SCT: 1578

for

Supply, Erection, Testing, Commissioning, operation and maintenance of
Construction Power Supply and yard lighting at Kothagudem Thermal Power station,
1 x 800 MW, Paloncha, Telangana

One set of Tender documents consisting of

- 1) Technocommercial bid - 2 copies
- 2) Price bid - 2 copies

Book Sl no

Issued to
M/s

Refer NIT for Last date of submission
Please note this tender document is not transferable

For and on behalf of
Bharat Heavy Electricals Limited

General Manager / HR & SCT

Place: Chennai -35
Date:



NOTICE INVITING TENDER

Bharat Heavy Electricals Limited



NOTICE INVITING TENDER

Ref: BHEL PSSR SCT 1578

Date: 27.02.2015

NOTICE INVITING TENDER (NIT)

**NOTE: BIDDER MAY DOWNLOAD FROM WEB SITES
OR
PURCHASE TENDERS FROM THIS OFFICE ALSO**

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To

Dear Sir / Madam

Sub: NOTICE INVITING TENDER

Sealed offers in two part bid system are invited from reputed & experienced bidders (meeting [PRE QUALIFICATION CRITERIA](#) as mentioned in Annexure-I) for the subject job by the undersigned on the behalf of BHARAT HEAVY ELECTRICALS LIMITED as per the tender document. Following points relevant to the tender may please be noted and complied with.

1.0 Salient Features of NIT

Sl. No	ISSUE	DESCRIPTION	
i	TENDER NUMBER	BHEL PSSR SCT 1578	
ii	Broad Scope of job	Supply, Erection, Testing, Commissioning, operation and maintenance of Construction Power Supply and yard lighting at Kothagudem Thermal Power station, 1 x 800 MW, Paloncha, Telangana	
iii	DETAILS OF TENDER DOCUMENT		
A	Volume-IA	Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc	Applicable
B	Volume-IB	Special Conditions of Contract (SCC) Rev. 01 Dt. 01 Jun 2012	Applicable
C	Volume-IC	General Conditions of Contract (GCC) Rev. 01 Dt. 01 Jun 2012; Amendment: 01 Dt. 15 April 2013	Applicable
D	Volume-ID	Forms and Procedures Rev. 01 Dt. 01 Jun 2012	Applicable
E	Volume-II	Price Schedule (Absolute value).	Applicable

Tender Specification No.: BHEL PSSR SCT 1578

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iv)	Issue of Tender Documents	<p>1. <u>Sale from BHEL PSSR Regional office at Chennai:</u> Start : 27.02.2015 Closes: 18.03.2015 , Time :15.00 Hrs</p> <p>2. From BHEL website (www.bhel.com → Tender Notifications) Tender documents can however be downloaded from website till due date of submission</p>	Applicable
v)	Due Date & Time of Offer Submission	<p>Date : 20.03.2015 Time :15.00 Hrs Place : <u>BHEL PSSR :Chennai</u></p> <p>Tenders can be submitted through post / representative / in person at Sub-contracts Dept., 7th floor, A-wing, BHEL, PSSR, Chennai-600035. Ph: 044 24330209, Fax: 044 24335920 (BHEL will not be responsible for any delay or loss of document sent by post)</p>	Applicable
vi)	Opening of Tender	<p>Date : 20.03.2015, Time :15.30 Hrs Notes: (1) In case the due date of opening of tender becomes a non-working day, tenders shall be opened on next working day at the same time. (2) Bidder may depute representative to witness the opening of tender</p>	Applicable
vii)	EMD Amount	Rs 2,00,000/- (Rupees Two Lakhs Only)	Applicable
viii)	Cost of Tender	Rs 2000/- (Rupees Two thousand only)	Applicable
ix)	Last Date For Seeking Clarification	At least 7 days before the due date of offer submission or two days before the scheduled date of pre-bid meeting whichever is earlier along with soft version also, addressing to undersigned & to others as per contact address given below	Applicable
x)	Schedule of Pre Bid Discussion (PBD)	Date: 12.03.2015 Time 11.00AM at BHEL:PSSR:Chennai-35	Applicable

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xi)	Integrity Pact & Details of Independent External Monitor (IEM)	Bidders shall enter into an Integrity Pact (IP) with BHEL as per format given at Volume 1D Formats of this tender. The bidders are required to return this Integrity Pact (IP) along with Techno Commercial Bid duly signed and stamped by the authorized signatory who signs the bid. It may be noted that only those bidders who have entered into such an IP with BHEL would be competent to participate against this tender .i.e. entering into this pact is a preliminary qualifications for the bidders. The Independent External Monitor against this NIT shall be Shri	Not Applicable
xii)	Latest updates	Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc to Tender Specifications will be hosted in BHEL webpage only (www.bhel.com → Tender Notifications) and not in the newspapers. Bidders to keep themselves updated with all such information. This also form part of tender hence the same shall be enclosed with their offer.	

- 2.0 The offer shall be submitted as per the instructions of tender document and as detailed in this NIT. Bidders to note specifically that all pages of tender document, including these NIT pages of this particular tender together with subsequent correspondences shall be submitted by them, duly signed & stamped on each page, as part of offer. **Rates / Price including discounts / rebates, if any, mentioned anywhere / in any form in the techno-commercial offer other than the Price Bid, shall not be entertained.**
- 3.0 Unless specifically stated otherwise, bidder shall remit cost of tender and courier charges if applicable, in the form of Demand Draft drawn in favour of Bharat Heavy Electricals Ltd, payable at Chennai. Bidder may also choose to deposit the Tender document cost by cash at the Cash Office as stated above against sl no iv of 1, on any working day; and in such case copy of Cash receipt is to be enclosed with the Techno Commercial offer. Sale of tender Documents shall not take place on National Holidays, holidays declared by Central or State Governments and BHEL PS HQ at Chennai, Sundays and second / last Saturdays.
- 4.0 Unless specifically stated otherwise, bidder shall deposit EMD through Demand Draft / Pay Order in favour of Bharat Heavy Electricals Ltd, payable at Chennai. For other details and for 'One Time EMD' please refer General Conditions of Contract.

NOTICE INVITING TENDER

5.0 **Procedure for Submission of Tenders:** The Tenderers must submit their Tenders to Officer inviting Tender, as detailed below:

- PART-I consisting of 'PART-I A (Techno Commercial Bid)' & 'PART-I B (EMD / COST of TENDER)' in two separate sealed and superscribed envelopes (ENVELOPE-I & ENVELOPE-II)
- PART-II (Price Bid) – in sealed and superscribed envelope (ENVELOPE-III)
- One set of each document shall be retained by the bidder for their reference.

6.0 The contents for ENVELOPES and the superscription for each sealed cover / Envelope are as given below. **(All pages to be signed and stamped)**

Sl no	Description	Remarks
	Part-I A	
	<p><u>ENVELOPE – I superscribed as :</u> PART-I (TECHNO COMMERCIAL BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION:</p> <p>CONTAINING THE FOLLOWING:-</p>	
i.	Covering letter / Offer forwarding letter of Tenderer.	
ii.	<p>Duly filled-in 'No Deviation Certificate' as per prescribed format to be placed after document under sl no (i) above.</p> <p><u>Note:</u></p> <p>a. In case of any deviation, the same should be submitted separately for technical & commercial parts, indicating respective clauses of tender against which deviation is taken by bidder. The list of such deviation shall be placed after document under sl no (i) above. It shall be specifically noted that deviation recorded elsewhere shall not be entertained.</p> <p>b. BHEL reserves the right to accept / reject the deviations without assigning any reasons, and BHEL decision is final and binding.</p> <p style="padding-left: 20px;">(i) In case of acceptance of the deviations, appropriate loading shall be done by BHEL</p> <p style="padding-left: 20px;">(ii) In case of unacceptable deviations, BHEL reserves the right to reject the tender.</p>	
iii.	<p>Supporting documents / annexure / schedules / drawing etc as required in line with Pre-Qualification criteria.</p> <p>It shall be specifically noted that all documents as per above shall be indexed properly and credential certificates issued by clients shall</p>	

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	distinctly bear the name of organization, contact phone no, FAX no, etc.	
iv.	All Amendments / Correspondences / Corrigenda / Clarifications / Changes / Errata etc pertinent to this NIT.	
v.	Integrity Pact Agreement (Duly signed by the authorized signatory)	If applicable
vi.	Duly filled-in annexures, formats etc as required under this Tender Specification / NIT	
vii.	Notice inviting Tender (NIT)	
viii.	Volume – I A : Technical Conditions of Contract (TCC) consisting of Scope of work, Technical Specification, Drawings, Procedures, Bill of Quantities, Terms of payment, etc	
ix.	Volume – I B : Special Conditions of Contract (SCC)	
x.	Volume – I C : General Conditions of Contract (GCC)	
xi.	Volume – I D : Forms & Procedures	
xii.	Volume – II (UNPRICED – without disclosing rates/price, but mentioning only 'QUOTED' or 'UNQUOTED' against each item	
xiii.	Any other details preferred by bidder with proper indexing.	

	PART-I B	
	<p><u>ENVELOPE – II superscribed as:</u> PART-I (EMD/COST of TENDER) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION:</p> <p><u>CONTAINING THE FOLLOWING:-</u></p>	
i.	<p>1. Earnest Money Deposit (EMD) in the form as indicated in this Tender</p> <p style="text-align: center;"><u>OR</u></p> <p>Documentary evidence for 'One Time EMD' with BHEL PSSR Chennai</p> <p>2. Cost of Tender (Demand Draft or copy of Cash Receipt as the case may be)</p>	

	PART-II	
	PRICE BID consisting of the following shall be enclosed	
	<u>ENVELOPE-III</u> superscribed as:	

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	PART-II (PRICE BID) TENDER NO : NAME OF WORK : PROJECT: DUE DATE OF SUBMISSION: CONTAINING THE FOLLOWING	
i	Covering letter/Offer forwarding letter of Tenderer enclosed in Part-I	
ii	Volume II – PRICE BID (Duly Filled in Schedule of Rates – rate / price to be entered in words as well as figures)	

	OUTER COVER	
	ENVELOPE-IV (MAIN ENVELOPE / OUTER ENVELOPE) superscribed as: TECHNO-COMMERCIAL BID, PRICE BID & EMD TENDER NO: NAME OF WORK: PROJECT: DUE DATE OF SUBMISSION: Addressed to: Sub-contracts Dept., 7th floor, A-wing, BHEL PSSR, 690, Anna Salai, Nandhanam, Chennai-35. Ph: 044 24330209 CONTAINING THE FOLLOWING:	
i	<ul style="list-style-type: none"> ○ Envelopes I ○ Envelopes II ○ Envelopes III 	

SPECIAL NOTE: All documents / annexures submitted with the offer shall be properly annexed and placed in respective places of the offer as per enclosure list mentioned in the covering letter. BHEL shall not be responsible for any missing documents.

- 7.0 Deviation with respect to tender clauses and additional clauses / suggestions / in Techno-commercial bid / Price bid shall NOT be considered by BHEL. Bidders are requested to positively comply with the same.
- 8.0 BHEL reserves the right to accept or reject any or all Offers without assigning any reasons thereof. BHEL also reserves the right to cancel the Tender wholly or partly without assigning any reason thereof. Also BHEL shall not entertain any correspondence from bidders in this matter (except for the refund of EMD).

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9.0 Assessment of Capacity of Bidders:

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

- I. **LOAD:** Load takes into consideration **ALL** the contracts of the Bidder under execution with BHEL Regions, irrespective of whether they are similar to the tendered scope or not. The 'Load' is the sum of the unit wise identified packages (refer Table-1) for contracts with BHEL Regions. The cut off month for reckoning 'Load' shall be the month, two (2) months preceding the month corresponding to the 'latest date of bid submission', in the following manner:

(**Note:** For example if latest bid submission is in Aug 2011, then the 'load' shall be calculated upto and inclusive of June 2011)

i). **Total number of Packages**

Total number of Packages in hand = P

Where

- 'P' is the sum of all unit wise identified packages under execution with BHEL Regions as of the cut off month defined above, including packages yet to be commenced, excepting packages which are on HOLD due to reasons not attributable to Bidder.

- II. **PERFORMANCE:** Here 'Monthly Performance' of the bidder for all the packages (under execution / executed during the 'Period of Assessment' in all the Power Sector Regions of BHEL) SIMILAR to the packages covered under the tendered scope, excepting packages not commenced shall be taken into consideration. The 'Period of Assessment' shall be 6 months preceding the cut off month. The cut off month for reckoning 'Period of Assessment' shall be the month two (2) months preceding the month corresponding to the 'latest date of bid submission', in the following manner:

(**Note:** For example if 'latest date of bid submission' is in Aug 2011, then the 'performance' shall be assessed for a 6 month period upto and inclusive of June 2011, for all the unit wise identified packages (refer Table I)

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

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

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- a) $P_1, P_2, P_3, P_4, P_5, \dots, P_N$ etc be the packages (**under execution / executed** during the 'Period of Assessment' in all Regions) **SIMILAR** to the packages covered under the tendered scope, excepting packages not commenced. Total number of similar packages for all Regions = P_T (ie $P_T = P_1 + P_2 + P_3 + P_4 + \dots + P_N$)
- b) Number of Months ' T_1 ' for which 'Monthly Performance Evaluation' as per relevant formats, should have been done in the 'Period of Assessment' for the corresponding similar package P_1 . Similarly T_2 for package P_2 , T_3 for package P_3 , etc for the tendered scope. Now calculate cumulative total months ' T_T ' for total similar Packages ' P_T ' for all Regions (i.e $T_T = T_1 + T_2 + T_3 + T_4 + \dots + T_N$)
- c) Sum ' S_1 ' of 'Monthly Performance Evaluation' Scores ($S_{1-1}, S_{1-2}, S_{1-3}, S_{1-4}, S_{1-5}, \dots, S_{1-N}$) for similar package P_1 , for the 'period of assessment' ' T_1 ' (i.e $S_1 = S_{1-1} + S_{1-2} + S_{1-3} + S_{1-4} + S_{1-5} + \dots + S_{1-N}$). Similarly S_2 for package P_2 for period T_2 , S_3 for package P_3 for period T_3 , etc for the tendered scope for all Regions. Now calculate cumulative sum ' S_T ' of 'Monthly Performance Evaluation' Scores for total similar Packages ' P_T ' for all Regions (i.e ' $S_T = S_1 + S_2 + S_3 + S_4 + S_5 + \dots + S_N$.)
- d) **Overall Performance Rating ' R_{BHEL} ' for the similar Package / Packages** (under execution / executed during the 'Period of Assessment') in all the Power Sector Regions of BHEL):
- Aggregate of Performance scores for all similar packages in all the Regions
- = -----
- Aggregate of months for each of the similar package for which performance should have been evaluated in all the Regions
- $$= \frac{S_T}{T_T}$$
- e) **Bidders to note that the risk of non evaluation or non availability of the 'Monthly Performance Evaluation' reports as per relevant formats is to be borne by the Bidder**
- f) **Table showing methodology for calculating 'a', 'b' and 'c' above**

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Sl no	Item Description	Details for all Regions							Total
		(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	
1	Similar Packages for all Regions → (under execution/ executed during period of assessment)	P ₁	P ₂	P ₃	P ₄	P ₅	...	P _N	Total No of similar packages for all Regions = P_T ie Sum (Σ) of columns (iii) to (ix)
2	Number of Months for which 'Monthly Performance Evaluation' as per relevant formats should have been done in the 'period of assessment for corresponding similar Package (as in row 1)	T ₁	T ₂	T ₃	T ₄	T ₅	...	T _N	Sum (Σ) of columns (iii) to (ix) = T_T
3	Monthly performance scores for the corresponding period (as in Row 2)	S ₁₋₁ , S ₁₋₂ , S ₁₋₃ , S ₁₋₄ , ... S _{1-T1}	S ₂₋₁ , S ₂₋₂ , S ₂₋₃ , S ₂₋₄ , ... S _{2-T2}	S ₃₋₁ , S ₃₋₂ , S ₃₋₃ , S ₃₋₄ , ... S _{3-T3}	S ₄₋₁ , S ₄₋₂ , S ₄₋₃ , S ₄₋₄ , ... S _{4-T4}	S ₅₋₁ , S ₅₋₂ , S ₅₋₃ , S ₅₋₄ , ... S _{5-T5}	S _{N-1} , S _{N-2} , S _{N-3} , S _{N-4} , ... S _{N-TN}	-----
4	Sum of Monthly Performance scores of the corresponding Package for the corresponding period (as in row-3)	S ₁	S ₂	S ₃	S ₄	S ₅	...	S _N	Sum (Σ) of columns (iii) to (ix) = S_T

- ii). Calculation of Overall 'Performance Rating' (R_{BHEL}) in case 'similar Package / Packages' for the tendered scope ARE NOT AVAILABLE, during the 'Period of Assessment':

This shall be obtained by summing up the 'Monthly Performance Evaluation' scores obtained by the bidder in all Regions for ALL the packages, divided by the total number of Package months for which evaluation should have been done. 'R_{BHEL}' shall be calculated subject to availability of 'performance scores' for at least.6 'package months' in the order of precedence below:

- a) 'Period of Assessment.

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- b) 12 months preceding the cut-off month
- c) 24 months preceding the cut-off month
- d) 36 months preceding the cut-off month

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

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

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

III. 'Assessment of Capacity of Bidder':

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

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

Note:

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

The Bidder shall be considered 'Qualified' as per 'Assessment of Capacity of Bidder' for the subject Tender if $P \leq P_{Max}$ (where P is calculated as per clause 9.I)

IV. Explanatory note:

- a) Similar package means Boiler or ESP or Piping or Turbine or Civil or Structure or Electrical or CI, etc at the individual level irrespective of rating of Plant, and irrespective of whether the subject tender is a single package or as part of combined/composite packages. Normally Boiler, ESP, Piping, Turbine, Electrical, CI, Civil, Structure, etc is considered individual level of package. For example in case the

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tendered scope is a Boiler Vertical Package comprising of Boiler, ESP and Power Cycle Piping (i.e the 'identified packages as per Table-1 below), the 'PERFORMANCE' part against sl no II above, needs to be evaluated considering all the identified packages (ie., Boiler, ESP and Power Cycle Piping) and finally the Bidder's capacity to execute the tendered scope is assessed in line with III above.

b) Identified Packages (Unit wise)

Table-1

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

c) Bidders who have not been evaluated for at least six package months in the last 36 months in the online BHEL system for contractor performance evaluation in BHEL PS Regions, wef July'2010 shall be considered "NEW VENDOR".

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

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

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The “FIRST TIMER” tag shall remain till execution of work for a period of not less than 09 months, from the commencement of work of first package

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

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

- d) In the unlikely event of all bidders shortlisted against Technical and Financial Qualification criteria not meeting the criteria on ‘Assessment of Capacity of Bidders’ detailed above, OR leads to a single tender response on applying the criteria of ‘Assessment of Capacity of Bidders’ or due to non-approval by Customer, then BHEL at its discretion reserves the right to consider the further processing of the Tender based on the **Overall Performance Rating ‘R_{BHEL}’** only, starting from the upper band.
- e) ‘Under execution’ shall mean works in progress as per the following:
- i. up to Boiler Steam Blowing in case of Steam Generator and Auxiliaries
 - ii. upto Synchronisation in case of all other works excepting sl no (i) and (iii)
 - iii. Upto execution of at least 90% of anticipated contract value in case of Civil & Structures (unit wise), Enabling works and upto 90% of material unloading (in tonnage) as per the original contract in case of MM Package.
- Note:** BHEL at its discretion can extend (or reduce in exceptional cases in line with Contract conditions) the period defined against (i), (ii) and (iii) above, depending upon the balance scope of work to be completed.
- f) Performance evaluation in Clause 9 above is applicable to Prime bidder and consortium partner (or Technical tie up partner) for their respective scope of work.

10.0 Since the job shall be executed at site, bidders must visit site/ work area and study the job content, facilities available, availability of materials, prevailing site conditions including law & order situation ,applicable wage structure, wage rules, etc before quoting for this tender. They may also consult this

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office before submitting their offers, for any clarifications regarding scope of work, facilities available at sites or on terms and conditions.

- 11.0 For any clarification on the tender document, the bidder may seek the same in writing or through e-mail, as per specified format, within the scheduled date for seeking clarification, from the office of the undersigned. BHEL shall not be responsible for receipt of queries after due date of seeking clarification due to postal delay or any other delays. Any clarification / query received after last date for seeking clarification may not be normally entertained by BHEL and no time extension will be given.
- 12.0 BHEL may decide holding pre-bid discussion [PBD] with all intending bidders as per date indicated in the NIT. The bidder shall ensure participation for the same at the appointed time, date and place as may be decided by BHEL. Bidders shall plan their visit accordingly. The outcome of pre-bid discussion (PBD) shall also form part of tender.
- 13.0 In the event of any conflict between requirement of any clause of this specification / documents / drawings / data sheets etc or requirements of different codes / standards specified, the same to be brought to the knowledge of BHEL in writing for clarification before due date of seeking clarification (whichever is applicable), otherwise, interpretation by BHEL shall prevail. Any typing error/missing pages / other clerical errors in the tender documents, noticed must be pointed out before pre-bid meeting / submission of offer, else BHEL's interpretation shall prevail.
- 14.0 Unless specifically mentioned otherwise, bidder's quoted price shall deemed to be in compliance with tender including PBD.
- 15.0 Bidders shall submit Integrity Pact Agreement (Duly signed by authorized signatory who signs in the offer), **if applicable**, along with techno-commercial bid. This pact shall be considered as a preliminary qualification for further participation. **The names and other details of Independent External Monitor (IEM) for the subject tender is as given at point (1) above.**
- 16.0 The Bidder has to satisfy the Pre-Qualifying Requirements stipulated for this Tender in order to be qualified. The Price Bids of only those bidders will be opened who will be qualified for the subject job on the basis of satisfying the pre-qualification criteria specified in this NIT as per Annexure--1(as applicable) past performance etc. and date of opening of price bids shall be intimated to only such bidders. BHEL reserves the right NOT to consider offers of parties under HOLD.
- 17.0 In case BHEL decides on a 'Public Opening', the date & time of opening of the sealed PRICE BID shall be intimated to the qualified bidders and in such a case, bidder may depute one authorised representative to witness the price bid opening. BHEL reserves the right to open 'in-camera' the 'PRICE BID' of

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- any or all Unsuccessful / Disqualified bidders under intimation to the respective bidders.
- 18.0 Validity of the offer shall be for **six months** from the latest due date of offer submission (including extension, if any) unless specified otherwise.
- 19.0 BHEL reserves the right to decide the successful bidder on the basis of Reverse Auction process. In such case all qualified bidders will be intimated regarding procedure / modality for Reverse Auction process prior to Reverse Auction and price will be decided as per the rules for Reverse Auction.
- However, if reverse auction process is unsuccessful as defined in the RA rules / procedures, or for whatsoever reason, then the sealed 'PRICE BIDS' will be opened for deciding the successful bidder. BHEL's decision in this regard will be final and binding on bidder.
- 20.0 On submission of offer, further consideration will be subject to compliance to tender & qualifying requirement and customer's acceptance, as applicable.
- 21.0 In case the bidder is an "Indian Agent of Foreign Principals", 'Agency agreement has to be submitted along with Bid, detailing the role of the agent along with the terms of payment for agency commission in INR, along with supporting documents.
- 22.0 The bidders shall not enter into any undisclosed M.O.U. or any understanding amongst themselves with respect to tender.
- 23.0 Void
- 24.0 The bidder shall submit documents in support of possession of 'Qualifying Requirements' duly self-certified and stamped by the authorized signatory, indexed and properly linked in the format for PQR. In case BHEL requires any other documents / proofs, these shall be submitted immediately.
- 25.0 The bidder may have to produce original document for verification if so decided by BHEL.
- 26.0 The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site "www.bhel.com → tender notification".
- 27.0 It may be noted that guidelines / rules in respect of 'Suspension of Business dealings', 'Vendor evaluation format', Quality, Safety & HSE guidelines', etc may undergo change from time to time and the latest one shall be followed.
- 28.0 MSE suppliers can avail the intended benefits only if they submit along with offer, attested copies of either EM II certificate having deemed validity (Two years from the date of issue of acknowledgement in EM-II) or valid NSIC certificate or EM II certificate along with CA certificate (Format enclosed as

NOTICE INVITING TENDER

per Annexure -8) applicable for the year, certifying quantum of investment in plant and machinery within the permissible limit as per the act for relevant status (Micro or small) where the deemed validity of EM II is over. Date to be reckoned for determining the deemed validity will be the last date of technical bid submission. Non submission of such documents will lead to consideration of their bids at par with other bidders and MSE status of such suppliers shall be shifted to Non MSE supplier till the supplier submits these documents”.

29.0 **Mode of Award of work for this tender:**

29.1 The tender consists of two packages viz., Package A and Package B as explained below:

Package A: Supply of required materials, Erection, testing, commissioning and operation & maintenance of construction power distribution system.

Package B: Operation and Maintenance of construction power distribution system

29.2 Evaluation of price bid shall be on the total amount of lowest competitive price of both package-A and package-B together.

29.3 Though packages are two in numbers, both the packages shall be awarded to only one bidder.

30.0 **Performance of the bidder:**

In addition to the monthly performance of the bidder as per the clause “Assessment of Capacity of Bidders” of NIT (clause no 9), the Performance of the bidder shall be evaluated every year also.

31.0 **Order of Precedence:**

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

- a. Amendments / Clarifications / Corrigenda / Errata etc. issued in respect of the tender documents by BHEL
- b. Notice Inviting Tender (NIT)
- c. Price Bid
- d. Technical Conditions of Contract (TCC)—Volume-1A
- e. Special Conditions of Contract (SCC) —Volume-1B
Rev. 01 Dt. 01 Jun 2012
- f. General Conditions of Contract (GCC) —Volume-1C
Rev. 01 Dt. 01 Jun 2012; Amendment: 01 Dt. 15 April 2013

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- g. Forms and Procedures —Volume-1D
Rev. 01 Dt. 01 Jun 2012

For and on behalf of BHARAT HEAVY ELECTRICALS LTD

General Manager / HR and SCT

Enclosure

1. Annexure-1: Pre Qualifying criteria.
2. Annexure-2: Check List.
3. Annexure-3 Technical PQR
4. Annexure-4 Annexure to Pre-Qualifying Criteria
5. Annexure-5 Performance certificate
6. Annexure-6 Tender Schedule.
7. Annexure-7 Declaration for Reverse auction
8. Annexure-8 Certificate by Chartered Accountant
9. Other documents as per this NIT.

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ANNEXURE - 1

PRE QUALIFYING CRITERIA

JOB	Supply, Erection, Testing, Commissioning, operation and maintenance of Construction Power Supply and yard lighting at Kothagudem Thermal Power station, 1 x 800 MW, Paloncha, Telangana
TENDER No.	BHEL PSSR SCT 1578

Sl. No.	PRE QUALIFICATION CRITERIA	Bidders claim in respect of fulfilling the PQR Criteria	
		Name and Description of qualifying criteria	Page no of supporting document. Bidder must fill up this column as per applicability
A	Submission of Integrity Pact duly signed (if applicable) (Note: To be submitted by Prime Bidder & Consortium / Technical Tie up partner jointly in case Consortium bidding is permitted, otherwise by the sole bidder)	Not Applicable	
B	<u>Technical</u> Refer Annexure 3	Applicable	To be filled in Annexure-4
C: C-1	<u>FINANCIAL</u> Turnover Bidders must have achieved an average annual financial turnover (Audited) of Rs 50,00,000/- (Rs. Fifty lakhs only) or more over last three Financial Years (FY) i.e 2011-12, 2012-13 and 2013-14.	Applicable	To be filled in Annexure-4
C-2	Networth (only in case of Companies) Net worth of the Bidder based on the latest Audited Accounts as furnished for 'C-1' above should be positive		To be filled in Annexure-4

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C-3	<p>Profit</p> <p>Bidder must have earned cash profit in any one of the three Financial Years as applicable in the last three Financial Years defined in 'C-1 above based on latest Audited Accounts.</p>		To be filled in Annexure-4
D	<p>Assessment of Capacity of Bidder to execute the work as per Sl. No 9 of NIT (if applicable)</p>	Applicable	By BHEL
E	<p>Approval of Customer (if applicable)</p> <p><u>Note:</u> Names of bidders (including consortium / Technical Tie up partners in case consortium bidding is permitted) who stand qualified after compliance of criteria A to D shall be forwarded to customer for their approval.</p>	Not Applicable	BY BHEL
F	<p>Price Bid Opening</p> <p><u>Note:</u> Price Bids of only those bidders shall be opened who stand qualified after compliance of criteria A to E</p>	Applicable	BY BHEL
G	<p>Consortium criteria (if applicable)</p>	Not applicable	
<p><u>Explanatory Notes for the PQR (unless otherwise specified in the PQR):</u></p> <ol style="list-style-type: none"> 1. Bidder to submit Audited Balance Sheet and Profit and Loss Account for the respective years as indicated against C-1 above along with all annexures. 2. In case audited financial statements have not been submitted for all the three years as indicated against C-1 above, then the applicable audited statements submitted by the bidders against the requisite three years, will be averaged for three years i.e. total divided by three. 3. C-2:-NETWORTH: Shall be calculated based on the latest Audited Accounts as furnished for C-1 above. Net worth = Paid up share capital + Reserves. (Net worth is required to be evaluated in case of companies) 4. C-3:- PROFIT : shall be NET profit (PAT + Non cash expenditure viz depreciation) earned during any one of the three financial years as in C-1 above 5. Void 			

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<p>6. Time period for achievement of the 'Technical' criteria of PQR (as in 'B' above) will be the last 7 years ending on the 'latest date' of Bid submission</p> <p>7. 'EXECUTED' means the Vendor should have achieved the criteria specified in the Technical criteria of PQR (as in 'B' above) even if the Contract has not been completed or closed.</p> <p>8. Void.</p> <p>9. Void</p> <p>10. Void</p> <p>11. Void</p> <p>12. In case the experience / PO / WO certificate enclosed by bidders do not have separate break up prices for the E&C portion of Electrical and CI Works, (i.e. the certificates enclosed are for composite order for supply and erection of Electrical & CI and other works if any), then value of Erection and Commissioning for the Electrical & CI portion shall be considered as 15% of the supply & erection of Electrical & CI, unless otherwise specifically indicated in the PQR.</p> <p>Also refer foot note mentioned in Annexure-3 of Notice Inviting Tender.</p> <p>13. Void</p> <p>14. In case the tendered scope is not a Pulverised Fuel Boiler, experience of Oil / Gas Fired Boilers also can be considered unless otherwise specifically indicated in the PQR.</p>

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

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ANNEXURE - 2

CHECK LIST

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

1	Name and Address of the Tenderer		
2	Details about type of the Firm / Company		
3a	Details of Contact person for this Tender: Name : Mr. / Ms. Designation: Telephone No: Mobile No: Fax No: E-mail ID:		
3b	Details of alternate Contact person for this Tender: Name : Mr. / Ms. Designation: Telephone No: Mobile No: Fax No: E-mail ID:		
4	EMD DETAILS	DD No: Date : Bank : Amount: <u>Please tick (√) whichever applicable:-</u> ONE TIME EMD / ONLY FOR THIS TENDER	
5	Validity of Offer	To be valid for six months from due date	
		Applicability (By BHEL)	Bidder Reply
6	Whether the format for compliance with PRE QUALIFICATION CRITERIA (ANNEXURE-I & ANNEXURE-IV) is understood and filled with proper supporting documents referenced in the specified format	Applicable	YES / NO
7	Submission of Copy Audited profit and Loss Account for the last three years	Applicable	YES / NO
8	Submission of Copy of PAN Card	Applicable	YES / NO

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9	Whether all pages of the Tender documents including annexures, appendices etc are read understood and signed	Applicable	YES / NO
10	Submission of Integrity Pact	Applicable	YES / NO
11	Submission of Declaration by Authorised Signatory	Applicable	YES / NO
12	Submission of No Deviation Certificate	Applicable	YES / NO
13	Submission of Declaration confirming knowledge about Site Conditions	Applicable	YES / NO
14	Submission of Declaration for relation in BHEL	Applicable	YES / NO
15	Submission of Non Disclosure Certificate	Applicable	YES / NO
16	Submission of Copy Bank Account Details for E-Payment	Applicable	YES / NO
17	Submission of Capacity Evaluation of Bidder for current Tender	Applicable	YES / NO
18	Submission of Tie Ups/Consortium Agreement are submitted as per format	Not Applicable	YES / NO
19	Submission of Power of Attorney for Submission of Tender / Signing Contract Agreement	Applicable	YES / NO
20	Submission of Analysis of Unit rates	Applicable	YES / NO
21	Submission of Unquoted price bid	Applicable	YES / NO
22	Tabular column showing Category- wise, month wise, man power deployment sub package wise planned for the execution of the scope of works. Data on categories of labour like mill wright fitters, fitters, gas-cutters, welders, electricians, riggers, khalasis, grinder-men, crane operators and helpers shall be shown in detail. Data shall be split up under the work areas like sub- station, cable laying / stinging, yard lighting etc.	Applicable	YES / NO
23	Declaration by bidder for price opening through reverse auction (Refer Annexure-7 of Notice Inviting Tender)	Applicable	YES / NO

NOTE :

1. STRIKE OFF 'YES' OR 'NO', AS APPLICABLE.
2. TENDER NOT ACCOMPANIED BY THE PRESCRIBED **ABOVE APPLICABLE DOCUMENTS** ARE LIABLE TO BE SUMMARILY REJECTED.
3. For Sl. No. 10 to 20 above, the formats are available in " Volume I of Volume I Book-II – Forms and Procedures" of this tender specification.

DATE :

AUTHORISED SIGNATORY
(With Name, Designation and Company seal)

NOTICE INVITING TENDER

Annexure-3

B. Technical PQR:

The bidder should satisfy all the following clauses

A. The bidder should have executed Erection, Testing, and Commissioning of HT distribution network comprising of 11kV/415 V substation, Overhead conductors / underground cabling in the last seven years reckoned from the date of bid opening.

(AND)

B. The bidder should have had valid 'HT Electrical Contractor License' issued by State / Central authorities for executing 11kV electrical works or should have submitted application for renewal of the above license to the State/Central authorities at the time of bid opening.

(AND)

C.1 Bidder should have executed* One (1) Electrical work of value not less than Rs 135 Lakhs in a Power / Industrial projects in the last seven years reckoned from the date of bid opening

(OR)

C.2 Bidder should have executed* Two (2) Electrical works each of value not less than Rs 85 Lakhs in a Power / Industrial projects in the last seven years reckoned from the date of bid opening

(OR)

C.3 Bidder should have executed* Three (3) Electrical works each of value not less than Rs 65 Lakhs in a Power / Industrial projects in the last seven years reckoned from the date of bid opening.

Note to clause C.1 above:

The value of work executed* against C.1 above will be updated as per PVC formula of GCC with indices for All India average consumer price index for Industrial workers with base month as the date of completion of execution and indexed upto two months prior to the bid opening month.

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Example Calculation for value updation:

Value of work done as per the completion certificate produced by the bidder in which completion month mentioned as June 2011 is say Rs.75,00,000.00

Technical bid opening date of the current tender is say Feb 01, 2014

Consumer Price Index for labour as published in www.labourbureau.nic.in is as follows:

Nc = For the month of June 2011(work completed month) is 189.

Nt = For the month of Dec 2013 (two months prior to tender opening month) is 239.

Updated value= Executed value (Ev) + (Ev X 0.80 $\frac{(Nt - Nc)}{Nc}$)

$$=7500000 + (7500000 \times 0.80 \frac{(239 - 189)}{189})$$

= Rs. 9087302.00

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ANNEXURE - 4

Additional Format to be submitted by Bidders in an additional separate cover superscribed "Annexure to Pre-Qualifying Criteria".

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

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

Sl. No.	PQR Ref	PQR (Reproduced from Annexure – 1)	Qualifying Experience	Work order Ref with page no in Offer for supporting documents	Completion certificate ref for the referred Work with page no in Offer for supporting documents	Details of work with Project, Unit , Qty / rating & Period	Remarks
1	B: Technical	B.1. The bidder should have executed Erection, Testing, and Commissioning of HT distribution network comprising of 11kV/415 V substation, Overhead conductors / underground cabling in the last seven years reckoned from the date of bid opening. (AND) B.2. The bidder should have had valid 'HT Electrical Contractor License' issued by State / Central authorities for executing 11kV electrical works or should have submitted					

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	<p>application for renewal of the above license State/Central authorities at the time of bid opening.</p> <p style="text-align: center;">(AND)</p> <p>C.1 Bidder should have executed* One (1) Electrical work of value not less than Rs 135 Lakhs in a Power / Industrial projects in the last seven years reckoned from the date of bid opening</p> <p style="text-align: center;">(OR)</p> <p>C.2 Bidder should have executed* Two (2) Electrical works each of value not less than Rs 85 Lakhs in a Power / Industrial projects in the last seven years reckoned from the date of bid opening</p> <p style="text-align: center;">(OR)</p> <p>C.3 Bidder should have executed* Three (3) Electrical works each of value not less than Rs 65 Lakhs in a Power / Industrial projects in the last seven years reckoned from the date of bid opening.</p> <p>Note to clause C.1 above: The value of work executed* against C.1 above will be updated as per PVC formula of GCC with indices for All India average consumer price index for Industrial workers with base month as the date of completion of execution and indexed upto two months prior to the bid opening month.</p>					
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NOTICE INVITING TENDER

2	<u>Financial</u> C1	TURNOVER Bidders must have achieved an average annual financial turnover (Audited) of Rs. 50 Lakhs (Rs.Fifty lakhs only) or more over last three Financial Years (FY) i.e 2011-12, 2012-13, 2013-14					
3	<u>Financial</u> C2	NETWORTH (only in case of Companies) Net worth of the Bidder based on the latest Audited Accounts as furnished for 'C-1' above should be positive					
4	<u>Financial</u> C3	PROFIT Bidder must have earned cash profit in any one of the three Financial Years as applicable in the last three Financial Years defined in 'C-1' above based on latest Audited Accounts.					

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ANNEXURE-5

PERFORMANCE CERTIFICATE

Performance certificate to be submitted by bidders who have not been working with any of the four BHEL Regions in the last 12 months prior to the latest date of bid submission.

Performance of the Agency _____ in Project _____

Name of the Agency :
Address of the agency :
Work Order issued :

Erection and Commissioning works in Project _____ under work order dated _____ under reference number / Lol number _____ for the scope of _____ (Copy of work order issued enclosed)

Duration of work as per contract without extended periods : __ months

Time taken for actual completion of works : __ months
(Actual completion of works will mean the completion of contracted works enabling the intended purpose of contract, and not necessarily the closure of contract)

Delays in execution of works attributable to contractor : __ months

Performance of the Contractor in the referred works :

Sl. No	Description of Parameter	Max. Marks	Please enter your score here	Remarks, if any
01	Performance – Technical performance with respect to plan, progress achieved and organization of works at site and HQ	45		
02	Resources – Capacity to plan, organize and utilize the resources like skilled manpower, Tools & Plants(T & P), Consumables	20		
03	Management of Finance for the project	7		
04	Compliance with Safety requirements	10		
05	Compliance with Quality requirements	10		
06	Site infrastructure and services	8		
	Total	100	"X"	

Total score of the Agency _____ in work above is (in words) _____

Signature

Name and Seal of the issuing Authority

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Note:

The average marks scored by the bidder in the qualifying work should be above 60% for qualifying the bidder against tendered work.

Further to this BHEL reserves the right to obtain feedback from customer directly and any adverse report from respective customers on the performance of the bidder will render the bidder liable for rejection.

New vendors (Ref: NIT 9.0 Clause) should enclose the duly filled in certificates for performance as per this format.

Tender Schedule

Description	Schedule	Remarks
Technical Bid Opening	As mentioned in Notice Inviting Tender.	
Communication from BHEL for Clarifications, if any, required by BHEL	Within three days from tender opening date	
Last date for Bidders to submit the clarifications / documents required	Within eight days from tender opening date	Bidders to note that their competent representative to be readily available in this week for offering clarifications / submitting the further documents, if any, required.
If Reverse Auction is applicable, then the tentative date for conducting Reverse Auction	Tenth day from tender opening date	Exact date of reverse auction shall be informed to the bidders through BHEL's reverse auction agency. Bidders to note that their competent representative to be readily available at one day notice for Reverse Auction.

Note:

1. Bidders to note that the above schedule should be adhered to and no further extension will be given. To adhere to the schedule indicated below, Bidders should ensure the adequacy of the documents submitted in their offer, with proper validation.
2. Bidders who have not been working with Power Sector Regions of BHEL in the last twelve months should enclose the duly filled in certificates for performance as per the format (Annexure-5) provided in Notice Inviting Tender of this book.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Annexure 7

DECLARATION BY BIDDER FOR PRICE OPENING THROUGH REVERSE AUCTION

(To be typed and submitted in the Letter Head of the Company / Firm of Bidder)

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub : Declaration by Bidder for Price opening through Reverse Auction

Ref : 1) NIT / Tender Specification No:,
2) Participation in the Reverse Auction

We have studied and understood the clauses of Reverse auction published in the tender specification.

Strike out either (1) or (2) of the following whichever is not applicable.

1. I / We, hereby declare that I / we **shall be** participating in the Reverse Auction in case BHEL opts for opening the price bid through Reverse auction.
2. I / We, hereby declare that I / we **shall not be** participating in the Reverse Auction in case BHEL opts for opening the price bid through Reverse auction.

Yours faithfully,

Date: (Signature, Date & Seal of Authorized Signatory of the Bidder)

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Annexure 8

Certificate by Chartered Accountant on letter head

This is to certify that M/s. _____, (hereinafter referred to as 'company') having its registered office at _____ is registered under MSMED Act 2006, (Entrepreneur Memorandum No (Part-II) _____ dtd. _____, Category: _____ (Micro / Small)). (Copy enclosed)

Further verified from the Books of Accounts that the investment of the company as per the latest audited financial year _____ as per MSMED Act 2006 is as follows:

1. **For Manufacturing enterprises:** Investment in plant and machinery (i.e., original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722(E) dated October 5, 2006 :

Rs. _____ Lacs

2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:

Rs. _____ Lacs

(Strike off whichever is not applicable)

The above investment of Rs. _____ Lacs is within permissible limit of Rs. _____ Lacs for _____ Micro / small (Strike off which is not applicable) category under MSMED Act 2006.

Or

The company has been graduated from its original category (Micro / Small) (Strike off which is not applicable) and the date of graduation of such enterprise from its original category as notified vide S.O.No. 3322(E) dated 01-11-2013 published in gazettee notification dated 04-11-2013 by Ministry of MSME.

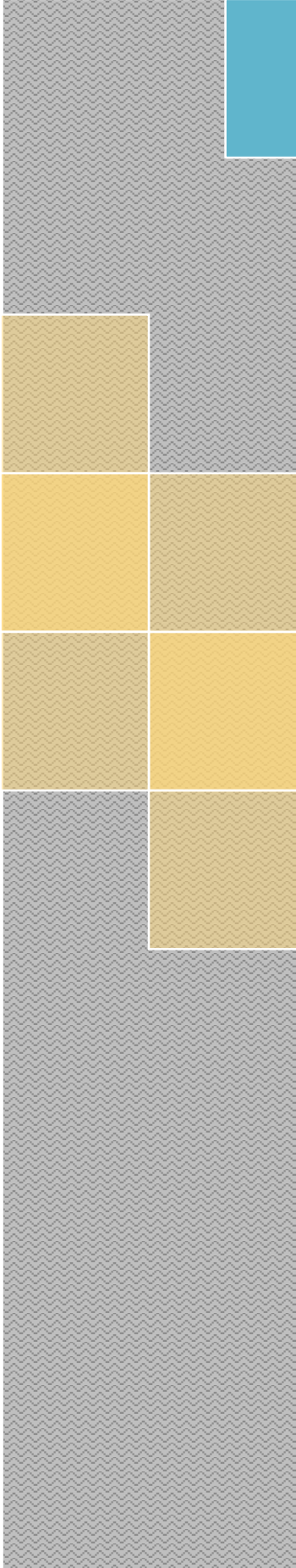
Date:

(Signature)

Name-

Membership number-

Seal of Chartered Account



VOLUME – IA
Part I & II
TECHNICAL
CONDITIONS OF
CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED



TECHNICAL CONDITIONS OF CONTRACT (TCC)

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Vol IA	Part-I: Contract specific details		
1	Project Information	Chapter-I	
2	Scope of works	Chapter-II	
3	Facilities in the scope of Contractor / BHEL (Scope Matrix)	Chapter-III	
4	Materials, Consumables, T&Ps and MMEs to be Deployed by Contractor	Chapter-IV	
5	T&Ps and MMEs to be deployed by BHEL on sharing basis	Chapter-V	
6	Time Schedule	Chapter-VI	
7	Terms of Payment	Chapter-VII	
8	Taxes and other Duties	Chapter-VIII	
9	Bill of Quantity	Chapter-IX	
10	General	Chapter-X	
11	Foundation , Grouting and Civil works	Chapter-XI	
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3a	11 kV Substation Foundation drawing		
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TECHNICAL CONDITIONS OF CONTRACT (TCC)

	3g	Drawings on Location of substation in plant premises		
	3h	General arrangement diagram of front view & side view of 11kV pillar Box		
	3i	Diagram of Typical detail of flood lighting fixture on swaged poles		
4		Technical Requirements and Guidelines for Installation, Testing, Commissioning and Supply items of HT / LT Electrical packages	Chapter-4	

TECHNICAL CONDITIONS OF CONTRACT (TCC)

CHAPTER – I PROJECT INFORMATION

1	Name of the Project	KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT # 12,
2	Station Capacity	1X800 MW (Coal based)
3	Owner	Telangana State Power Generation Corporation Limited (TSGENCO)
4	Site Location	The proposed Power Plant will be installed adjacent to the existing D colony of Kothagudem Thermal Power Station, at Kothagudem.
5	Latitude	17°37' N
6	Longitude	80°42' E
7	Nearest Railway Station	Bhadrachalam Road (Known as Kothagudem)
8	Nearest Airport	180 Kms (Vijayawada)
9	Site Conditions	
	Ambient Temperature	
	Daily minimum (average)	12.9 Deg C
	Daily maximum (average)	44.9 Deg C
	Design Ambient Temperature	50 Deg C
	Ambient temperature (performance)	38 Deg C
	Ambient Temperature (for efficiency guarantee)	28 Deg C
	Relative Humidity for design / efficiency	35-82%
	Plant Elevation above MSL	89 m above MSL
	Mean Wind Speed	5.8 kmph
	Wind Pressure	As per the latest revision of IS 875/1987
	Seismic co-efficient	Zone-III as per IS- 1893 (Part-IV)

TECHNICAL CONDITIONS OF CONTRACT (TCC)

CHAPTER – III DESCRIPTION & SCOPE WORK

DESCRIPTION

The proposed construction power supply shall have 9 Nos substations of rating 500 kVA, 11/433 kV each. All the Substations shall be connected to 11 kV ring main feeder through 11 kV buried cable.

Out of 09 substations three numbers shall be of Conventional Type and the balance six shall be of Skid mounted mobile type substations.

Yard Lighting:

30 numbers of stepped tubular / swaged type 11 metre long steel lighting poles. Each pole shall be having two flood lights.

1.2.1 BROAD SCOPE OF WORK:

THE SCOPE OF THE WORK WILL COMPRISE OF BUT NOT LIMITED TO THE FOLLOWING:

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

The scope of work package-A covers the supply installation obtaining statutory clearance, erection, testing commissioning and Package-B covers maintaining of the following.

- Supply of required materials, Erection and commissioning and maintenance of 11 KV/ 433 V- 500 KVA sub – stations.
- Supply of required materials, laying, termination of 11 KV HT cable for power distribution and maintenance of 11 KV feeder power distribution systems.
- Any other items that are required for completion of construction power supply but not explicitly mentioned in the contract with in the quated value.
- Supply of materials and erection of pillar box

1.2.1.1 Package A

The scope of work covers identification of items at stores / yards, checking, reporting the damages if any, taking delivery at storage yard / stores, loading, transportation, unloading at Contractor's stores / working yard, keeping in safe custody in contractor's stores, pre-assembly, calibration, checking, erection, testing and commissioning, & post-commissioning activities along with the supply of all consumables, tools and tackles, testing instruments, supply of consumables like electrodes, gas, cable dressing materials, tag plates, PVC

TECHNICAL CONDITIONS OF CONTRACT (TCC)

sleeves for wire marking, lugs, fasteners, paints and its consumables. Deployment of skilled / unskilled manpower, engineers / supervisors, Tools & Plants (T & P), Material handling equipments, Testing instruments, returning of un-used materials / items to BHEL stores. The installation and commissioning of all the electrical equipments / items shall conform to the technical requirements specified elsewhere in the tender.

The scope also includes Operation and maintenance of construction power distribution system till commencement of contract period of package B.

1.2.1.2 Package B

1.2.1.2.1 Deployment of Minimum 1 (one) Electricians & 1 (one) Helper with required T&P per shift for three shifts per day and 1 (One) Supervisor for day shift for the works of operation and maintenance of construction power distribution system which consists of all the components and equipments erected and commissioned under package A. **The man power should be available throughout the year inclusive of all holidays and Sundays.**

1.2.1.2.2 The scope of O & M work includes identification of items at stores / yards, checking, reporting the damages if any, taking delivery at storage yard / stores, loading, transportation to working yard, pre-assembly, calibration, checking, replacing, testing and commissioning, & post-commissioning activities using their tools and tackles and testing instruments along with the supply of all consumables like electrodes, gas, paints, cable dressing materials, tag plates, PVC sleeves for wire marking.

1.2.2 SCOPE OF WORK IN GENERAL

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

1.2.2.2 Deployment of skilled / unskilled manpower, engineers / supervisors, Tools & Plants (T & P), Material handling equipments, Testing instruments, returning of un-used materials / items to BHEL stores.

1.2.2.3 The scope of specification covers the installation, testing and commissioning of the electrical equipments, hardware along with accessories as detailed in Bill of Quantity (BOQ)

1.2.2.4 If any item or equipment not covered in this tender but requires be erecting / commissioning, the same shall be carried out by the contractor. Equivalent unit rate for those item or equipment shall be considered wherever possible from the BOQ / rate schedule. The rates quoted by the contractor shall be uniform as far as possible for similar items appearing in rate schedule.

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- 1.2.2.5 Receipt of materials / component to be erected by the contractor, loading and transportation from the storage yard to the project site, stacking, storage and preservation.
- 1.2.2.6 Supply of consumables as per clause 1.3.6 & 2.2.1
- 1.2.2.7 Fabrication and installation of steel supports wherever required.
- 1.2.2.8 Supply of paints and painting of items covered in the scope of works.

Note to Chapter-II:

- 1. Detailed BOQ with detailed specification of various equipments and items are given in the VOLUME- IA PART-I CHAPTER-IX. The rate schedule is the summary of BOQ i.e. consolidated list of BOQ. Contractor shall go through the detailed BOQ with respective rate schedule Id no. and specification before filling the rate in the rate schedule.**

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

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CHAPTER – III FACILITIES IN THE SCOPE OF CONTRACTOR / BHEL (SCOPE MATRIX)

Sl.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.1.1	ESTABLISHMENT			
1.3.1.1.1	FOR CONSTRUCTION PURPOSE:			
1.3.1.1.1.1	Open space for office	Yes		
1.3.1.1.1.2	Open space for storage	Yes		
1.3.1.1.1.3	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
1.3.1.1.1.4	Bidder's all office equipments, office / store / canteen consumables		Yes	
1.3.1.1.1.5	Canteen facilities for the bidder's staff, supervisors and engineers etc		Yes	
1.3.1.1.1.6	Fire fighting equipments like buckets, extinguishers etc		Yes	
1.3.1.1.1.7	Fencing of storage area, office, canteen etc of the bidder		Yes	
1.3.1.1.2	FOR LIVING PURPOSES OF THE BIDDER			
1.3.1.1.2.1	Open space		Yes	
1.3.1.1.2.2	Living accommodation		Yes	
1.3.1.2	ELECTRICITY			
1.3.1.2.1	Electricity For construction purposes			
1.3.1.2.1.1	Single point source	Yes		Free
1.3.1.2.1.2	Further distribution for the work to be done which include supply of materials and execution		Yes	
1.3.1.2.2	Electricity for the office, stores, canteen etc of the bidder which include:		Yes	
1.3.1.2.2.1	Distribution from single point including supply of materials and service		Yes	
1.3.1.2.2.2	Supply, installation and connection of material of energy meter including operation and maintenance		Yes	
1.3.1.2.2.3	Duties and deposits including statutory clearances for the above		Yes	

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Sl.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.1.2.2.4	Living facilities for office use including charges		Yes	
1.3.1.2.2.5	Demobilization of the facilities after completion of works		Yes	
1.3.1.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc on the above lines.(in case BHEL provides this facility, the scope should be given without ambiguity)		Yes	
1.3.1.3.0	WATER SUPPLY			
1.3.1.3.1	For construction purposes:			
1.3.1.3.1.1	Making the water available at single point	Yes		Free
1.3.1.3.1.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	
1.3.1.3.2	Water supply for bidder's office, stores, canteen etc		Yes	
1.3.1.3.2.1	Making the water available at single point		Yes	
1.3.1.3.2.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	
1.3.1.4.0	LIGHTING			
1.3.1.4.1	For construction work (supply of all the necessary materials) At office storage area At the preassembly area At the construction site /area		Yes	
1.3.1.4.2	For construction work (Execution of the lighting work / arrangements) At office storage area At the preassembly area At the construction site /area		Yes	
1.3.1.5.0	COMMUNICATION FACILITIES for site operations of the bidder	-		
1.3.1.5.1	Telephone, Fax, internet, intranet, email etc		Yes	

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SI.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.2	ERECTION FACILITIES			
1.3.2.1.0	Engineering works for construction			
1.3.2.1.1	Providing the erection drawings for all the equipments covered under this scope		Yes	
1.3.2.1.2	Drawings for construction methods		Yes	In consultation with BHEL
1.3.2.1.3	As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	„
1.3.2.1.4	Shipping lists etc for reference and planning the activities		Yes	„
1.3.2.1.5	Preparation of site erection schedules and other input requirements		Yes	„
1.3.2.1.6	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments		Yes	
1.3.2.1.7	Weekly erection schedules based on SI No 1.3.2.1.5		Yes	
1.3.2.1.8	Daily erection / work plan based on SI No 1.3.2.1.7		Yes	For daily monitoring meeting at site
1.3.2.1.9	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	
1.3.2.1.10	Preparation of preassembly bay		Yes	
1.3.2.1.11	Laying of racks for gantry crane if provided by BHEL or brought by the contractor / bidder himself			Not applicable

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1.3.3 LAND FOR SITE OFFICE

- 1.3.3.1 To establish a temporary site office, fabrication yard and storage area at the job site, open space will be provided free of charges by BHEL. Contractor has to make his own arrangements for labour colony.
- 1.3.3.2 BHEL shall not provide to the contractor any residential accommodation to any of his staff and the contractor has to make his own arrangements.
- 1.3.3.3 Contractor has to furnish along with their offer, the details of requirements of area of space for his temporary site office, stores / storage shed.
- 1.3.3.4 Location and area requirement for office / storage sheds / fabrication yard shall be discussed and mutually agreed to.

1.3.4 CONSTRUCTION WATER

- 1.3.4.1 Water shall be provided by BHEL at one point at free of charges. However bidder shall arrange for further distribution at their cost.
- 1.3.4.2 No separate payment shall be made for any contingency arrangement made by contractor, due to delay / failure of water supply.

1.3.5 CONSTRUCTION POWER

- 1.3.5.1 Electricity for construction purpose (11 KV) shall be provided by BHEL at one single point at free of any charges. Further distribution of electricity shall be arranged by the contractor at his cost.
- 1.3.5.2 Any duty, deposit involved in getting the Electricity shall be borne by the bidder. As regards contractor's office shed also all such expenditure shall be borne by the contractor.
- 1.3.5.3 Provision of distribution of electrical power from the given single central common point to the required places with proper distribution boards, approved cables and cable laying including supply of all materials like cables, switch boards, pipes etc., observing the safety rules laid down by electrical authority of the State / BHEL / their customer with appropriate statutory requirements shall be the responsibility of the tenderer / contractor.
- 1.3.5.4 BHEL is not responsible for any loss or damage to the contractor's equipment as a result of variations in voltage / frequency or interruptions in power supply.
- 1.3.5.5 As there are bound to be interruptions in regular power supply, power cut / load shedding in any construction sites, suitable extension of time, if found necessary only be given and contractor is not entitled for any compensation. Contractor shall make his own arrangement for alternative source of power supply through deployment of adequate number of DG sets with consumables at their cost during the power breakdown / failure to get urgent and important

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work to go on without interruptions. No separate payment shall be made for this contingency.

1.3.5.6 Necessary "Capacitor Banks" to improve the Power factor to a minimum of 0.8 shall be provided by the contractor at his cost. Penalty if any levied by customer on this account will be recovered from contractor's bills.

1.3.6 MATERIALS / CONSUMABLES TO BE ARRANGED BY THE CONTRACTOR FOR ERECTION AND COMMISSIONING AS PART OF THE SCOPE WITHIN THE QUOTED RATE / PRICE

- i) All types of welding electrodes, filler wires, Gases
- ii) Provision for Temporary Scaffoldings.
- iii) Insulation tape.
- iv) Paints required for primer & final coating and for protective coating.
- v) Solder wire (Lead) - (60/40)
- vi) Protocol / Calibration report sheets as per BHEL Format.
- vii) Panel / JB sealing compound material (for cable entry from bottom / top of Panel).
- viii) Materials required for cable dressing (GI / aluminum flats, PVC cable ties etc).
- ix) PVC wire marker sleeves and Tag plates
- x) Lugs of size less than 50 sq mm.
- xi) Anchor fasteners for wall mounted cable trays / JB's.

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CHAPTER – IV

T&PS and MMEs TO BE DEPLOYED BY CONTRACTOR

1.4.1 The following minimum major (T&P) shall be deployed by the contractor for execution of this contract with in the quoted rate:

Sl. no	Description	Capacity	Minimum quantity
1	Oil filtering machine and tank	Minimum 1000 litres / hr	01

1.4.2 For loading and transportation, all necessary T&P such as Trailers, Cranes, Winches, welding generators, slings, jacks, sleepers, rails etc., are to be arranged by the contractor.

1.4.3 The contractor at his cost shall arrange all cranes and truck / tractor, trailers required for material handling purpose and also cranes required for erection.

1.4.4 All the tools & plants required for this scope of work are to be arranged by the contractor within the quoted rates. Necessary accessories for the tools & plants shall also be provided by the contractor.

1.4.5 **EQUIPMENT FOR TESTING & COMMISSIONING :**

The following testing equipment / T&P shall be brought to site by contractor in sufficient number to carry out the job simultaneously in more than one area.

- 1) Insulation tester:
 - a) Motorised megger - 0 - 1000 - 2000 - 5000V, 0 - 25000 M ohms
 - b) Hand operated megger - 0.5 KV/1.0 KV/2.5 KV, 200 - 100 M ohm
- 2) Earth resistance tester 0 to 1, 10, 100 ohms
- 3) Transformer oil test kit-Only if rate schedule includes oil filled transformers
- 4) Torque wrench
- 5) Voltmeter AC - 0 - 125 - 250 - 625 V
- 6) Ammeter AC - 0 - 2A - 10A .
- 7) Wattmeter – AC / DC - 0 - 125 - 250 V 0-5-10A.
- 8) Multimeter - analogue : AC -V 2.5V - 2500V,
AC- A - 100 mA - 10 A, 10A- 200A
DC- V 25.V - 2500V, DC- A - 50mA - 10A
Resistance - 0 - 200 M ohms
- 9) Multimeter -digital : Voltages AC & DC - 100mv - 1000 V
Current 10-mA - 10A
Resistance - 0-20 M ohms
- 10) High vacuum stream line oil filter of 1000 LPH for transformer dryout.
- 11) Variac - 1 /3 phase - 5A, 15A 3 phase - 10A, 20A.

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- 12) Primary injection kit - 0-5000 A.
- 13) Primary injection kit - 0-10000 A.
- 14) Secondary injection kit - 0-5A.
- 15) HV Test kit - 50 KV AC 400kVA.
- 16) Oscilloscope
- 17) Oil Tank for transformer oil filtration- Only if transformers are included in rate schedule
- 18) Vacuum cleaner.
- 19) Phase sequence meter - 110V - 450V - 25 to 65Hz.
- 20) Frequency meter - 0 - 115 - 230 - 4500 - 45 - 601/s.
- 21) Tong tester - 0 - 5A - 10A, 30A, 60A, 150A - 600A, 500A-1000A.
- 22) Tachometer etc.
- 23) mA Source
- 24) Temperature oil bath-If required
- 25) Oil specific gravity and PPM measuring equipment- Only if HV transformers are included in rate schedule
- 26) Contact resistance measurement kit
- 27) Micro ohm meter
- 28) Air blower

1.4.6 Equipments / T & P for Operation and Maintenance:

The following testing equipment / T&P shall be brought to site by contractor in sufficient number to carry out the job simultaneously in more than one area.

- 1) Insulation tester:
 - c) Motorised megger - 0 - 1000 - 2000 - 5000V, 0 - 25000 M ohms
 - d) Hand operated megger - 0.5 KV/1.0 KV/2.5 KV, 200 - 100 M ohm
- 2) Multimeter – Digital / analogue : AC -V 2.5V - 1000V,
AC- A - 100 mA - 10A, 10A- 200A
DC- V 25.V - 2500V,
DC- A - 50mA - 10A
Resistance - 0 - 200 M ohms
- 3) Vacuum cleaner
- 4) Phase sequence meter - 110V - 450V - 25 to 65Hz.
- 5) Tong tester - 0 - 5A - 10A, 30A, 60A, 150A - 600A, 500A-1000A.
- 6) Air blower
- 7) Tool box set

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ACCURACY REQUIREMENT OF TESTING INSTRUMENTS

Sl. No	INSTRUMENT / TOOL	RANGE	ACCURACY
1	Power Pack	0 to 50V DC, 3A	$\pm 2\%$
2	Analog Multimeter	Voltage 2.5 to 2500V AC	$\pm 1.0\%$
		Current 100 mA to 10A AC	$\pm 2.0\%$
		Current 250 micro A to 1A DC	$\pm 1.5\%$
		Resistance upto 100 ohms	$\pm 3.0\%$
		Voltage 2.5V to 2500V DC	$\pm 1\%$
3	Digital Multimeter	Voltage 200mV to 1000 V DC	$\pm 1\% + 1$ digit
		Voltage 200mV to 1000 V AC	$\pm 1\% + 1$ digit
		Current 200mA to 20 A AC	$\pm 0.8\% + 1$ digit
		Current 20 mA to 20 A AC	$\pm 0.8\% + 1$ digit
		Resistance 2120 200* to 200M*	$\pm 0.5\% + 1$ digit
		Resistance 2105 200* to 200M*	$\pm 0.25\% + 1$ digit
		Voltage 200mA to 750 V	$\pm 0.8\% + 1$ digit
		Current 20 mA to 20 A DC	$\pm 0.5\% + 1$ digit
5	Secondary Injection Kit	Upto 5A	$\pm 0.5\text{mA}$
6	Motor operated Megger	Upto 200 Ohms	$\pm 5\%$ at Centre scale
7	Tongue tester	0 / 300 / 600A AC	$\pm 5\%$
		0 to 300A DC	$\pm 5\%$
8	Tachometer (Hand held)	0 to 4000 rpm	$\pm 5\%$
9	Phase Sequence Meter		N/A
10	Three Phase Variac	15 A Capacity	N/A
11	Feeler gauges	300 mm long and 100 mm long	± 2 microns
12	Dial gauges	0 to 10mm	± 0.01 mm
13	Hand operated Megger 500V / 1000V	Upto 200 M Ohms	$\pm 5\%$ at Centre Scale
			$\pm 10\%$ at end of Scale
14	Motorised Megger 2.5 kV	Upto 1000 M Ohms	$\pm 5\%$ at Centre Scale
			$\pm 10\%$ at end of Scale
15	Motorised Megger 2.5 kV	Upto 200 M Ohms	$\pm 5\%$ at Centre Scale
			$\pm 10\%$ at end of Scale

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Sl. No	INSTRUMENT / TOOL	RANGE	ACCURACY
16	Earth Resistance tester (Megger)	0 to 1, 10, 100 Ohms	$\pm 5\%$ at Centre Scale range
17	AC tongue Tester	0 to 300A AC	$\pm 3\%$
18	DC Tongue Tester	0 to 300A DC	$\pm 5\%$
19	High Voltage test Kit	Upto 50 KV AC	$\pm 10\%$
		Upto 70 KV DC	$\pm 10\%$
20	Tacho Generator (Mech)	0 to 4000 rpm	$\pm 0.25\%$
21	DC Ammeter	0 to 300 A	$\pm 10\%$
22	DC Voltmeter	0 to 500 V	$\pm 10\%$
23	Micro ohm meter	10V and 100 V	
24	Primary Injection Kit	0-10000A	
25	Single Phase Variac	0-15 Amps	
26	Motor direction tester		
27	DC Tong Tester (mA)	0-500 mA	
28	Contact resistance tester for breaker contact resistance measurement		
29	Motorised Megger 5kV	10000 M ohms	

Notes for this chapter:

- a. List of T & Ps and testing equipments are for illustrative purpose only. Any other T & Ps and testing equipments required for successful completion of the scope off the contract shall also be arranged by the contractor within the quoted rate.
- b. The above instruments / equipment will be sent for testing and calibration wherever from time to time and maintained by contractor as required by BHEL.
- c. All testing instruments shall have calibration certificate issued by recognized / accredited agencies.
- d. List of such agencies and periodicity of calibration required for different instruments will be furnished by BHEL at site.
- e. Contractor shall maintain calibration records as per the BHEL format and produce them whenever called for by BHEL Engineers.
- f. Contractors shall arrange experienced / qualified persons for using these calibration instruments at laboratory and also at work spot.
- g. Wherever frequent calibration is required, contractor shall arrange adequate number of instruments such that the work does not suffer for want of test instruments.

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- h. PROTECTION / HANDLING OF TOOLS AND PLANT ARRANGED BY THE CONTRACTOR
- i) Equipment, vehicles, tools and plants and materials brought to site by the contractor from his resources shall have distinctive identification marks and the contractor shall intimate the description and quantity to BHEL in writing.
 - ii) All construction materials brought by the contractor shall have prior approval regarding quality and quantity by BHEL. The contractor shall also provide without extra cost necessary enclosures containers and protective materials for proper storage of materials inside, whenever so instructed by the purchaser without any extra cost.
 - iii) No material or equipment or tools etc. shall be taken out of the work-site without the written consent of BHEL.
 - iv) BHEL shall not be responsible for the safety and protection of the materials of the contractor and the contractor shall make his arrangements for proper watch and ward for his materials.

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CHAPTER - V

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

1.5.1 No T & P shall be supplied by BHEL

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CHAPTER-VI TIME SCHEDULE

1.6.1 TIME SCHEDULE

1.6.1.1 **Package A:** The entire work of erection testing and commissioning of all electrical components including Supply & Application of Final Painting, as detailed in the Tender Specification shall be completed within **4** months from the date of commencement of work at site.

1.6.1.2 **Package B:** The operation and maintenance period of the construction power distribution system shall be **36** months from the date of start of commencement of operation and maintenance.

1.6.1.3 During the total period of contract of package A, the contractor has to carry out the erection testing and commissioning activities in a phased manner as required by BHEL and the program of milestone events.

1.6.2 COMMENCEMENT OF CONTRACT PERIOD of package A

The date of commencement of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy the decision of BHEL engineer is final.

1.6.3 COMMENCEMENT OF CONTRACT PERIOD of package B

The date of commencement of contract period shall be the date of acceptance of the commissioning of the fourth substation by BHEL Engineer (meaning: Prior to this three substations should have been commissioned). In case of discrepancy the decision of BHEL engineer is final.

1.6.4 MOBILISATION FOR ERECTION, TESTING, COMMISSIONING ETC., of **Package A**

The activities for erection, testing etc shall be started as per directions of Construction manager of BHEL.

The contractor has to augment his resources in such a manner that following major milestones of erection & commission are achieved on specified schedules:

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Major milestones

Description	Milestone month for package A
Start of work (Expected)	Mar'2015
Completion of first four substations	2 months from start of work
Completion of next four substations	3 months from start of work
Completion of balance one No substations	4 months from start of work

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

1.6.5 MOBILISATION FOR Package B

The contractor has to provide the resources from the first day of commencement of contract period of package B

1.6.6 CONTRACT PERIOD FOR Package A

The contract period for completion of entire work under scope for Package A shall be **4 (four) months** from the "COMMENCEMENT OF CONTRACT PERIOD" as specified earlier.

1.6.7 CONTRACT PERIOD FOR Package B

The contract period for completion of entire work under scope for Package B shall be **36 (thirty six) months** from the "COMMENCEMENT OF CONTRACT PERIOD" as specified earlier.

1.6.8 GUARANTEE PERIOD FOR Package A

The guarantee period of twelve months shall commence from the date of acceptance of BHEL Engineer for start of operation and maintenance of the respective equipment.

1.6.9 GUARANTEE PERIOD FOR CONTRACTOR SUPPLIED ITEMS

The guarantee period of twelve months shall commence from the date of acceptance of BHEL Engineer for start of operation and maintenance (after commissioning).

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CHAPTER-VII TERMS OF PAYMENT

1.7.1 Terms of payment :

No advance payment will be made.

1.7.2 The progressive payment against monthly running bills for erection, testing and commissioning as per the percentage mentioned below on accepted rate / price of contract value will be released as mentioned below from Clause 1.7.2.1 to 1.7.2.7.2 on Pro rata basis.

Sl. No.	Activity / Work Description	% of unit rate
1.7.1	PRO RATA PAYMENTS	
1.7.2.1	Preparation of drawings and obtaining statutory clearances etc.	
1.7.2.1.1	On completion of preparation of drawings and obtaining approvals and statutory clearances etc.	85%
1.7.2.1.2	On submission and passing of final bill	5%
1.7.2.2	Supply of Materials	
1.7.2.2.1	On receipt of material, verification of documents and on acceptance at site on pro-rata basis	65%
1.7.2.2.2	On charging on pro-rata basis	20%
1.7.2.2.3	On completion of guarantee period of supply items	5%
1.7.2.4	Laying and termination of HT / LT cable	
1.7.2.4.1	On laying of cable	45%
1.7.2.4.2	Termination of cables with respective equipments	20%
1.7.2.4.3	Checking, fixing of cables, route marker and completion of HV test	25%
12.2.4	Laying of 33kV and 11kV O/H line	
12.2.4.1	On completion of line stringing	45%
12.2.4.2	On completion of completion of end connection	20%
12.2.4.3	On Charging	25%
1.7.2.5	Erection and Commissioning of Transformers/ Kiosks and other Hardware items	
1.7.2.5.1	Construction of foundation plinth for transformer, HT & LT panels	25%
1.7.2.5.2	Receipt, positioning, end termination of cables and earthing of equipments etc.	25%
1.7.2.5.3	Fencing, substation flooring, lighting and lightning poles erection etc., as applicable for each substation on prorata basis	20%

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Sl. No.	Activity / Work Description	% of unit rate
1.7.2.5.4	Testing, Commissioning and charging of each substation on prorata basis.	20%
1.7.2.6	Erection and testing of Pillar box	
1.7.2.6.1	On erection of pillar box	65%
1.7.2.6.2	On charging of pillar box	25%
1.7.2.7	Erection of any other item, not covered above, the terms of payment shall be as follows	
1.7.2.7.1	On Erection on pro rata basis	65%
1.7.2.7.2	On completion of work	25%

1.7.3 The balance 10 % will be payable six months after commissioning of respective system completion as certified by BHEL engineer

1.7.4 Payment for Package B - O&M portion- shall be payable on submission of monthly running Bills at the quoted / accepted monthly charges and as certified by BHEL engineer subject to standard deductions.

Note:

1. Recovery of Retention amount as per Cl. 2.22 of General Conditions of Contract. (Volume IC of Volume-I Book-II).
2. RA bill payments as per Chapter-X of Special Conditions of Contract (Volume IB of Volume-I Book-II).
3. Payment for the first running bill will be released only on production of the following. (Sl no i to iii at PSSR-HQ and balance at site)
 - i. Un Qualified Acceptance for Detailed L.O.I.
 - ii. Rs 100 /- Stamp Paper for Preparation of Contract agreement.
 - iii. Security Deposit as per General Conditions of Contract (Volume IC of Volume-I Book-II).
 - iv. PF Regn. No.
 - v. Labour License No.
 - vi. Workmen Insurance Policy No.

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CHAPTER – VIII TAXES AND OTHER DUTIES

1.8.0 TAXES

1.8.1 Value Added Tax (VAT) for the works

- 1.8.1.1 **Price quoted for Package A shall be inclusive of VAT and proof of remittance shall be submitted to BHEL.**
- 1.8.1.2 In civil works, as transfer of property in goods is involved, Works Contract Tax under VAT Act as applicable shall be included in the quoted price by you. You shall get registered with State VAT authorities and the Registration Certificate should be forwarded to BHEL immediately after commencement of work.
- 1.8.1.3 Deduction of VAT (WCT) at source would be enforced from the running bills at the rates prescribed unless exemption certificate is produced from the concerned authorities. Tax invoice if required under the relevant State VAT Law / or as required by BHEL, shall be submitted along with other compliances as per VAT Act.
- 1.8.1.4 The monthly/quarterly VAT return, duly incorporating the income from BHEL as turnover, should be submitted to BHEL at regular intervals with all annexure and details of payment of VAT (WCT).
- 1.8.1.5 Copy of the Assessment Orders under the State VAT Acts are also to be submitted to BHEL. If Assessment Orders are not forthcoming, then a Certificate of Tax paid for the project (year wise), from the concerned CTO, is to be submitted
- 1.8.1.6 You have to obtain VAT Clearance Certificate from the concerned authorities as per the provisions of local VAT act, on completion of the project and submit along with the final bill.
- 1.8.1.7 The bidder shall quote very competitive price after taking into consideration of above points.

1.8.2 Service Tax for PACKAGE A

- 1.8.2.1 Price quoted for **Package A** shall be **inclusive** of Service Tax. The service tax as statutorily leviable and payable by the bidder under the provisions of service tax Law / Act shall be paid by BHEL as per bidder claim through various running bills. The bidder shall furnish proof of service tax registration with Central Excise Department specifying the name of services covered under this contract. Registration Certificate should also bear the endorsement for the premises from where the billing shall be done by the bidder on BHEL for this project. The bidder shall obtain prior consent of BHEL before billing the service tax amount.
- 1.8.2.2 Service Tax as claimed by the Contractor shall be paid only on production of documentary evidence. Service Tax for the first running bill shall be released

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along with the bill. Service Tax on subsequent running bills shall be released only on submission of proof of remittance of the previous bill.

1.8.3 Service Tax for PACKAGE B

1.8.3.1 Price quoted shall be exclusive of Service Tax. The service tax as statutorily leviable and payable by the bidder under the provisions of service tax Law / Act shall be paid by BHEL as per bidder claim through various running bills. The bidder shall furnish proof of service tax registration with Central Excise Department specifying the name of services covered under this contract. Registration Certificate should also bear the endorsement for the premises from where the billing shall be done by the bidder on BHEL for this project. The bidder shall obtain prior consent of BHEL before billing the service tax amount.

1.8.3.2 Service Tax as claimed by the Contractor shall be paid only on production of documentary evidence. Service Tax for the 1st running bill shall be released along with the bill. Service Tax on subsequent running bills shall be released only on submission of proof of remittance of the previous bill.

1.8.3.0 Other Taxes & Levies

1.8.3.1 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.

1.8.4.0 New Levies / Taxes

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

1.8.5.0 Statutory variations

1.8.5.1 Statutory variations are applicable only in the cases of Value Added Tax and Service Tax. 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

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favour of BHEL. No other variations shall be allowed during the tenure of the contract.

1.8.6.0 **Direct Tax**

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

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CHAPTER – IX BILL OF QUANTITY (BOQ)

BILL OF QUANTITY CONTAINS DETAILED SPECIFICATION OF VARIOUS EQUIPMENTS AND ITEMS.

S.NO	PREPARATION OF DRAWING & OBTAINING STATUTORY APPROVAL	QTY	UNIT	RATE	TOTAL VALUE
PACKAGE A					
1.1	Route survey, Preparation of route drawing, detailed substation drawing, 33KV & 11KV distribution drawing, Two/Three pole structure /Four pole structure drawing and getting approval of above from statutory authority including sag and regulation calculation.	1	LUMP SUM		
1.2	Supply of 9.1 M long 280kg min working load pre-stressed cement concrete poles (PSCC) as per IS 1678 to withstand wind velocity of the project.	12	Nos		
1.3	Supply of 11KV GI stay (7/30.mm) sets with Guy, Bow, Stay Rod, wire etc. as per I.E. Specifications.	10	Nos		
1.4	Supply of 11 Mtr R.S. joist steel Poles- 127x114 and 29.6 Kg per Mtr and shall be supplied as per IS with min 280kg working load.	8	Nos		
1.5	Supply of 11KV disc insulator with fixing & conductor and holding clamp as per ISS 3188/1965 & IEC 309/1969/Latest .Vendor shall specify the make for which he is quoting and attach relevant IS certificates along with the bid	25	Nos		
1.6	Supply of 11KV pin insulator with pins as per ISS 2544/1963 AMD 125&IEC 168/1969 Latest .Vendor shall specify the make for which he is quoting and attach relevant IS certificates along with the bid.	30	Nos		
1.7	Supply of 11KV Air break switch -double break- horizontal rotating type as per ISS/IEC Spec No.4710/1968-265-C/1970/Latest.	9	Nos		
1.8	Supply of 11KV Lighting arrestor set (3 Nos. each) as per ISS/IEC Spec No. IS307/2-1985/Latest.	9	SETS(Each set contain 3Nos).		

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S.NO	PREPARATION OF DRAWING & OBTAINING STATUTORY APPROVAL	QTY	UNIT	RATE	TOTAL VALUE
1.9	Supply of 11KV HG fuse (3 Nos. each) set as per ISS/IEC Spec IS9385/Latest.	9	SETS(Each set contain 3Nos).		
1.1	Supply of 3C x185 sq.mm HT Outdoor termination kits for the HT cables as per ISS/IEC Spec. Vendor shall specify the make for which he is quoting and attach relevant IS certificates along with the bid.	12	SETS		
1.11	Supply of double compression type cable glands for 3 ½ x 185 Sq. mm LT cables as per IS Standards	10	Nos		
1.12	Supply of 65 x10 mm GI earth flat for earthing including supply of necessary fasteners as per IS standards wherever required.	150	Mtrs		
1.13	Supply of 25 x 5 mm GI earth flat for equipment earthing including supply of necessary fasteners as per IS standards wherever required	100	Mtrs		
1.14	Supply of ISMC-100 channel and ISMC-75, ISA 50 angles as per IS standards.	1.5	TON		
1.15	Supply of 14 SWG wire for earthing as per IS standards	150	Mtrs		
1.16	Supply of 25x3mm GI strip as per IS standards	150	Mtrs		
1.17	Supply of 3C x185 sq.mm HT indoor termination kits for the HT cables as per ISS/IEC Spec. Vendor shall specify the make for which he is quoting and attach relevant IS certificates along with the bid	16	SETS		
1.18	Supply of 11KV Piller box as per IS with one No. Incoming and two Nos out going including supply of HT Termination kits, earthing materials etc...	3	Nos		
2	YARD LIGHTING				
2.1	Supply of Swaged lighting Poles (MS) of 11m height, along with marshalling box and suitable fixing arrangements for non integral control gear box.	30	Nos		

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S.NO	PREPARATION OF DRAWING & OBTAINING STATUTORY APPROVAL	QTY	UNIT	RATE	TOTAL VALUE
2.2	Supply of Flood lighting fixtures of Compact, sturdy general purpose floodlight with Non integral control gear box, weather proof suitable high pressure Metal Halide lamp 400W. Vendor shall specify the make for which he is quoting along with the bid.	60	Nos		
2.3	Supply of 400W high pressure Metal Halide Lamp. Vendor shall specify the make for which he is quoting along with the bid.	60	Nos		
2.4	Supply of PVC insulated CU wire of 2.5sqmm size	1500	Mtrs		
2.5	Supply of 25 mm dia GI Pipe of medium class for below ground earthing.	90	Mtrs		
2.6	Supply of 50mm dia medium thickness GI pipe for incoming and outgoing cables.	90	Mtrs		
2.7	Supply of 100mm dia medium thickness GI pipes for make use of cable crossing where ever required such as existing culverts, trenches and road etc.	100	Mtrs		
2.8	Supply & Installation of Lighting distribution board (LDB)with one incomer with 200A TPN MCB and 3Nos out going feeders with 40A 4pole ELCB, 3 Nosout going feeders with 63 A TPN MCB's and 3 indicating lamps with fuse for indication bus supply ON, Timer & contactors(3 nos each), VOLT METER &VSS 0-500V etc. Including provision for two dummy space suitable for 4pole MCB. Sufficient space should be provided in the removable cable gland plate to accommodate the power cable and all outgoing cables from suitable connectors from each MCB / ELCB. Neutral link bar for incoming and outgoing neutrals.	1	Nos		

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S.NO	PREPARATION OF DRAWING & OBTAINING STATUTORY APPROVAL	QTY	UNIT	RATE	TOTAL VALUE
2.9	Supply & Installation of Lighting distribution board (LDB) with one incomer with 250A TPN CHANGE OVER SWITCH for EB supply & DG SET POWER SUPPLY and 5Nos out going feeders with 32 A TPN MCB's,3Nos out going feeder with 40A 4POLE ELCB and 5 Nos outgoing feeders with 63 A TPN MCB's,3 indicating lamps with fuse for indication bus supply ON, Timer & contactors(3 nos each),VOLT METER &VSS 0-500V etc... Including provision for two dummy space suitable for 4pole MCB. Sufficient space should be provided for the removable cable gland plate to accommodate the power cable and all outgoing cables from suitable connectors from each MCB / ELCB. Neutral link bar for incoming and outgoing neutrals.	1			
3	RATE SCHEDULE FOR ERECTION, TESTING & COMMISSIONING				
3.1	11/433KV-SKIDMOUNTED SUBSTATIONS.				
	Supply of materials as required and erection, testing & commissioning of 11KV/433V Mobile skid mounted type sub-station.				
	(A- Leveling of substation yard, supply and spreading of 40mm size stone aggregate of 75mm thick for an area of size 8 mtr. x 6 mtr, supply and construction of Brick work with cement mortar 1:6 of 230 mm thick and 450 mm height all round the substation yard, plastering the brick work in CM 1:6 etc,-	6	Nos		
	B- Supply and construction of stone masonry plinth for 500KVA SMSS size 4400 mm x 4400 mm x500 mm height from ground level and including excavation of plinth pit and base concreting and plastering, four corner lighting etc... as per the as per the instruction of BHEL site engineer.				

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	C- Supply and fixing of 3.15mm GI chain linked wire fencing height 2 M for the substation of size 8Mx6M including grouting of 3.0 Mtrs. height ISA 75 fabricated posts at an interval of 1.5M (2M vertical 0.5M slanting, 0.5M grouting) and three runs of barbed wire along with the fencing on the slanting angle post, fixing of mesh with post by 50x6mm MS flat with fasteners (2 Nos./ post) and earthing of fencing by 8 SWG GI wire and providing finish painting of all steel materials etc.				
	D- Supply and installation of 1M x 2M height MS gate made of rolled sections including supply and fixing of hinges, all drop, locking arrangement etc including providing finish painting etc .				
	E- Supply, erection of 3 Mtr. long earth electrode and filling the each pit with alternate layer of charcoal & salt as per IE specification and making of brick chamber, with both side plastering supply and fixing of man hole cover plate with RCC slab etc. complete as per IS 3043.Mim 5 Sets for each sub stations and earthing of total substation.				
3.2	11KV/433V SUBSTATIONS.				
	(CONVENTIONAL)				
	Supply of materials as required and erection, testing & commissioning of 11KV/433V conventional type sub-station with two pole structure.				
	(A- Leveling of substation yard, supply and spreading of 40mm size stone aggregate of 75mm thick for an area of size 10 mtr. x 8 mtr, supply and construction of Brick work with cement mortar 1:6 of 230 mm thick and 450 mm height1 all round the substation yard, plastering the brick work in CM 1:6 etc,-	3	Nos		
	B- Supply and construction of stone masonry plinth for 500KVA Transformer size 6' x 6'x 7' height from ground level and including excavation of plinth pit and base concreting and plastering, four corner lighting etc... as per the instruction of BHEL site engineer.				

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	C- Supply and fixing of 3.15mm GI chain linked wire fencing height 2 M for the substation of size 10Mx8M including grouting of 3.0 Mtrs. height ISA 75 fabricated posts at an interval of 1.5M (2M vertical 0.5M slanting, 0.5M grouting) and three runs of barbed wire along with the fencing on the slanting angle post, fixing of mesh with post by 50x6mm MS flat with fasteners (2 Nos./ post) and earthing of fencing by 8 SWG GI wire and providing finish painting of all steel materials etc.				
	D- Supply and installation of 1M x 2M height MS gate made of rolled sections including supply and fixing of hinges, all drop, locking arrangement etc including providing finish painting etc .				
	E- Supply, erection of 3 Mtr. long earth electrode and filling the each pit with alternate layer of charcoal & salt as per IE specification and making of brick chamber, with both side plastering supply and fixing of man hole cover plate with RCC slab etc. complete as per IS 3043.Mim 5 Sets for each sub stations. and earthing of total substation)				
	Note:				
	Supply and Erection cost of 11KV two pole structure within this fencing area is given in the rate contract Separately.				
	415 Volts LT kiosk				
	Erection of LT panel of size approx 1200x1000x2000 mm with necessary height from ground level including excavation of earth, plinth bit, base concreting and plastering etc, cast of foundations, grouting and including supply of cement, sand, Bricks, metal, grouting Bolts, earthing etc, as per the instructions of BHEL site Engineer.				
	Note: LT KIOSK only supplied by BHEL.				
3.3	Erection of 9.1 M long 280kg min working load pre-stressed cement concrete poles (PSCC) as per IS 1678 to withstand wind velocity of the project.	12	Nos		
3.4	Erection of 11KV GI stay (7/30.mm) sets with Guy, Bow, Stay Rod, wire etc. as per I.E. Specifications.	10	Nos		

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3.5	Erection of 11 Mtr R.S. joist steel Poles-127x114 and 29.6 Kg per Mtr and shall be supplied as per IS with min 280kg working load.	8	Nos		
3.6	Erection of 11KV disc insulator with fixing & conductor and holding clamp as per ISS 3188/1965 & IEC 309/1969/Latest .Vendor shall specify the make for which he is quoting and attach relevant IS certificates along with the bid	25	Nos		
3.7	Erection of 11KV pin insulator with pins as per ISS 2544/1963 AMD 125&IEC 168/1969 Latest .Vendor shall specify the make for which he is quoting and attach relevant IS certificates along with the bid.	30	No		
3.8	Erection of 11KV Air break switch -double break-horizontal rotating type as per ISS/IEC Spec No.4710/1968-265-C/1970/Latest.	9	Nos		
3.9	Erection of 11KV Lighting arrester set (3 Nos. each) as per ISS/IEC Spec No. IS307/2-1985/Latest.	9	SETS (Each set contain 3Nos).		
3.10	Erection of 11KV HG fuse (3 Nos. each) set as per ISS/IEC Spec IS9385/Latest.	9	SETS (Each set contain 3Nos).		
3.11	Erection of 3C x185 sq.mm HT Outdoor termination kits for the HT cables as per ISS/IEC Spec. Vendor shall specify the make for which he is quoting and attach relevant IS certificates along with the bid.	12	SETS		
3.12	Erection of Two pole structure with necessary Busbar arrangements, fasteners etc... as per ISS / IEC specification	2	Nos		
3.13	Erection of Three pole / Four pole structure with necessary Busbar arrangements, fasteners etc... as per ISS / IEC specification.	3	Nos		
3.14	Installation of Swaged lighting Poles (MS) of 11m height, along with non integral control gear box & marshalling box including foundation. The work also includes following a) Providing earth pit using of 25 mm dia with concrete of ratio 1:4:8 and including supply of cement, sand, metal etc.:	30	Nos		

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	b) Connection using 25 x 3 mm GI strip				
	c) Earthing of lamp fixtures with 14 SWG wire.				
	d) Installation of Flood lighting fixtures with high pressure Metal Halide lamps.				
	e) Associated CU wiring of 2.5 sq.mm size from fittings/ fixtures to JB's and control gear box.				
	f) Installation of 50mm dia. GI pipe as required for incoming and outgoing cables.				
3.15	Erection of 65 x10 mm GI earth flat for earthing including supply of necessary fasteners wherever required.	150	Mtrs		
3.16	Erection of 25 x 5 mm GI earth flat for equipment earthing including supply of necessary fasteners wherever required	100	Mtrs		
3.17	Fabrication of ISMC-100 channel and ISMC-75, ISA 50 angles.	1.5	TON		
3.18	Erection of 3C x185 sq.mm HT indoor termination kits for the HT cables as per ISS/IEC Spec. Vendor shall specify the make for which he is quoting and attach relevant IS certificates along with the bid	20	SETS		
3.19	Erection of 11KV Piller box as per IS with one No. Incoming and three Nos out going including supply of HT Termination kits, earthing materials etc...	3	Nos		
3.2	Erection of 100mm dia medium thickness GI pipes for make use of cable crossing where ever required such as existing culverts, trenches and road etc.	75	Mtrs		
3.21	Supply and fixing of Danger boards for poles & sub stations as per I.E. specification	30	Nos		
3.22	Supply and fixing of HT cable route marker 1 M length as per I.E. specifications.	75	Nos		
3.23	Supply and fixing of LT cable route marker 1 M length as per I.E. specifications.	30	Nos		
3.24	Excavation of earth for a depth of 1Mtr, laying & termination of HT cable of size 3CX 185 Sq.mm, Erection of double compression type cable glands and refilling the trench with already excavated earth material including supply and laying of standard sand, bricks etc..Cable only supplied by BHEL.	2600	Mtrs		

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3.25	Excavation of earth for a depth of 1Mtr, laying & termination of LT cable of size 3.5CX 185 Sq.mm and refilling the trench with already excavated earth material including supply and laying of standard sand, bricks etc..Cable only supplied by BHEL.	600	Mtrs		
3.26	Excavation of earth for a depth of 1Mtr, laying & termination of LT cable of size 3.5CX 25 Sq.mm and refilling the trench with already excavated earth material including supply and laying of standard sand, bricks etc..Cable only supplied by BHEL.	900	Mtrs		
3.27	Excavation of earth for a depth of 1Mtr, laying & termination of LT cable of size 4CX 16 Sq.mm and refilling the trench with already excavated earth material including supply and laying of standard sand, bricks etc..Cable only supplied by BHEL.	1500	Mtrs		

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PACKAGE B

S.NO	PREPARATION OF DRAWING & OBTAINING STATUTORY APPROVAL	QTY	UNIT	RATE	TOTAL VALUE
1	Operation and running maintenance including attending breakdown jobs for the entire Construction Power and yard lighting covered in the contract. Minimum manpower to be provided shall be 1 Electrician & 1 Helper with required T&P per shift for three shifts per day and One (1) Supervisor for day shift. The maintenance contract period will start after energizing of 4 Nos substations.	Months	36		

NOTE:

1. The above unit rate will be applicable for 6 more months beyond the O&M period of 36 months, If required by BHEL.
2. Supply of Consumables (Insulation tape, Grease and lubrication oil etc...) for the above is in the scope of the Bidder.
3. Cable repair work (cable joining) is included in the package B (O&M).
4. Necessary materials for package B will be issued by BHEL free of cost.
5. The Price bid contains the consolidated list of Rate schedule serial number with brief description of items.
6. Rates are to be filled only in the Price bid. Quoting of rates in any other form / formats will not be entertained.
7. Before filling the Rates in the Price bid, the bidder shall go through the detailed specification of all items of BOQ as well as Scope of Work as specified in relevant Clause of this document.
8. The quantity indicated in the BOQ / Price bid is approximate only and is liable for variation. Payment will be as per actual qty erected / commissioned as certified by BHEL Engineer.
9. Tenderers are requested to affix their company seal and authorised signature in all packages.

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10. LUMPSUM UNIT RATE

Unit rate to be quoted on lump sum basis shall include installation of all loose items which are not explicitly mentioned, but comes as part of the system, integration of total system and commissioning. No separate rate shall be payable for loose items. The quantities of loose supplied items are approximate only. No proportional rate will be applicable for any variation in quantity or for any additional items supplied as part of equipments.

11. Contractor shall maintain all the substations free of cost till completion and energizing of initial 4 Nos Substation.

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VOLUME-IA PART –I CHAPTER -X GENERAL

THE SCOPE OF THE WORK WILL COMPRISE OF BUT NOT LIMITED TO THE FOLLOWING:

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

1.10.1 In addition to the clause 2.8 of General Conditions of Contract (Volume-1C of Book-II) the contractor shall comply with the following.

1.10.1.1 BOCW Act & BOCW Welfare Cess Act

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

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

b) Inspector of Factories in respect of the project premises which is under the purview of State Govt.

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

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

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

1.10.1.2 PROVIDENT FUND & MINIMUM WAGES

1.10.1.2.1 The contractor is required to extent the benefit of Provident Fund to the labour employed by you in connection with this contract as per the Employees Provident Fund and Miscellaneous Provisions Act 1952. For due implementation of the same, you are hereby required to get yourself registered with the Provident Fund authorities for the purpose of

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reconciliation of PF dues and furnish to us the code number allotted to you by the Provident Fund authorities within one month from the date of issue of this letter of intent. In case you are exempted from such remittance an attested copy of authority for such exemption is to be furnished. Please note that in the event of your failure to comply with the provisions of said Act, if recoveries therefore are enforced from payments due to us by the customer or paid to statutory authorities by us, such amount will be recovered from payments due to you.

- 1.10.1.2.2 The contractor shall ensure the payments of minimum labour wages to the workmen under him as per the rules applicable from time to time in the state.
- 1.10.1.2.3 The final bill amount would be released only on production of clearance certificate from PF / ESI and labour authorities as applicable.

1.10.1.3 OTHER STATUTORY REQUIREMENTS

- 1.10.1.3.1 The Contractor shall submit a copy of Labour License obtained from the Licensing Officer (Form VI) u/r25 read with u/s 12 of Contract Labour (R&A) Act 1970 & rules and Valid WC Insurance copy or ESI Code (if applicable) and PF code no alongwith the first running bill.
- 1.10.1.3.2 The contractor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r78(1)(a)(1) of Contract Labour Rules, copies of monthly return of PF contribution with remittance Challans under Employees Provident Fund Act 1952 and copy of renewed WC Insurance policy or copies of monthly return of ESI contribution with Challans under ESI Act 1948 (if applicable) in respect of the workmen engaged by them.
- 1.10.1.3.3 The Contractor should ensure compliance of Sec 21 of Contract Labour (R&A) Act 1970 regarding responsibility for payment of Wages. In case of "Non-compliance of Sec 21 or non-payment of wages" to the workmen before the expiry of wage period by the contractor, BHEL will reserve its right to pay the workmen under the orders of Appropriate authority at the risk and cost of the Contractor.
- 1.10.1.3.4 The Contractor shall submit copies of Final Settlement statement of disbursal of retrenchment benefits on retrenchment of each workmen under I D Act 1948, copies of Form 6-A(Annual Return of PF Contribution) along with Copies of PF Contribution Card of each member under PF Act and copies of monthly return on ESI Contribution – Form 6 under ESI Act 1948 (If applicable) to BHEL along with the Final Bill.
- 1.10.1.3.5 In case of any dispute pending before the appropriate authority under I D act 1948, WC Act 1923 or ESI Act 1948 and PF Act 1952, BHEL reserve

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the right to hold such amounts from the final bills of the Contractor which will be released on submission of proof of settlement of issues from the appropriate authority under the act.

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

1.10.2 GENERAL

- 1.10.2.1 Identification of equipment at storage yard, technical assistance for checking and making the shortage/damage reports, taking delivery at storage yard and pre-assembly of equipment wherever required, erecting the equipment, aligning, fastening, supporting, cleaning, checking and carrying out statutory tests as required, trial operation, pre-commissioning, commissioning and post-commissioning activities up to the time of completion of commissioning activities along with the supply of all consumables, tools and tackles and testing instruments.
- 1.10.2.2 Scope of work covered under this specification requires quality workmanship, engineering and construction management. The contractor shall ensure timely completion of work. The contractor shall have adequate tools, measuring instruments, calibrating equipment etc. in his possession. He shall also have adequate trained, qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works.
- 1.10.2.3 It is not the intent to specify herein all details of material. Any item related this work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the work.
- 1.10.2.4 The contractor shall have valid **ELECTRICAL CONTRACTOR LICENSE**, as required to carry out the scope / job mentioned in the Bill of Quantity (BOQ).
- 1.10.2.5 Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations.
- 1.10.2.6 The contractor shall carry out testing, pre-commissioning, commissioning and trial run of the connected equipment under overall guidance of BHEL and shall locate any cause of malfunction and rectify the same for proper operation. Testing shall also include any additional tests, which the Engineer

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- feels necessary because of site conditions and also to meet system specification.
- 1.10.2.7 The work shall be executed under the usual conditions without affecting power plant construction and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
- 1.10.2.8 All the work shall be carried out as per instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.
- 1.10.2.9 Contractor shall erect all items / materials etc. as per sequence prescribed by BHEL at site. BHEL engineer depending upon the availability of materials / work fronts etc will decide the sequence of erection / commissioning methodology. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of erection / commissioning adopted in erection/commissioning of similar job or for any reasons whatsoever.
- 1.10.2.10 During the course of erection, testing and commissioning of electrical work, certain rework / modification / rectification / repairs / fabrication etc. may be necessary on account of feed back from other power stations and site operation / maintenance requirements. Contractor shall carryout such rework / modification / rectification / fabrication / repairs etc, promptly and expeditiously.
- 1.10.2.11 The contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be effected for such excess drawals at the rate prescribed by manufacturing units.
- 1.10.2.12 After completing all the works, contractor shall hand over all remaining extra materials with proper identification tags in a packed condition to BHEL stores. In case of any use over actual design requirements, BHEL reserves the right to recover the cost of material used in excess or misused. Decision of BHEL engineer in this regard will be final and binding on the contractor.
- 1.10.2.13 Contractor shall, transport all materials to site and unload at site / working area, or pre-assembly yard for inspection and checking. All material handling equipment required shall be arranged by the contractor.
- 1.10.2.14 The contractor must obtain the signature and permission of the security personnel of the customer for bringing any of their materials inside the site premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside.

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- 1.10.2.15 Contractor shall retain all T&P / Testing instrument / Material handling equipments etc at site as per advice of BHEL engineer and same shall be taken out from site only after getting the clearances from engineer in charge.
- 1.10.2.16 The contractor at his cost shall arrange necessary security measures for adequate protection of his machinery, equipment, tools, materials etc. BHEL shall not be responsible for any loss or damage to the contractor's construction equipment and materials. The contractor may consult the Engineer-in-Charge on the arrangements made for general site security for protection of his machinery equipment tools etc.
- 1.10.2.17 Wherever erection sequences are furnished by BHEL, the contractor shall follow the same sequence. If required by BHEL, the contractor shall change the sequence of his operation so that work on priority sectors can be completed within the projects schedule. The contractor shall afford maximum assistance to BHEL in this connection without causing delay to agreed completion date.
- 1.10.2.18 Any wrong erection shall be removed and re-erected promptly to comply with the design requirements to the satisfaction of Site Engineer.
- 1.10.2.19 Contractor has to work in close co-ordination with other erection agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less / more at a particular given time. Activities and erection program have to be planned in such a way that the milestones are achieved as per schedule / plans. Contractor shall arrange & augment the resources accordingly.
- 1.10.2.20 Contractor shall remove all scrap materials periodically generated from his working area in and around power station and collect the same at one place earmarked for the same. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect. All the package materials, including special transporting frames, etc. shall be returned to the BHEL stores / customer's stores by the contractor.
- 1.10.2.21 Contractor shall remove all scrap materials periodically generated from his working area in and around power station plant boundary area and collect the same at one place earmarked for the same by BHEL. Failure to collect the scrap is likely to lead to accidents and BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if the contractor fails to clear the scraps. All the package materials, including special transporting frames, etc. shall be returned to the BHEL stores / customer's stores by the contractor.

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- 1.10.2.22 The contractor is strictly prohibited from using BHEL's regular components like angles, channels, beams, plates, pipe / tubes, and handrails etc for any temporary supporting or scaffolding works. Contractor shall arrange himself all such materials. In case of such misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor.
- 1.10.2.23 No member of the already erected structure / platform, pipes, grills, platform, other component and auxiliaries should be cut without specific approval of BHEL engineer.
- 1.10.2.24 Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on ISO 9001 – 2008 Standards.
- 1.10.2.25 For other agencies, such as piping, Boiler, ESP, instrumentation, insulator etc., to commence their work from / on the equipments coming under this scope, Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer. Some time it may be required to re-schedule the activities to enable other agencies to commence / continue the work so as to keep the over all project schedule.
- 1.10.2.26 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.
- 1.10.2.27 Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.
- 1.10.2.28 On Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.
- 1.10.2.29 Prior to erection of any components inspection to be done for any foreign materials and damages and they are to be attended as per directions of BHEL engineer.
- 1.10.2.30 It is the responsibility of the contractor to do the alignment, checking, etc. if necessary, repeatedly to satisfy BHEL Engineer / Customer Engineers with all the necessary tools and tackles, manpower etc. without any extra cost. The alignment will be completed only when jointly certified so, by the BHEL Engineer & Customer. Also the contractor should ensure that the alignment is not disturbed afterwards.
- 1.10.2.31 If any item or equipment not covered but requires being erected / commissioned, same shall be carried out by the contractor. Equivalent or

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proportional unit rate shall be considered wherever possible from the BOQ. The rates quoted by the contractor shall be uniform as far as possible for similar items appearing in rate schedule.

- 1.10.2.32 The contractor shall ensure that his premises are always kept clean and tidy to the extent possible. Any untidiness noted on the part of the contractor shall be brought to the attention of the contractor's site representative who shall take immediate action to clean the surroundings to the satisfaction of the Engineer-in-Charge.
- 1.10.2.33 The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances. The contractor shall co-operate with other contractors and agencies so that various activities can be carried out simultaneously in order to achieve an early completion.
- 1.10.2.34 Scope of work covered under this specification requires quality workmanship, engineering and construction management. The contractor shall ensure timely completion of work. The contractor shall have adequate tools, testing / calibrating equipments, etc and also adequate trained, qualified and experienced engineers, supervisory staff and skilled personnel.
- 1.10.2.35 All the necessary certificates and licenses required to carry out this scope of work are to be arranged by the contractor then and there at no extra cost. Also refer clause - ELECTRICAL INSPECTORATE'S APPROVAL- given below:
- 1.10.2.36 ELECTRICAL INSPECTORATE'S APPROVAL:**
- 1.10.2.36.1 Also refer clause 1.13.1 of chapter XIII in Technical Conditions of Contract, Volume I Book I for approval of Electrical drawings.
- 1.10.2.36.2 The contractor shall arrange necessary statutory inspections and obtain certificates for the installation work at his cost. Contractor is responsible for getting Electrical Inspector / statutory authority's approval for all electrical installation covered in his scope.
- 1.10.2.36.3 All electrical installation covered in contractors scope is to be inspected / approved by the electrical inspector / statutory authority. For getting electrical inspector approval, contractor shall arrange the following:
- a. Work Completion certificate for all the equipment covered in the contract.
 - b. Details of Equipments (specification)
 - c. Copy of Test results conducted at site for all the equipment including Electrical Equipment erected by Mechanical Contractor.
 - d. Any other documents as required by statutory authority. Any expenditure related to documentation shall be borne by contractor.

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- e. Contractor shall carry out the modifications / rectifications if any as suggested by the authority at his cost. However, it is not applicable for equipment erected by Mechanical contractor.
- f. Contractor shall also have valid electrical installation license on his company as well as for individuals acceptable to respective state electrical inspectorate requirement.

1.10.2.36.4 Any modification work required by inspector shall be attended by the contractor.

1.10.2.37 SITE INSPECTION

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

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

Wherever the performance of work by the contractor is not satisfactory in respect of workmanship, deployment of sufficient labour or equipment, delay in execution of work or any other matter, BHEL shall have the right to engage labour at normal ruling rates and get the work executed through other agency and debit the cost to the contractor and the contractor shall have no right to claim compensation thereof. In such a case, BHEL shall have the right to utilize the materials and tools brought by the contractors for the same work.

1.10.2.38 MANPOWER REQUIREMENT

1.10.2.38.1 The contractor shall provide to the satisfaction of BHEL, sufficient and qualified staff for the execution of works. If and whenever any of the contractor's staff is found guilty of any misconduct or be incompetent or insufficiently qualified in the performance of his duties the contractor shall remove them from site as directed by Site Engineer.

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- 1.10.2.38.2 Supervisor should have a minimum qualification of Diploma in Engineering or any graduate with minimum 05 years of experience in Thermal Power Station.
- 1.10.2.38.3 Safety Engineers should have experience in construction field especially in power plant.
- 1.10.2.38.4 The Site in charge shall be provided with PCs and good communication facilities like telephone, fax, email etc. at the cost and expense of the contractor. Lack of communication facilities will not be an excuse for extension of completion date.
- 1.10.2.38.5 All instructions from BHEL / Customer will be directed to the contractor through the Site in-charge and he shall be responsible for all the contractor's activities at site. The contractor shall name his authorized representative prior to or immediately on commencement of operations at site
- 1.10.2.38.6 The Site In charge shall be present at site during all normal working hours and his contact address after normal working hours shall be made available to BHEL so that if any emergency arises, the presence of the contractor's site Representative at site can be called for.
- 1.10.2.38.7 The contractor shall not change the site Representative without the consent of BHEL. Should BHEL require the replacement of the contractor's site Representative for justifiable reasons (including inadequate progress of work) the contractor shall ensure that replacement is made as soon as possible and work is not allowed suffering delay on this account.
- 1.10.2.38.8 The contractor shall ensure that all his supervisor's staff and workmen conduct themselves in a proper manner. They shall all be persons who are familiar with and skilled at the jobs allocated to them. Any misconduct / inefficiency noted on the part of the contractor's personnel shall be brought to the attention of the contractor's site representative who shall immediately take such action as necessary including the removal of such misconducting / inefficient persons, if so required by the Engineer-in-Charge.
- 1.10.2.39 DOCUMENTATION
- 1.10.2.39.1 The following information shall be furnished by the bidder within two weeks of award of contract for purchaser's approval
- a) Bar chart covering planned activities at site
 - b) Detailed organization chart
 - c) Details of T&P available with contractors with documents proofs.

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1.10.2.39.2 The following information shall be furnished by the bidder after testing and inspection:

Test certificates of various tests conducted at site. All inspection and test certificates shall be signed by customer's representative also, wherever called for as per field quality plan.

1.10.2.39.3 As built drawings:

After successful completion, testing and commissioning of installation work, Purchaser's drawings / documents shall be updated in line with the actual work carried out and as built drawings / documents shall be submitted by the contractor as agreed for the project.

1.10.2.39.4 Other documents as specified in VOLUME-IA PART- II CHAPTER-XIV

1.10.2.40 VOLUME-IA PART- II CHAPTER-5 of this booklet contains general guidelines for Erection and Commissioning of Electrical systems.

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VOLUME-IA PART –I CHAPTER -XI FOUNDATIONS AND GROUTING

THE SCOPE OF THE WORKS WILL COMPRISE OF BUT NOT LIMITED TO THE FOLLOWING:

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

- 1.11.1 Foundation for the equipments to be erected shall be in scope of the contractor.
- 1.11.2 Cleaning of foundation surfaces, pocket holes and anchor bolt pits etc., de-watering, making them free of oil, grease, sand and other foreign materials by soda wash, water wash, compressed air or any other approved methods etc., form / shuttering work are within the scope this work.
- 1.11.3 The surface of foundations shall be dressed to bring the surface of the foundations to the required level and smoothness prior to placement of equipments.
- 1.11.4 Foundation pockets are to be cleaned thoroughly before placing the columns / equipments. Verticality of foundation bolts to be checked along with correctness of the threads and freeness of the nuts movement. If required cleaning of the threads to be done with proper dies.
- 1.11.5 The concrete foundation, surfaces shall be properly prepared by chipping, as required to bring the top of such foundation to the required level to provide the necessary roughness for bondage and to ensure enough bearing strength. All laitance and surface film shall be removed and cleaned. The required percentage contact between contact surfaces of Packer plates and foundation shall be achieved by chipping and scrapping as per BHEL Engineers instructions.
- 1.11.6 For grouting of equipments necessary cement, sand, gravels etc to be arranged by the contractor including the fine aggregates.
- 1.11.7 **PROCEDURE FOR GROUTING :**
Contractor has to carryout the grouting as per the work instructions for grouting available at site.

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VOLUME-IA PART –I CHAPTER -XII MATERIAL HANDLING AND SITE STORAGE

THE SCOPE OF THE WORKS WILL COMPRISE OF BUT NOT LIMITED TO THE FOLLOWING:

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

1.12.1 SCOPE OF STORAGE / TRANSPORT OF CONTRACTOR SUPPLIED ITEMS

1.12.1.1 Contractor shall also make his own arrangement for transporting the materials to site. Necessary material handling equipment for transporting to site/ stores and also for taking delivery from stores to work place shall be arranged at his cost.

1.12.1.2 Any excess materials supplied for which payment has not been made can be taken back by the contractor as per customer procedure. Incoming material gate pass shall be made for any material supplied by the contractor.

1.12.1.3 Contractor shall unload, transport, store, erect, test and commission the equipment as per instructions of the manufacturer recommendation.

1.12.1.4 Contractor shall be responsible for examining all the shipment immediately for any damage, shortage, discrepancy etc. for the purpose of Purchaser's information only. However, the Contractor shall be solely responsible for any shortages or damages in transit, handling and/or in storage and erection of the equipment at Site.

1.12.2 COLLECTION OF BHEL SCOPE OF SUPPLY MATERIALS

1.12.2.1 Contractor shall take delivery of BHEL supplied materials from the / stores storage yard / sheds of BHEL / customer, which is within the plant premises after getting approval of engineer / customer in the prescribed indent forms of BHEL / customer. He shall also make arrangements for safe custody, watch and ward of equipment after it has been handed over to him till they are fully erected / commissioned. The contractor shall transport materials to erection site by the prescribed route without disturbing and damaging the other's works in the most professional manner and materials shall be stored in appropriate manner as per BHEL's instructions.

1.12.2.2 Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment placement on respective foundation / location, fabrication yard, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipments from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks /

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slings / tools and tackles / labour including operators Fuel lubricants etc for loading & unloading of materials will be in the scope of contractor.

- 1.12.2.3 BHEL shall issue materials covered in BHEL scope from their stores at site. The contractor shall collect such materials from BHEL stores and transport to site of work at his cost.
- 1.12.2.4 The equipments / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.
- 1.12.2.5 The contractor shall inspect such materials as soon as received by the contractor and shall bring to the attention of the Engineer-in-Charge any shortage / damage or other defects noticed before taking over the materials. Materials once taken over will be deemed to have been received in good condition and in correct quantities except for intrinsic defects which cannot be observed by visual and dimensional inspection and weighing.
- 1.12.2.6 Upon receipt by the contractor the responsibility for any loss, damage and / or misuse of such materials shall rest with the contractor.
- 1.12.2.7 All materials issued by BHEL shall be properly stored and systematic records of receipts, issue and disposal will be maintained. Periodic inventory shall be made available to BHEL Engineer-in-Charge.
- 1.12.2.8 All materials issued by BHEL shall be utilized as directed by Engineer-in-Charge or most economically in the absence of such direction. The contractor shall be responsible for the return to BHEL Stores of all surplus material, as determined by the Engineer-in-Charge.
- 1.12.2.9 If the materials issued by BHEL are lost, damaged or unaccounted, the cost of such items shall be recovered from payments to the contractor. However, the contractor shall raise FIR and inform BHEL all details.
- 1.12.2.10 Sometimes it may become necessary for the contractor to handle certain unrequired components at Customer's / BHEL's stores in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.

1.12.3 STORAGE

- 1.12.3.1 The contractor shall provide any fixtures, concrete blocks & wooden sleepers, which are required for temporary supporting / storage of the components at site.

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- 1.12.3.2 The equipment should be preferably in its original package and should not be unpacked until it absolutely necessary for its installation. The equipment should be best protected in its cases. It should be arranged away from walls.
- 1.12.3.3 The wooden pallet provided for packing itself can be retained for raised platform to protect equipment from ground damp, sinking into ground and to circulate air under the stored equipment. This will also help in lifting the packing with fork lift truck.
- 1.12.3.4 Periodic inspection of silica gel placed inside the equipment is necessary. It has to be replaced when decolonization takes place or regenerated. BHEL shall supply the material and contractor shall replace.
- 1.12.3.5 Due care should be taken to ensure that the equipment is not exposed to fumes gases etc. which can affect electrical contacts of relays and terminal boards.
- 1.12.3.6 The storage room and the equipment should be checked at regular interval of three months to ensure protection from termites, mould growth, condensation of water etc. which can damage the equipment.
- 1.12.3.7 Contractor shall keep BHEL informed about such problem and try to rectify the problem at his risk and cost.
- 1.12.3.8 All the instrument, materials and goods kept in the store room should be identified and registered in a book. Inspection report should be recorded. Any discrepancy observed should be communicated to site.
- 1.12.3.9 The loose items supplied for the main equipment falls into various categories like tools, modules, prefabricated cables, console inserts, recorders, modules and display units, printers, sensors and transducers, PCs, monitors, cable glands, cable ducts, frames etc. are to be categorized and stored separately.
- 1.12.4 **Sub-Assemblies**
- a) All sub-assemblies should be kept in a separate place where it is easily accessible.
 - b) Sub-assemblies should have a protective cover in case it is stored without wooden packing / case to prevent accumulation of dust. Silica gel packets should also be kept along with it.
 - c) Sub-assemblies should not be stacked one above the other.
- 1.12.10 Materials shall be stacked neatly, preserved and stored in the contractor's shed / work area in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work area / site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.

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VOL – I A PART – 1 CHAPTER – XIII SCOPE OF SUPPLY AND ERECTION - DETAILED

1.14.1 SCOPE OF ROUTE SURVEY LAYOUT AND DETAILED DRAWINGS

The drawings provided along with the tender are only schematic, typical and tentative. The contractor shall prepare final detailed drawings in consultation with site engineers after carrying out the route survey for underground distribution. These drawings shall be prepared in accordance with IE-Rules and have to be approved by the electrical statutory authorities. Obtaining approval from statutory authority shall be the responsibility of the contractor and any expenditure involved in getting approval from statutory authority for the drawings and documents generated by the contractor shall be borne by the contractor. Based on the detailed drawings, contractor shall procure/ fabricate, install all construction power supply equipments as required and erect as per drawing. After CEA if any modification/correction is required in line with applicable IE standards the same has to be done by vendor. However the material as required will be provided by BHEL with the approval of site incharge.

1.14.2 SCOPE OF SUPPLY

- 1.14.2.1 Scope of supply of materials shall be as detailed in the BOQ. All materials shall be procured from reputed manufacturers as per IS specification. Bidder shall ensure technical compliance for supply and erection to ensure trouble-free operation. Necessary test certificates, guarantee certificate etc. shall be submitted to BHEL along with supply.
- 1.14.2.2 The quantities furnished in the BOQ for supply items are approximate only. Contractor shall assess the quantity of supply items after conducting route survey, which is part of this contract and also taking in to consideration the materials supplied by BHEL. If suitable materials are available with BHEL, the quantity of supply items shall be reduced accordingly. The payment for erection of BHEL supply items shall be as per rate quoted for erection.
- 1.14.2.3 The quantity to be supplied shall be strictly as per site requirement only in consultation with Engineer-in-Charge. Before starting erection, the contractor shall get all the supply items in his scope verified by BHEL and also get necessary endorsement from BHEL Stores. BHEL's endorsement or Store Receipt Voucher (SRV) shall be submitted along with bills for payment of Supply items. After BHEL verification, material shall be kept under contractor's custody.

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1.14.3 SCOPE OF ERECTION

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

- 1.14.3.1 The scope of “Construction Power Supply Package” work includes engineering, procurement, identification of equipment at BHEL storage yard, technical assistance for checking and making the shortage / damage reports, taking delivery at storage yard, erecting, and carrying out statutory tests as required, commissioning and maintenance of the equipments erected till contract period using their tools and tackles and testing instruments along with the supply of all consumables.
- 1.14.3.2 It is not the intent to specify herein all details of equipment and materials. Any item of work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the job.
- 1.14.3.3 The scope of specification covers the installation, testing and commissioning of the erected equipment / instrument along with accessories as detailed in Bill of Quantity.
- 1.14.3.4 Site testing shall be carried out for all electrical equipment installed by the contractor to ensure proper installation and functioning in accordance with drawings specifications and manufacturer’s recommendations.
- 1.14.3.5 All the work shall be carried out as per instructions of BHEL engineer. BHEL engineer’s decision regarding the correctness of the work and method of working shall be final and binding on the contractor.
- 1.14.3.6 Contractor shall erect all items, equipments etc. as per sequence prescribed by BHEL at site. BHEL engineer depending upon the availability of materials at site will decide the priority of erection requirements & methodology. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the usual methods of erection adopted in erection / commissioning of similar jobs.
- 1.14.3.7 During the course of erection, testing and commissioning of construction power supply work, certain rework or modification may be necessary on account of feedback from other construction sites or on account of site maintenance requirements. The contractor shall carry out such rework / modification expeditiously and the same shall be deemed to be part of the scope of work.
- 1.14.3.8 Removal of rank vegetation, grass, brushwood, etc. (if any), backfilling & levelling of ground required for execution of work within the scope of this contract shall be deemed to be part of the scope of work.

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1.14.3.9 SCOPE OF 500 KVA, 11KV/433 V SUB –STATIONS

Two types of sub station will be erected- Conventional Type two numbers and Skid mounted mobile type substations seven numbers.

1.14.3.9.1 Conventional Type substations – 3 Nos

1) Scope of BHEL supply items for each Conventional Type Substation as free issue shall be as below:

- a. 11 KV/433 V -500 KVA Transformers (oil filled) – 1 No
- b. LT Kiosks – 1 No
- c. HT & LT Power cables – required quantity
- d. Steel materials for fabrication (for base frame only) - required quantity
- e. HT Kiosks – 1 No

2) Contractor scope of work for each 11 KV/ 433 V substation approximate size (L)15500 X (B)7500 X (D)3050

- a. Preparation of detailed drawing of 11KV/433 V substation layout
- b. Vetting of drawings & documents by BHEL
- c. Supply and installation Earth Pits – 6 Nos
- d. Supply and Installation lightning poles and spikes – 2 Nos
- e. Supply and installation of Earthing materials as required for Substation
- f. Supply and installation of Lighting poles, fixture and hardware- 4 sets
- g. Supply installation of safety boards – 2 sets.
- h. Installation of BHEL supplied free issue materials as mentioned under above clause
- i. All civil works like PCC pavement, construction of foundation for Transformer and Kiosks, fencing & gate and supply of required materials for civil works including supply and installation of fencing & gate etc as detailed in the technical conditions of Contract clauses and drawing enclosed.
- j. Laying and termination of HT/LT cables including supply of cable glands, lugs, etc as required.
- k. Supply and installation of HT Termination kits.

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- l. Obtaining approval of entire installation from appropriate statutory authority.
- m. Commissioning of Substations.
- n. Lump sum rate shall be quoted for erection of 11 KV/433 V Substation which shall cover all the works including supply as mentioned above and elsewhere in the contract.

1.14.3.9.2 **SKID mounted mobile type substations – 6 Nos**

1. Scope of BHEL supply items for each SKID mounted mobile type Substation as free issue shall be as below:
 - a) 11 KV/433 V- 500 KVA Skid mounted mobile Substation.
 - Each substation shall have approximate size of (L)2800 X (B)2430 X (H) 2350 and weight of 05 MT.
 - This substation shall be an single unit consisting 11 KV VCB, Dry Type 500 KVA Transformer, LT Board with all protection circuits.
2. Contractor scope of work for each Skid mounted mobile type substations.
 - a. Preparation of details drawing of 11KV/433 V substation layout
 - b. Vetting of drawings & documents by BHEL.
 - c. Supply and installation Earth Pits – 4 Nos
 - d. Supply and installation lightning poles and spikes – 2 Nos
 - e. Supply and Installation of Earthing materials as required for Substation
 - f. Supply and installation of Lighting Poles, fixture and hardware – 4 sets
 - g. Supply installation of safety boards – 2 sets
 - h. Installation of BHEL supplied free issue materials as mentioned under above clause.
 - i. All civil works like arranging Block foundation of suitable size, fencing & gate and supply of required materials for civil works, including Supply and installation of fencing & gate etc as detailed in the technical requirement Clause.
 - j. Obtaining approval of entire installation from appropriate statutory authority
 - k. Supply and Installation of HT termination kits approximately 3 sets for 3CX185 sqmm HT cable.

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I. Commissioning of Substations.

m. **Lump sum rate shall be quoted for 11 KV/433V Skid mounted mobile type substations which cover all the works including supply as mentioned above and elsewhere in the contract.**

1.14.3.9.3 SCOPE OF SUB STATION YARD LEVELING AND FENCING

1) After conducting route survey and identifying sub station location, the yard shall be leveled suitably. Necessary, PCC pavement, fencing, construction of foundation for kiosks and Transformer, plinth wall, etc. shall be carried out by the contractor. The supply of materials required for the above civil works shall be arranged by the contractor. Above works shall be carried out as per priority decided by site Engineers and the works shall be as per Indian electricity rules & regulation.

2) **No separate unit rate shall be paid for the substation yard leveling and fencing which shall be part of 11 KV/433V substation works.**

1.14.3.9.4 SCOPE OF ERECTION OF 500 KVA – ONAN TRANSFORMER

1) 500 KVA, 11/0.433 KV ONAN transformers will be supplied by BHEL that may be new or diverted from other sites and the same shall be drawn from BHEL –stores or yard and transported to the required location. The contractor shall make his own arrangements for loading the transformers from BHEL- Stores and unloading the same at the specified location. T& P and other materials required for loading and unloading the transformers shall be arranged by the contractor. All grouting material shall be arranged by contractors.

2) Old Transformer (diverted Transformer) shall be checked up thoroughly and if any items are found to be damaged and requires replacement, the same shall be carried out by the contractor at free of cost. However replacement materials shall be arranged by BHEL including Transformer oil.

3) All BHEL transformers will be supplied in oil filled and assembled conditions. Oil filtration shall be carried out by the contractor for all the transformers supplied by BHEL.

4) Contractor shall make his own arrangement for unloading, storing of Transformers.

5) All testing instrument such as megger, multimeter, oil test kit, oil-filtering machine, H.V test kit shall be arranged by the contractor to carry out the checking of the transformer. Oil filtration shall be carried out by the contractor till achieving the Dielectric strength as stipulated, other tests like insulation resistance and earth resistance checks, Dielectric strength

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test of oil before filling, Bucholtz relay test and phase sequence test shall be carried out by the contractor. After completing all the works, full painting shall be carried out for all the transformers.

6) No separate unit rate shall be paid for the erection of Transformers which shall be part of 11 KV/433 V sub station works.

1.14.3.9.5 SCOPE OF ERECTION OF L.T. KIOSK & 11 KV CB (HT KIOSK)

- 1) LT Kiosk will be supplied by BHEL, which may be diverted from other sites and the same shall be drawn from BHEL stores and transported to the required location. The contractor shall make his own arrangements for loading the L.T Kiosk from BHEL- Stores and unloading the same at the specified location. The contractor shall arrange necessary T&P and other materials required for loading and unloading. Necessary civil foundation including supply of materials shall be arranged by the contractor before erecting the L.T Kiosk as part of Kiosk erection.
- 2) If any loose items supplied along with L.T Kiosks are required to be mounted, the same shall be carried out by the contractor at free of charge.
- 3) Kiosk shall be checked up thoroughly and if any items are found to be damaged / defective / not working and requires replacement or any internal wiring to be modified, the same shall be carried out by the contractor at the free of cost. However replacement materials shall be arranged by BHEL.
- 4) Erection of LT Kiosks shall cover all the works mentioned above including full painting. The base frames shall normally be supplied along with the kiosks. These shall be aligned, leveled and grouted in position, as per approved drawings. Wherever the base channels are not available, the same shall be fabricated and painted by the contractor within the quoted rate. However required steel materials shall be arranged by BHEL with the approval of Site In-charge/BHEL. Base channels shall be grouted on the foundation.
- 5) 11 KV CB (HT KIOSK) shall be erected in line with LT Kiosk
- 6) Contractor shall carry out full painting for LT Kiosks and 11 KV CB (HT KIOSK)
- 7) LT Kiosk and 11 KV outdoor CB (HT KIOSK) shall be checked thoroughly and before charging. Contractor shall carry out checking of Breaker operation, FS unit operation, Bus bar clearances, earth resistance and protection checks etc. After the satisfactory completion of these checks,

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the LT Kiosk and 11 KV CB shall be energized. The contractor shall arrange all instruments required for testing at his cost.

- 8) No separate unit rate shall be paid for the erection of HT/LT kiosk which shall be part of 11 KV/433 V sub station works.**

1.14.3.9.6 **SCOPE OF SUPPLY AND INSTALLATION OF SIGN BOARDS AND SAFETY MEASURES**

- 1) All required signboards, caution boards and safety boards shall be arranged and installed by the contractor in all poles and sub-stations wherever required. Feeder description and line description shall be displayed at vital locations. Foremost importance shall be given to Safety, and the contractor shall adhere to safety instructions and ensure use of safety appliances, as required. The contractor shall provide all safety equipments to his workmen to avoid accidents.
- 2) No separate unit rate shall be paid for the supply and erection of sign board which are to be laid with in the sub station and that shall be part 11 KV/ 433 V sub station works.**

1.14.3.9.7 **SCOPE OF SKID MOUNTED MOBILE TYPE SUBSTATION**

- 1) Skid mounted mobile type substations will be supplied by BHEL. And the same shall be drawn from BHEL stores and transported to the required location. The contractor shall make his own arrangements for loading the Skid mounted mobile substations from BHEL- Stores and unloading the same at the specified location. The contractor shall arrange necessary T&P and other materials required for loading and unloading. Necessary civil foundation including supply of materials shall be arranged by the contractor before erecting the Skid mounted mobile substations.
- 2) If any loose items supplied along with Skid mounted mobile substations that are required to be mounted, the same shall be carried out by the contractor at free of charge.
- 3) The base framed shall normally be supplied along with the SMSS. These shall be aligned, leveled and grouted in position, as per approved drawings. Wherever the base channels are not available, the same shall be fabricated and painted shall be carried out by the contractor at free of cost. However required materials shall be arranged by BHEL with the approval of Site In-charge/BHEL. Base channels shall be grouted on the foundation.
- 4) Skid mounted mobile substations shall be checked thoroughly and before charging. After the satisfactory completion of these checks, the LT Board

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and 11 KV CB shall be energized. The contractor shall arrange all instruments required for testing at his cost. Kiosk shall be checked up thoroughly and if any items are found to be damaged/ defective/ not working and requires replacement or any internal wiring to be modified, the same shall be carried out by the contractor at the free of cost. However replacement materials shall be arranged by BHEL.

- 5) No separate unit rate shall be paid for the erection of Skid mounted mobile substations which shall be part of shall be part substation works.**

1.14.3.9.8 SCOPE OF EARTHING, LIGHTING AND LIGHTNING PROTECTION SYSTEM

- 1) The scope of earthing covers, earthing of all substation equipments, pillar box and providing earth pits as per IS requirement.
- 2) The scope of earth pits covers excavation, supply and erection of 3 Mtr. Long earth electrode, filling the pits with alternate layer of charcoal & salt as per IE specification, making of brick chamber with both side plastering supply and fixing of manhole cover plate with RCC slab, as per typical drawing provided by BHEL.
- 3) Number of earth pits for substation shall be decided considering soil resistivity.
- 4) LIGHTING: Scope of Lighting covers supply and installation of 4 Nos lighting poles with Fixtures, control gears and Luminaries 400W. The pole shall be tubular type 4m long steel poles as per applicable standard. All the pole shall be supplied with associated pole mounted junction Boxes, suitable galvanized MS base plate wires etc. The scope of erection work shall include all civil works including supply of cement, sand, metal etc, mounting of assembled fittings, wiring/ cabling from junction box at the bottom of pole up to the lighting fixture,
- 5) LIGHTNING PROTECTION: The scope of work of Lightning Protection system includes supply and installation of two numbers vertical air terminations and poles of 11m long with base plate. The pole shall be tubular stepped type as per applicable standard. Vertical air terminal shall be grounded with earth pits. Required civil works for lighting pole erection and grouting, grounding the air terminals and supply of grouting and grounding materials are in the scope of Contractor. The supply of above base plate is in the scope of contractors.

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- 6) No separate unit rate shall be paid for supply installation of Earth pits, lighting fixture / poles, lightning spikes, erection of earthing materials and lightning pole which are to be erected with in the sub stations and that shall be part 11 KV/433 V sub station works.**

1.14.3.9.9 SCOPE OF SUPPLY AND ERECTION OF PILLAR BOX

- 1) Scope of supply and erection of pillar Box includes, fabrication and fixing of supports, supply and erection of one No earth pit, supply and erection of earthing materials, supply and of erection of 4sets 3Cx185 sqmm HT Termination kits, including supply of safety boards. The erection works also covers associated civil works like making suitable foundation and supply of foundation materials as required Pillar box shall be checked thoroughly and before charging.
- 2) No separate unit rate shall be paid for supply and erection Earth pits, Earthing materials, HT Termination kits, foundation and safety boards which shall be part of supply and erection of pillar box. Lumpsum rate shall be quoted.**

1.14.3.10 SCOPE OF 11 KV FEEDER POWER DISTRIBUTION SYSTEM

1. BHEL Scope of supply as free issue:
- a) HT Cable 3CX185sq mm required Qty
- 2 Contractor scope of work for 11 KV distribution
- a) Conducting route survey
 - b) Preparation of distribution / drawing
 - c) Vetting of drawings & documents by BHEL
 - d) Installation of BHEL supplied free issued materials as mentioned under above clause.
 - e) Supply and installation of HT Termination and joining kits, Glands, lugs, etc.
 - f) Supply and spreading of bricks
 - h) Removal of rank vegetation, grass, brushwood,etc of required.
 - g) Excavation and refilling of earth
 - h) Supply and installation cable markers.
 - i) Unit rate shall be quoted on meter basis for cable laying inclusive of termination.

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1.14.3.11 SCOPE OF LAYING AND TERMINATION OF H.T. AND L.T. CABLE

- 1) Scope of BHEL supply cables as free issue shall be as below:
 - a.) HT/ LT Cables of required Qty
- 2) All cables shall be drawn by the contractor from BHEL Stores.
- 3) Both supplying and laying of GI pipes shall be in the scope of contractor.
- 4) HT Cables shall be laid in below ground at a depth of 1200 mm. Before stating excavation, route survey shall be conducted in consultation with site engineers. Cable shall be laid through GI pipes as protective cover wherever road crossings are there.
- 5) The cables thus drawn shall be cut to size as per route length and laid. H.T Cable termination shall be carried out only by the HT cable jointer with utmost care. Cable laying and termination shall be in accordance with IS-specification as listed as a part of this document. The cables shall be suitably supported so that the cable load should not cause strain to the equipment connected.
- 6) If suitable cable box is not supplied along with the equipment i.e. the transformer, Suitable cable adaptor boxes shall be arranged by the contractor at free of cost and cable termination shall be carried out by using suitable cable glands etc as required.
- 7) Suitable pillar box shall be installed to form ring main systems at the incomer side.
- 8) The cables drawn from the BHEL stores shall be meggered before laying and any defect observed after laying also, the contractor shall replace / rectify the same free of charges.
- 9) Wherever road crossings are there, cable shall be laid in suitable pipes to the depth as mentioned above. Excavation, laying of pipes and refilling of earth shall be part of cable laying.
- 10) No separate unit rate shall be paid for the Laying and termination of HT & LT cables which are to be laid within the sub stations and that shall be part 11 KV/433 V sub station works including supply of cable glands, HT Termination kits, lugs, etc
- 11) Unit rate quoted for HT cables on per meter basis shall covers laying, termination, excavation of earth for a depth of 1200mm and 350 width,

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refilling of excavated, supply and laying of standard bricks, Cable Markers at every 30 mtrs distance.

1.14.3.12 DETAILED SCOPE OF WORKS – YARD LIGHTING:

1.14.3.12.1 SWAGED LIGHTING POLES:

1. Lighting poles for flood lights shall be of stepped tubular / swaged type 11 metre long steel poles as per applicable standard. The steel poles shall be coated with bituminous preservative paint on the inside as well as outside surface. Exposed outside surface of steel poles shall be painted with one coat of red lead oxide primer. After of installation, two coats of Aluminum paint shall be applied
2. The poles shall be supplied with associated pole mounted Junction Boxes, suitable MS base with shop drilled holes or by suitable clamps for fixing of light fixtures. No cutting or drilling of galvanized structure is permitted.
3. The lighting poles shall be erected at the locations shown in the layout drawing (This drawing is in the scope of bidder). The scope of erection work shall include excavation of earth, as per drawing, grouting with concrete of ratio 1:4:8, supply of cement, sand, metal etc to withstand wind velocity, mounting of assembled fittings, wiring / cabling from junction box at the bottom of pole up to the lighting fixture, installation of 50mm dia of medium thickness GI pipe for cable protection from trench to junction box for loop-in-loop-out cable. All the above required materials shall be supplied by the bidder.
4. Unit rate quoted for Erection of lighting pole includes Earthing of lighting pole Junction boxes and lighting fixtures, in compliance with IE rules and applicable Indian Standard.
5. Each lighting pole JB shall be earthed by 25X3mm GI Flat bonded to 25 mm dia GI earth electrode of 3 meter length driven vertically in the ground. 14SWG GI wire shall be taken from fixture to JB including fixing of clamps.

1.14.3.12.2 LIGHTING FIXTURES:

1. Flood light luminaires shall be of weather proof, Aluminium cast housing, anodized aluminium mirror polished reflector, heat resistant, toughened glass cover with necessary neoprene gaskets to prevent ingress of dust, moisture and insect, porcelain lamp holder, cable gland, earthing terminals etc. The housing shall be supported on a cast

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iron / aluminium base and capable of being swiveled in both horizontal and vertical directions and locked in any desired position

2. The luminaries shall be supplied with Non- integral weather proof control gear box, suitable for use with High pressure metal halide lamps 400W
3. Luminaires of 400W shall be of continuous trouble free operation under atmospheric conditions, without reduction in lamp life or without deterioration of materials and internal wiring. Fixtures shall be provided with outdoor type weather proof box with IP-54 or better. Applicable standards are **IS: 1913, IS: 1777, IS: 4012, IS: 4013.**
4. Lighting fixtures includes supply of single ended or double ended High pressure metal halide lamp, as required. The lamp shall be with quartz discharge tube and transparent / internal coated shell, quick restrict time (of within 5 minutes) and with burning life (about 5,000 hours) in standard rating. Applicable standards are **IS: 10322, IS: 9974.**

1.14.3.12.3 LIGHTING DISTRIBUTING BOARD (LDB):

1. LDB shall be totally enclosed dust and vermin proof cubicles without louvers and suitable for outdoor application and wall / column / structure mounting type with sloping canopy conforming to IP 55 class
2. LDB shall be constructed from CRCA sheet. The sheet steel used shall be cold rolled and two mm thick. The construction of LDB shall ensure adequate rigidity. All components of the LDB shall be fully mounted inside the panel. LDB shall have only one operational front. Door shall be provided to give full access to all the components. Door shall have padlocking arrangement.
3. Good quality synthetic rubber / neoprene gaskets shall be fixed around the door. The door when closed, shall compress the gasket uniformly.
4. LDB shall be designed to prevent contact with live parts when the front door is open.
5. LDB shall be fitted with MS mounting brackets and adequate size of removable undrilled gland plate of three mm thickness.
6. LDB shall be fitted with two GI earth studs located in accessible position on the outside of the panel on opposite sides.
7. All metal parts of the panel except current carrying parts shall be bonded together electrically to the earthing stud. Phase barriers of fireproof insulating material shall be fitted in such a manner that it is not readily possible for personnel to touch the phase busbars.

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8. LDBs shall be with one incomer with 250A Change over switch / 250A SFU/100A MCB, with required Nos of outgoing feeders with 32A/40A /63A/100A TPN MCBs/ 4 pole ELCB and three indicating lamps with fuses for indicating bus supply ON, voltmeter with selector switch and Power terminals. LDB shall be provided with earth stud, earth bus bar etc designated with labels. Applicable standard are IS: 2675, IS: 4237, IS: 13947
9. The location for erection shall be decided at site, in consultation with BHEL Engineer. Any mounting arrangement like construction of foundation, fabrication and fixing of mounting supports including supply of materials like cement, sand, steel, metal etc shall be arranged by the vendor at his cost. Fabrication materials like angle and channels will be supplied by BHEL. The scope of erection of LDB includes providing two numbers of Earth pits with three meter depth Earth electrode and connection using 25 X 3 GI flat.

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VOLUME-IA PART – I CHAPTER - XIV

PROGRESS OF WORK

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

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

- 1.11.1 Refer forms F -14 to F-18 of volume I D (Forms & Procedure) of volume -I book-II. Plan and review will be done as per the formats.
- 1.11.2 The progress reports shall indicate the progress achieved against plan, indicating reasons for delays, if any. The report shall also give remedial actions which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original plan the slippages do not accumulate and affect the overall programme.
- 1.11.3 It is the responsibility of the contractor to provide all relevant information on a regular basis regarding erection progress, labour availability, equipment deployment, testing, etc.
- 1.11.4 Contractor is required to draw mutually agreed monthly erection programs in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.
- 1.11.5 Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of nonconformities.
- 1.11.6 The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, consumables (gases / electrodes / ferules / lugs) report, cranes availability report and other reports as per Performa considered necessary by the Engineer as per the BHEL formats.
- 1.11.7 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.
- 1.11.8 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.

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- 1.11.9 The monthly report shall be submitted at the end of every month as a booklet and shall contain the following details :-
- a. Colour Progress photographs of executed jobs etc.
 - b. Erection progress in terms of tonnage, percentage of work completion, welding joints, radiography, stress relieving, etc., completed as relevant to the respective work areas against planned.
 - c. Site Organization chart of engineers & supervisors as on the last day of the month with further mobilization plan
 - d. Category- wise man hours engaged during the previous month under the categories of fitters, welders, riggers, khalasis, grinder-men, gas-cutters, electricians, crane operations, store keepers, lab technicians helpers, security etc. Data shall be split up under the work areas like Boiler (pressure parts, structures) Rotating machines, Electro static precipitator, Insulation, Piping, Steam turbine, Condenser, Generator etc.
 - e. Consumables report giving consumption of all types of gases and electrodes during the previous month.
 - f. Availability report of cranes
 - g. Safety implementation report in the format
 - h. Pending material and any other inputs required from BHEL for activities planned during the subsequent month.
- 1.11.10 The contractor to reflect actual progress achieved during the month and will be submitted to BHEL, so that slippages can be observed and necessary action taken in order to ensure that the situation does not get out of control will update the construction schedule forming part of this contract each month.

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VOLUME-IA PART - I CHAPTER- XV TESTING AND COMMISSIONING

THE SCOPE OF THE WORKS WILL COMPRISE OF BUT NOT LIMITED TO THE FOLLOWING:

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

SCOPE OF TESTING AND COMMISSIONING WORKS:

- 1.15.1 The contractor shall take the full responsibility of testing and commissioning of the equipment being installed by him under the overall supervision of BHEL. It shall be the responsibility of the contractor to arrange and complete all the testing, pre-commissioning and commissioning activities for the particular equipment as per relevant standard, code of practice, manufacturer's instructions and BHEL norms. All these will be witnessed by BHEL Engineers and reports signed jointly.
- 1.15.2 All T&P / instruments required for testing are to be arranged by the contractor. Any special equipment, tools and tackles, IMTEs etc. required for the successful completion of the Commissioning Tests shall be provided by the Contractor, free of cost.
- 1.15.3 All testing activities shall be carried out as per relevant standard, code of practice, manufacturer's instructions and BHEL norms. The contractor shall submit a checklist to BHEL prior to taking up testing and commissioning activities and the activities shall be carried out in accordance with the checklist approved by BHEL. All the above will be witnessed by BHEL engineer and the reports signed jointly.
- 1.15.4 The commissioning activities, tests, trial runs may have to be repeated till satisfactory results are obtained and also to satisfy the requirements of BHEL / customer / consultant / statutory authorities like boiler inspector, electrical inspector etc.
- 1.15.5 Prior to commissioning and after commissioning, protocols have to be made with BHEL / Customer. The formats will be given by BHEL and have to be printed by the contractor in adequate numbers.
- 1.15.6 It shall be the responsibility of the contractor to commission and attend any problem in the equipment erected by the contractor using various categories of workers in sufficient numbers along with Supervisors. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities. The commissioning group shall have the knowledge of various systems referred in the tender and possess adequate experience in testing and commissioning.

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- 1.15.7 All the tests at various stages shall be repeated till all the equipment satisfy the requirement of BHEL / Customer. Any rectifications required shall have to be done / redone by the contractor at his cost.
- 1.15.8 The contractor shall carryout any other test not listed in the tender but as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning, commissioning, and operation, to demonstrate the completion of any part or whole work performed by the contractor.
- 1.15.9 In case, any rework is required because of contractor's faulty erection, which is noticed during pre-commissioning and commissioning, the same has to be rectified by the contractor at his cost. If any equipment / part is required to be inspected during pre-commissioning and commissioning, the contractor will dismantle / open up the equipment / part and reassemble / redo the work without any extra claim.
- 1.15.10 During commissioning any improvement / repair / rework / rectification / fabrication / modification due to design improvement / requirement is involved, the same shall be carried out by the contractor promptly and expeditiously.

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VOLUME-IA PART- I CHAPTER-XVI PAINTING

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

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

FINAL PAINTING

- 1.16.1 The quoted rate / price shall be inclusive of supply and application of final painting of all the erected equipments like all steel items such as supports, racks, frames, HT / LT KIOSK, Transformer, etc as per the painting specifications of customer / BHEL.
- 1.16.2 In the case of steel fabricated items, raw steel after fabrication has to be cleaned and subsequent painting to be carried out.
- 1.16.3 All the exposed metal parts of the equipments including busducts, transformers, structures, etc., wherever applicable after installation unless otherwise specified the surface protected, are to be first painted with at least one coat of suitable primer and required number of finish coats as specified by BHEL which matches the shop primer paint used after thoroughly cleaning the dust, rust, scales, grease oil, and other foreign materials by wire brushing scrapping and chemical cleaning and the same being inspected and approved by BHEL engineers for painting. Afterwards the above parts shall be finished with as per the instructions of BHEL / Customer official.
- 1.16.4 Normally Paint shall be applied by brushing as per the instruction of BHEL Engineer. It shall be ensured that brush marks are minimum. If needed and insisted either by BHEL / Customer in certain cases, spray painting has to be carried out within the Quoted rates. Spray painting gun and compressed air arrangement has to be made by the contractor himself within the Quoted rates.
- 1.16.5 All damaged galvanized surfaces including cable trays shall be coated with cold galvanizing paint.
- 1.16.6 Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of the ready mix type in original sealed containers as packed by the paint manufacturer. No thinners shall be permitted. Paint manufacturer's instructions shall be followed in method of application, handling, drying time etc.,
- 1.16.7 The scope of painting includes application of colour bands, lettering the names of the systems, equipments, danger / warning signs and other data as required by BHEL within the quoted rate.
- 1.16.8 All surfaces shall be thoroughly cleaned, free from scales, dirt and other foreign matter. Each coat shall be applied in an even & uniform film free from lumps, streaks, runs, sags and uncoated spots. Each coat (Primer, intermediate, finish)

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shall have a minimum thickness of dry film thickness (DFT) in microns and the DFT of finish paint shall not be less than the specified. Necessary instrument for measuring the thickness of paint applied is to be arranged by the contractor.

- 1.16.9 Finish coat paint, No of coat and DFT shall be as indicated in the painting specification / relevant BHEL document / customer's specifications.
- 1.16.10 The actual colour to be applied shall be approved by the customer / BHEL before starting of actual painting work.
- 1.16.11 Primer & finish paint shall be of reputed paint supplier approved by BHEL / Customer. Contractor has to procure paints from the BHEL / Customer approved agencies only, and the paints should be as per the customer painting specification. The quality of the finish paint shall be as per the standards of IS or equivalent as approved by BHEL / Customer. Before procurement of paint the contractor has to obtain the clearance from BHEL authorities.
- 1.16.12 No paint shall be applied when the surface temp is above 55 deg. Centigrade or below 10 deg. Centigrade, and when the humidity is greater than 90% to cause condensation on the surface or frost / foggy weather.
- 1.16.13 Before commencement of final painting, contractor has to obtain written clearance from BHEL / Customer for effective completion of surface preparation.
- 1.16.14 Before applying the subsequent coats, the thickness of each coat shall be measured and recorded with BHEL/ Customer.
- 1.16.15 PRESERVATION / TOUCH UP PAINTING
 - 1.16.15.1 Supply & application of primer & finish paints with all manpower, tools & plants and consumables is covered in the scope of this tender.
 - 1.16.15.2 Contractor shall carryout cleaning and preservation / touch up painting for the materials / equipments under this tender specification right from pre-assembly stage to till the equipment is cleared for final painting within the quoted rate.
 - 1.16.15.3 Any equipment which has been given the shop coat of primer shall be carefully examined after its erection in the field and shall be treated with touch up coat of red oxide primer wherever the shop coat has been abraded, removed or damaged during transit / erection, or defaced during welding.
 - 1.16.15.4 Mostly the equipment / items / components will be supplied with one coat of primer paint and one coat of finish paint. However during storage and handling, the same may get peeled off / deteriorate. All such surfaces are to be thoroughly cleaned and to be touch up painted with suitable approved primer and finish paint matching with shop paint / approved final colour.

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VOL 1 A PART I CHAPTER – XVII

OPERATION AND MAINTENANCE

1.17.1 SCOPE OF OPERATION AND MAINTENANCE

- 1.17.1.1 Contractor shall maintain all the substations free of cost till completion and energizing of initial 4 Nos substation and the total completion period for all substations shall be 4 months. After completing and energizing initial 4 Nos sub-stations, BHEL shall declare for availing the services of the contractor for operation and maintenance of the system for a period of three years. **The bidders are advised to quote lumpsum rate per month for services to be provided for O & M scope.**
- 1.17.1.2 The contractor shall operate and maintain all the electrical installation by deploying electrician, helpers, supervisor etc. on a three shift basis as per the instruction of Engineer in charge.
- 1.17.1.3 Contractor shall attend the break down and replace the defective components promptly, failing which BHEL will get the same done at the risk and cost of the contractor.
- 1.17.1.4 During the maintenance period, if the contractor fails to deploy adequate manpower continuously for two weeks, BHEL shall engage a maintenance agency at the risk and cost of contractor. All the tools and plants required for preventive maintenance and breakdown maintenance shall be arranged by the contractor.
- 1.17.1.5 All replacement materials /spares shall be supplied by BHEL free of cost. During the maintenance period, Contractor shall carry out the work of replacement of any defective items/ spares free of cost for all electrical installation.
- 1.17.1.6 Also refer respective clauses in Chapter II and Chapter IV in Technical Conditions of Contract, Volume I Book I.

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VOLUME-IA PART – II CHAPTER 1

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

SI No: 1

The following clauses on **OVER RUN COMPENSATION (ORC)** published in **General Conditions of Contract (Volume I Book-II)** is revised as below:

2.12 Void (Explanatory statement: ORC shall not be applicable for this tender)

SI No: 2

The following clauses on **PRICE VARIATION COMPENSATION (PVC)** published in **General Conditions of Contract (Volume I Book-II)** is revised as below:

2.17 Void (Explanatory statement: PVC shall not be applicable for this tender)

SI No: 3

The clause no **1.15.13** published in **General Conditions of Contract (Volume I Book-II)** is revised as below:

1.15.13 Additional security deposit (SD) shall be submitted by the successful bidder with value as follows :

If the final price of successful bidder is lesser by 'more than 20%' of BHEL's estimates then only, 'Additional Security Deposit' will be required to be submitted by the successful bidder with value as follows:

Additional Security Deposit = 30 % of (A-B) will be calculated as below:

A = 80 % of BHEL estimate

B = The final offered price of successful bidder through Reverse Auction
(In case of Reverse Auction)

OR

Sealed paper price bid of successful bidder (in case of paper bid)

Additional security deposit may be furnished in any form as applicable for Security Deposit. This 'Additional Security Deposit' shall have the same validity as that of the 'Security Deposit' and shall be revalidated / released in the manner as spelt out for the 'Security Deposit' as per relevant clause of GCC.

The BHEL's estimated value shall be disclosed to successful bidder (on request) in case 'Additional Security Deposit' is applicable

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SI No: 4

The following note shall be added as footnote to form No: F-15 (Rev 01) published in 'Forms and Procedures' of Volume I Book-II

Note :

- 1) It is only indicative and shall be as per the online format issued by BHEL time to time.
- 2) No request will be entertained after specified date of the current month with respect to changes requested in the scores of immediate previous month.

SI No: 5

The chapter Reverse auction procedure published in 'Forms and Procedures' of Volume I Book-II is revised as below:

REVERSE AUCTION

RA 1 REVERSE AUCTION

- RA 1.1 BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. **All bidders to give their acceptance for participation in RA (Refer Annexure 7 to Notice Inviting Tender). Non-acceptance to participate in RA may result in non-consideration of their bids in RA.**
- RA 1.2 BHEL may opt for Reverse auction depending on situation as per company policy. In case BHEL opts for RA, then the price bids of bidders who fulfil all the following conditions only shall be opened.
- RA 1.2.1 The bidders should have qualified techno-commercially
- RA 1.2.2 The bidders should have submitted their acceptance to participate in the RA vide enclosed format.
- RA 1.3 In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'online sealed bid' in the Reverse Auction. Non-submission of 'online sealed bid' by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue."

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RA 1.4 The start price intimated by BHEL may be displayed to the bidders during reverse auction bidding process as 'L1 price' or 'start / base price'. In cases where the start price mentioned by BHEL is not displayed as L1 price and no bidder accepts that price, RA is to be treated as failed and sealed envelope price bids of all the techno-commercially qualified bidders shall be opened and the tender processed accordingly. Wherever the techno-commercially acceptable bidder(s) had agreed to participate in the RA and had failed to submit the online sealed bid, the envelope sealed bids of such bidder(s) shall not be entertained.

In such cases, no cognizance of online sealed bids shall be taken. In case the L1 bidder of "sealed envelope price bid" has quoted a lesser price in the "on-line sealed bid", cognizance of the same shall be taken for price negotiations.

RA 1.5 In case BHEL decides not to conduct RA, the envelope sealed price bids of all techno commercially qualified bidders, along with price impact, if any, shall be opened and processed as per company Policy.

RA 2 TERMS & CONDITIONS OF REVERSE AUCTION

Against this enquiry for the subject item / system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

RA 2.1 For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.

RA 2.2 Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit 'online sealed bid' in the Reverse Auction. Non-submission of 'online sealed bid' by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.

RA 2.3 BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.

RA 2.4 In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.

RA 2.5 Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- RA 2.6 Bidders have to fax the Compliance form (annexure- RA IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
- RA 2.7 In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
- RA 2.8 Reverse auction will be conducted on scheduled date & time.
- RA 2.9 At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.
- RA 2.10 The lowest bidder has to fax / e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure- RA VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.
- RA 2.11 In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.
- RA 2.12 Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the 'Business Rules of Reverse Auction', which will be communicated before the Reverse Auction.
- RA 2.13 If the Bidder or any of his representatives are found to be involved in Price manipulation / cartel formation of any kind, directly or indirectly by communicating with other bidders, action as per extant BHEL guidelines, shall be initiated by BHEL and the results of the RA scrapped / aborted.
- RA 2.14 The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
- RA 2.15 In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may / may not be allowed to participate in further RA process.**

RA 3 BUSINESS RULES FOR REVERSE AUCTION - TENTATIVE

(The business rules given here are only for information and the authorized rules shall be intimated before reverse auction by service provider)

TECHNICAL CONDITIONS OF CONTRACT (TCC)

RA 3.1 This has reference to tender no {tender number....date...}. BHEL shall finalise the Rates for the supply of {item name} through Reverse Auction mode. BHEL has made arrangement with M/s. {Service provider}, who shall be BHEL's authorized service provider for the same. Bidders should please go through the guidelines given below and submit acceptance of the same.

The technical & commercial terms are as per

- (a) BHEL Tender Enq. No. {...} dated {...},
- (b) Bidders' technical & commercial bid (in case of two part bid) and
- (c) Subsequent correspondences between BHEL and the bidders, if any.

RA 3.2 Schedule for reverse auction:

The Reverse Auction is tentatively scheduled on {date}:

- Online Sealed Bid:-

- {Start Time:
- Close Time: }

- Online Reverse Auction:-

- {Start Time:
- Close Time: }

RA 3.3 **Auction extension time:** If a bidder places a bid in the last {...} minutes of closing of the Reverse Auction and if that bid gets accepted, then the auction's duration shall get extended automatically for another {...} minutes, for the entire auction (i.e. for all the items in the auction), from the time that bid comes in. Please note that the auto-extension will take place only if a bid comes in those last {...} minutes and if that bid gets accepted as the lowest bid. If the bid does not get accepted as the lowest bid, the auto-extension will not take place even if that bid might have come in the last {...} minutes. In case, there is no bid in the last {...} minutes of closing of Reverse Auction, the auction shall get closed automatically without any extension. However, bidders are advised not to wait till the last minute or last few seconds to enter their bid during the auto-extension period to avoid complications related with internet connectivity, network problems, system crash down, power failure, etc.

The above process will continue till completion of Reverse Auction.

Complaints / Grievances, if any, regarding denial of service or any related issue should be given in writing thru e-mail / fax to M/s. {Service provider} with a copy to BHEL within 15 minutes from the initial closing time of Online Reverse Auction.

RA 3.4 **Bid price:** The Bidder has to quote the F.O.R. destination Price inclusive of Packing & Forwarding charges, all the routine & type tests as per tender scope,

TECHNICAL CONDITIONS OF CONTRACT (TCC)

ED + cess, CST against C-form, Freight (bidder to provide original Freight paid receipt), insurance charges, etc. including loading (if indicated by BHEL due to deviations in commercial terms) for the Items specified. Details are as shown in Excel Sheet for calculation of Landed cost.

Note: For the consideration of L1 bidder, the bid value shall be reduced by loading amount, if applicable.

RA 3.5 Bidding currency and unit of measurement: Bidding will be conducted in {Indian Rupees per Unit} of the material as per the specifications {...}

In case of foreign currency bids, exchange rate (TT selling rate of State Bank of India) as on scheduled date of tender opening (Part-I bid in case of two part bid) shall be considered for conversion in Indian Rupees.

RA 3.6 Validity of bids: Price shall be valid for {... days} from the date of reverse auction. These shall not be subjected to any change whatsoever.

RA 3.7 Lowest bid of a bidder: In case the bidder submits more than one bid, the lowest bid at the end of Online Reverse Auction will be considered as the bidder's final offer to execute the work.

RA 3.8 Post auction procedure: BHEL will proceed with the Lowest Bid in the Reverse Auction for further processing.

RA 3.9 Procedure of Reverse Auctioning

RA 3.9.1 Online Sealed Bid: This duration of online sealed bid will be {...} minutes. All bidders to submit their online sealed bids during this period.

RA 3.9.2 Online Reverse Auction: The "opening price" i.e. start price for RA and "bid decrement" will be decided by BHEL.

RA 3.9.3 If BHEL decides the lowest online sealed bid as the starting price, then the lowest bidder in online sealed bid shall be shown as current L1 automatically by the system and no acceptance of that price is required. System shall have the provision to indicate this bid as current L1.

RA 3.9.4 Bidders by offering a minimum bid decrement or the multiples thereof can displace a standing lowest bid and become "L1" and this continues as an iterative process.

RA 3.9.5 After the completion of the online reverse auction, the Closing Price (CP) shall be available for further processing.

RA 3.9.6 If no bid is received in the auction system / website within the specified time duration of the online RA, then BHEL will scrap the online reverse auction process and proceed with the conventional mode of tendering (opening of the envelope sealed bids earlier submitted by the bidders).

TECHNICAL CONDITIONS OF CONTRACT (TCC)

In cases where no bidder accepts the start price, the RA may be treated as failed and sealed envelope price bids of all the techno-commercially qualified bidders shall be opened and the tender processed accordingly. Wherever the techno-commercially acceptable bidder(s) had agreed to participate in the RA and had failed to submit the online sealed bid, the envelope sealed bids of such bidder(s) shall not be entertained.

Wherever, the evaluation is done for individual items of the package, and no bid is received for some of the item(s), RA will be considered as failed for these item(s), re-reverse auction/ retendering will be conducted for these items.

RA 3.9.7 Only those bidders who have submitted the “online sealed bid” within the scheduled time shall be eligible to participate further in RA process. However, **the H1 bidder (whose quote is highest in online sealed bid) may / may not be allowed to participate in further RA process.**

RA 3.9.8 Any commercial / technical loading shall be intimated to bidders prior to RA. The excel sheet provided in this regard shall cover all these aspects. Commercial / technical loading if any, shall be added by the respective bidder in its price during online sealed bid & Online Reverse Auction. Modalities of loading & de-loading shall be separately intimated to the bidders.

RA 3.9.9 Computerized reverse auction shall be conducted by BHEL (through M/s {Service Provider}), on pre-specified date, while the bidders shall be quoting from their own offices / place of their choice. Internet connectivity shall have to be ensured by bidders themselves.

RA 3.9.10 During the RA if a bidder is not able to bid and requests for extension of time by fax / e-mail / phone then time extension of additional 15 minutes will be given by the service provider provided such requests come before 5 minutes of auction closing time. However, only one such request per bidder can be entertained.

Despite this extension if bidder fails to upload his prices due to extreme case of failure of Internet connectivity, (due to any reason whatsoever may be) it is the bidders' responsibility / decision to send fax communication immediately to M/s. {Service provider}, furnishing the price the bidder wants to bid online with a request to the service provider to upload the faxed price on line so that the service provider will up load that price on line on behalf of the Bidder. It shall be noted clearly that the concerned bidder communicating this price to service provider has to solely ensure that the fax message is received by the service provider in a readable / legible form and also the Bidder should simultaneously check up with service provider about the clear receipt of the price faxed. It shall also be clearly understood that the bidder shall be at liberty to send such fax communications of prices to be up loaded

TECHNICAL CONDITIONS OF CONTRACT (TCC)

by the service provider only within the closure of Bid time and under no circumstance it shall be allowed beyond the closure of Bid time / reverse auction. It shall also be noted that the service provider should be given a reasonable required time by the bidders, to upload such prices online and if such required time is not available at the disposal of the Service provider at the time of receipt of the fax message from the bidders, the service provider will not be uploading the prices and either BHEL or the service provider are not responsible for this unforeseen circumstances. In order to ward-off such contingent situation bidders are requested to make all the necessary arrangements / alternatives whatever required so that they are able to circumvent such situation and still be able to participate in the reverse auction successfully. Failure of power or loss of connectivity at the premises of bidders during the Reverse auction cannot be the cause for not participating in the reverse auction. On account of this, the time for the auction cannot be extended and neither BHEL nor M/s. {*Service provider*} is responsible for such eventualities.

RA 3.9.11 **Proxy bids:** Proxy bidding feature is a pro-bidder feature to safe guard the bidder's interest of any internet failure or to avoid last minute rush. The proxy feature allows bidders to place an automated bid in the system directly in an auction and bid without having to enter a new amount each time a competing bidder submits a new offer. The bid amount that a bidder enters is the minimum that the bidder is willing to offer. Here the software bids on behalf of the bidder. This obviates the need for the bidder participating in the bidding process until the proxy bid amount is decrementally reached by other bidders. When proxy bid amount is reached, the bidder (who has submitted the proxy bid) has an option to start participating in the bidding process.

The proxy amount is the minimum amount that the bidder is willing to offer. During the course of bidding, the bidder cannot delete or change the amount of a proxy bid.

Bids are submitted in decrements (decreasing bid amounts). The application automates proxy bidding by processing proxy bids automatically, according to the decrement that the auction originator originally established when creating the auction, submitting offers to the next bid decrement each time a competing bidder bids, regardless of the fact whether the competing bids are submitted as proxy or standard bids. However, it may please be noted that if a manual bid and proxy bid are submitted at the same instant manual bid will be recognized as the L1 at that instant.

In case of more than one proxy bid, the system shall bid till it crosses the threshold value of "each lowest proxy bid" and thereafter allow the competition to decide the final L1 price.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Proxy bids are fed into the system directly by the respective bidders. As such this information is privy only to the respective bidder(s).

- RA 3.9.12 Bidders are advised to get fully trained and clear all their doubts such as refreshing of Screen, quantity being auctioned, tender value being auctioned etc.
- RA 3.9.13 M/s. {Service provider}, shall arrange to demonstrate/ train the bidder or bidder's nominated person(s), without any cost to bidders. M/s. {Service provider}, shall also explain the bidders, all the rules related to the Reverse Auction / Business Rules Document to be adopted along with bid manual. Bidders are required to give their compliance on it before start of bid process.
- RA 3.9.14 Successful bidder shall be required to submit the final prices, quoted during the Online Reverse Auction in Annexure - RA VII after the completion of auction to M/s. Service provider besides BHEL, duly signed and stamped as token of acceptance without any new condition other than those already agreed to before start of auction.
- RA 3.9.15 Any variation between the final bid value and that in the confirmatory signed price breakup document will be considered as tampering the tender process and will invite action by BHEL as per extant guidelines in vogue.
- RA 3.9.16 Bidders bid will be taken as an offer to execute the work / supplies the item as per enquiry no. {...} dt. {...}. Bids once made by the bidder, cannot be cancelled / withdrawn and bidder shall be bound to execute the work as mentioned above at bidder's final bid price. Should bidder back out and not execute the contract as per the rates quoted, BHEL shall take action as per extant guidelines in vogue.
- RA 3.9.17 Bidders shall be assigned a **Unique User Name & Password** by BHEL or M/s. {Service provider}. Bidders are advised to change the Password and edit the information in the Registration Page after the receipt of initial Password from BHEL / M/s. {Service provider} to ensure confidentiality. All bids made from the Login ID given to the bidders will be deemed to have been made by the bidders / bidders' company.
- RA 3.9.18 Bidders shall be able to view the following on their screen along with the necessary fields during Online Reverse Auction:
- a. Leading (Running Lowest) Bid in the Auction (only total price of package)
 - b. Bid Placed by the bidder
 - c. Start Price
 - d. Decrement value

TECHNICAL CONDITIONS OF CONTRACT (TCC)

- RA 3.9.19 After receipt of the system report from the Service Provider after completion of the Online Reverse Auction, BHEL will decide upon the winner. BHEL's decision on award of contract shall be final and binding on all the Bidders.
- RA 3.9.20 BHEL reserves the right to cancel the Reverse Auction process / tender at any time, before ordering, without assigning any reason.
- RA 3.9.21 BHEL shall not have any liability to bidders for any interruption or delay in access to the site irrespective of the cause. In such cases, the decision of BHEL shall be binding on the bidders.
- RA 3.9.22 Other terms and conditions shall be as per bidder's techno-commercial offers and other correspondences, if any, till date.
- RA 3.9.23 Bidders are required to submit their acceptance to the terms / conditions / modalities before participating in the Reverse Auction in the process compliance Form as per Annexure- RA IV.
- RA 3.9.24 BHEL can decide to extend, reschedule or cancel any Auction with prior intimation to all bidders.
- RA 3.9.25 If there is any clash between this business document and the FAQ available, if any, in the web site of M/s. {Service provider} the terms& conditions given in this business document will supercede the information contained in the FAQs. Any changes made by BHEL / service provider (due to unforeseen contingencies) after the first posting shall be deemed to have been accepted if the bidder continues to access the portal after that time.
-

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Annexure – RA IV

Process Compliance Form

(The bidders are required to print this on their company's letterhead and sign, stamp before faxing)

To

- M/s. {Service provider
- Postal address}

Sub: Agreement to the Process related Terms and Conditions

Dear Sir,

This has reference to the Terms & Conditions for the Reverse Auction mentioned in the RFQ document for {Items} against BHEL enquiry / RFQ no.{.....} dt. {.....}

This letter is to confirm that:

- 1) The undersigned is authorized official/ representative of the company to participate in RA and to sign the related documents.
- 2) We have studied the Reverse Auction Terms & Conditions and the Business rules governing the Reverse Auction as mentioned in your letter and confirm our agreement to them.
- 3) We also confirm that we have taken the training on the auction tool and have understood the functionality of the same thoroughly.
- 4) We also confirm that, in case we become L1 bidder, we will email / fax the price confirmation & break up of our quoted price (including that of line items) as per *Annexure – RA VII* within **two** working days (of BHEL) after completion of RA event, besides sending the same by registered post/ courier both to M/s. BHEL and M/s. {Service provider.}

We, hereby confirm that we will honour the Bids placed by us during the auction process.

With regards

Signature with company seal

Name –

Company / Organization

Designation within Company / Organization

Address of Company / Organization

- Sign this document and Fax it to M/s {Service provider} at {.....} prior to start of the Event.
- Attach a signed copy of the RFQ document along with the Agreement Form/ Process Compliance form and send to M/s. {Service provider}

TECHNICAL CONDITIONS OF CONTRACT (TCC)

Annexure – RA VII

RA price confirmation and breakup

To

- M/s. Service provider
- Postal address

CC: M/s BHEL

{Unit-
-Address-}

Sub: **Final price quoted during Reverse Auction and price breakup**

Dear Sir,

We confirm that we have quoted.

Rs.{_____} for item covered under tender enquiry No. {...} dt.{...}

Total price of the items covered under above cited enquiries is inclusive of {Packing & forwarding, E.D., C.S.T., freight and insurance charges upto {.....} District, {.....} State and Type Test Charges etc., (exclusive of service tax), other as per NIT} as our final landed prices as quoted during the Reverse Auction conducted today {date} which will be valid for a period of {_____} days.

The price break-up including that of line items is as given below.

=====

Total - Rs.

=====

Thanking you and looking forward to the valuable order from BHEL.

Yours sincerely,

For _____

Name:

Company:

Date:

Seal:

TECHNICAL CONDITIONS OF CONTRACT (TCC)

DATA SHEET

2.2.1 SPECIFIC TECHNICAL REQUIREMENTS FOR SUPPLY ITEMS

2.2.1.1 Ferrules / Fire stop cable sealing system / tags: As per Clause 2.5.11.4

2.2.1.2 Tag

- a. Material : Aluminium / Fiber / Stainless Steel
- b. Markings : Engraving / Embossing / Printing
- c. Size : As required.

2.2.1.3 Cable lugs of all size: Copper / Aluminium (crimping type)

2.2.1.4 Anchor fasteners for wall mounted cable trays / JB's

2.2.1.5 Insulation tape.

2.2.1.6 Paints required for primer & final coating and for protective coating.

2.2.1.7 Solder wire (Lead) -(60/40)

2.2.1.8 Panel sealing compound material (for cable entry from bottom / top of Panel).

2.2.1.9 Materials required for cable dressing. (GI / aluminum flats, PVC ties etc).

2.2.1.10 PVC wire marker sleeves and Tag plates

2.2.1.11 Welding electrodes, filler wires, gases etc.

2.2.1.12 Metallic clamps for flexible and rigid conduits

2.2.2 Wastage Allowance:

Support installation : 1% by weight

TECHNICAL CONDITIONS OF CONTRACT (TCC)

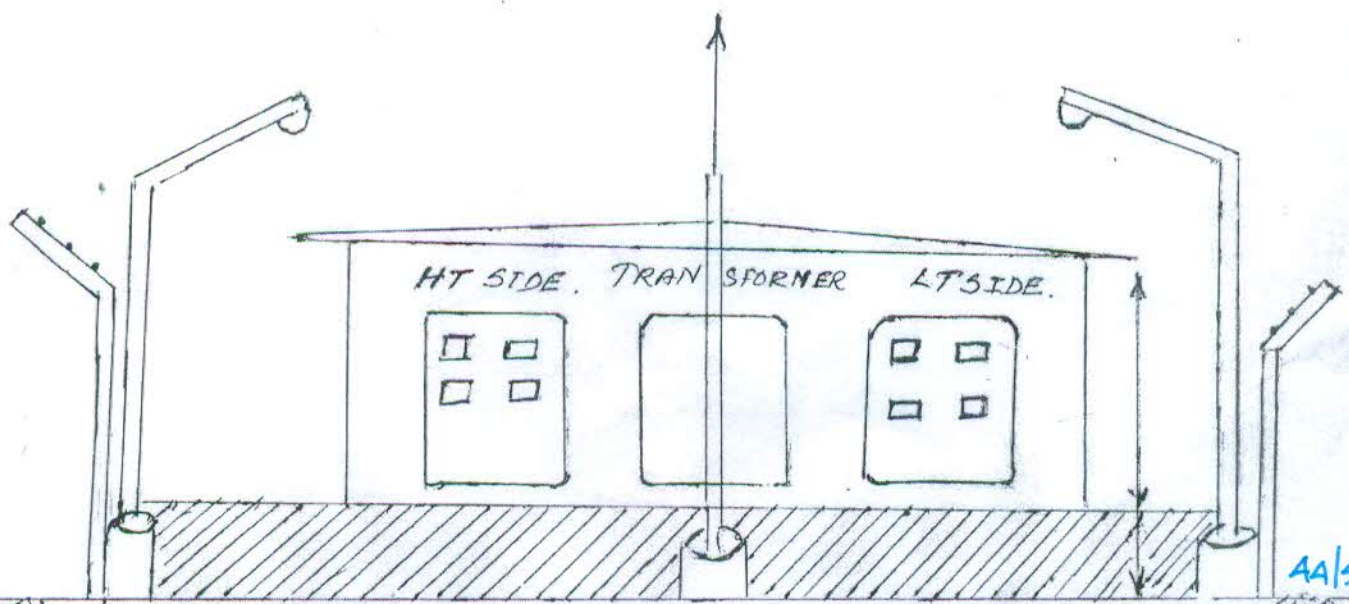
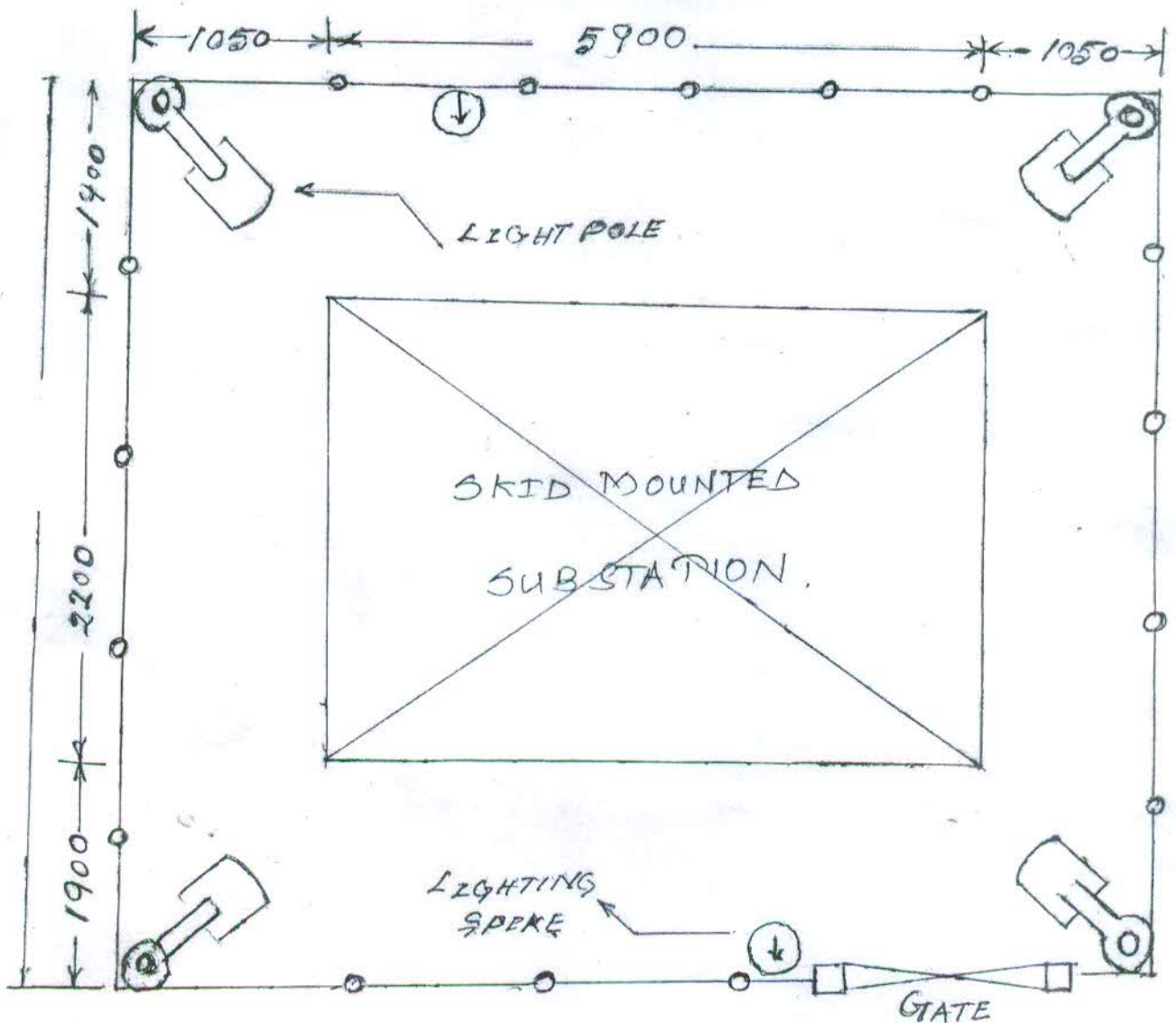
DRAWINGS

THE FOLLOWING ENCLOSED DRAWINGS ARE FOR INFORMATION ONLY

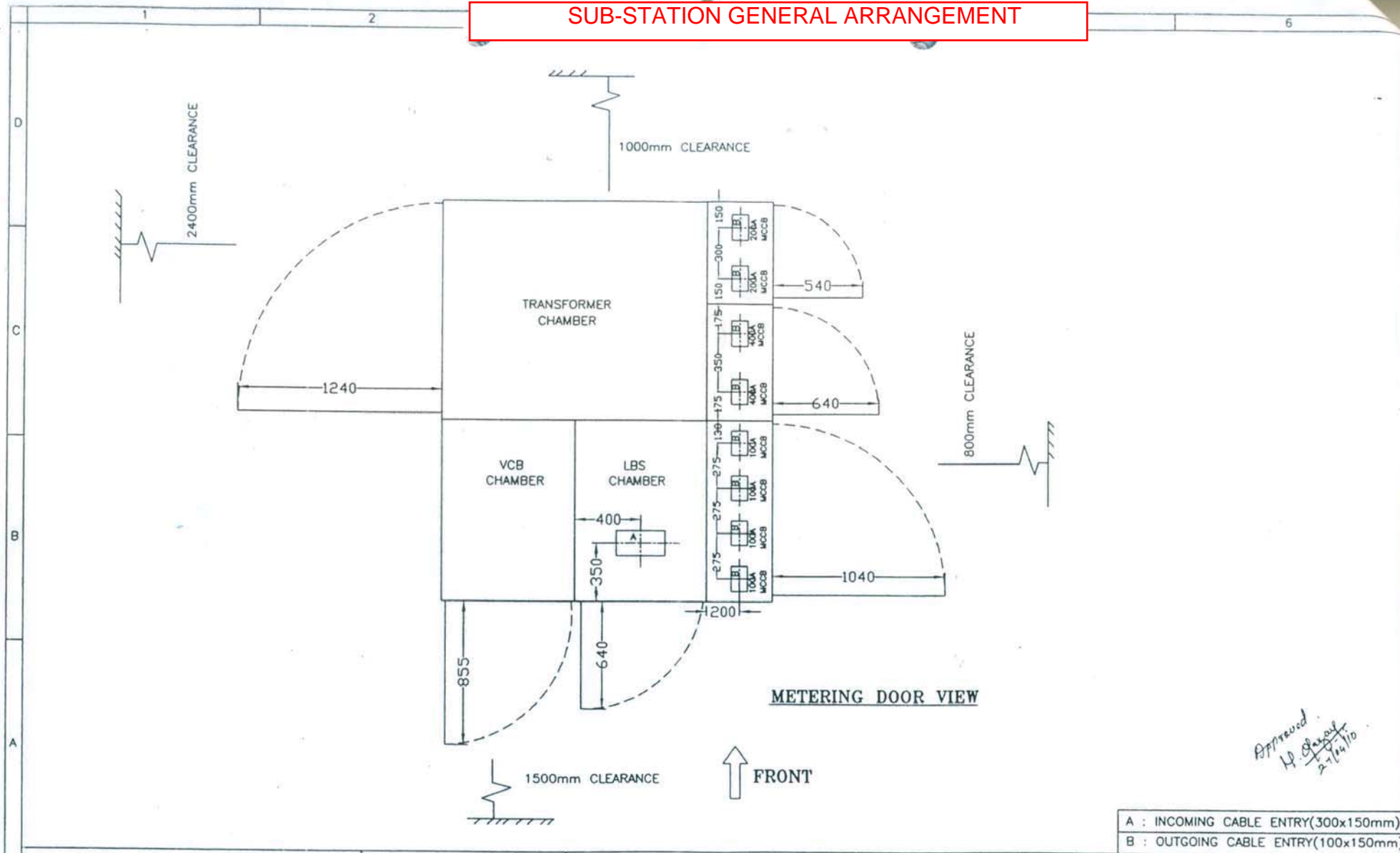
Available in next 7 pages

Sl no	Details	No.of sheets
1)	11 kV Substation Layout	01
2)	11 kV Substation Foundation	01
3)	11 kV Substation General Arrangement	01
4)	Pillar Box Front View	01
5)	Pillar Box Side View	01
6)	Yard Lighting – 11 m Swaged Pole Arrangement	01
7)	Plot Plan R3 with tentative cabling and substation arrangement	01

11KV/433V-500KVA SKID MOUNTED SUBSTATION.
FOR CONSTRUCTION POWER SUPPLY.



SUB-STATION GENERAL ARRANGEMENT



Approved
H. S. Srinivasan
 2-7/14/10

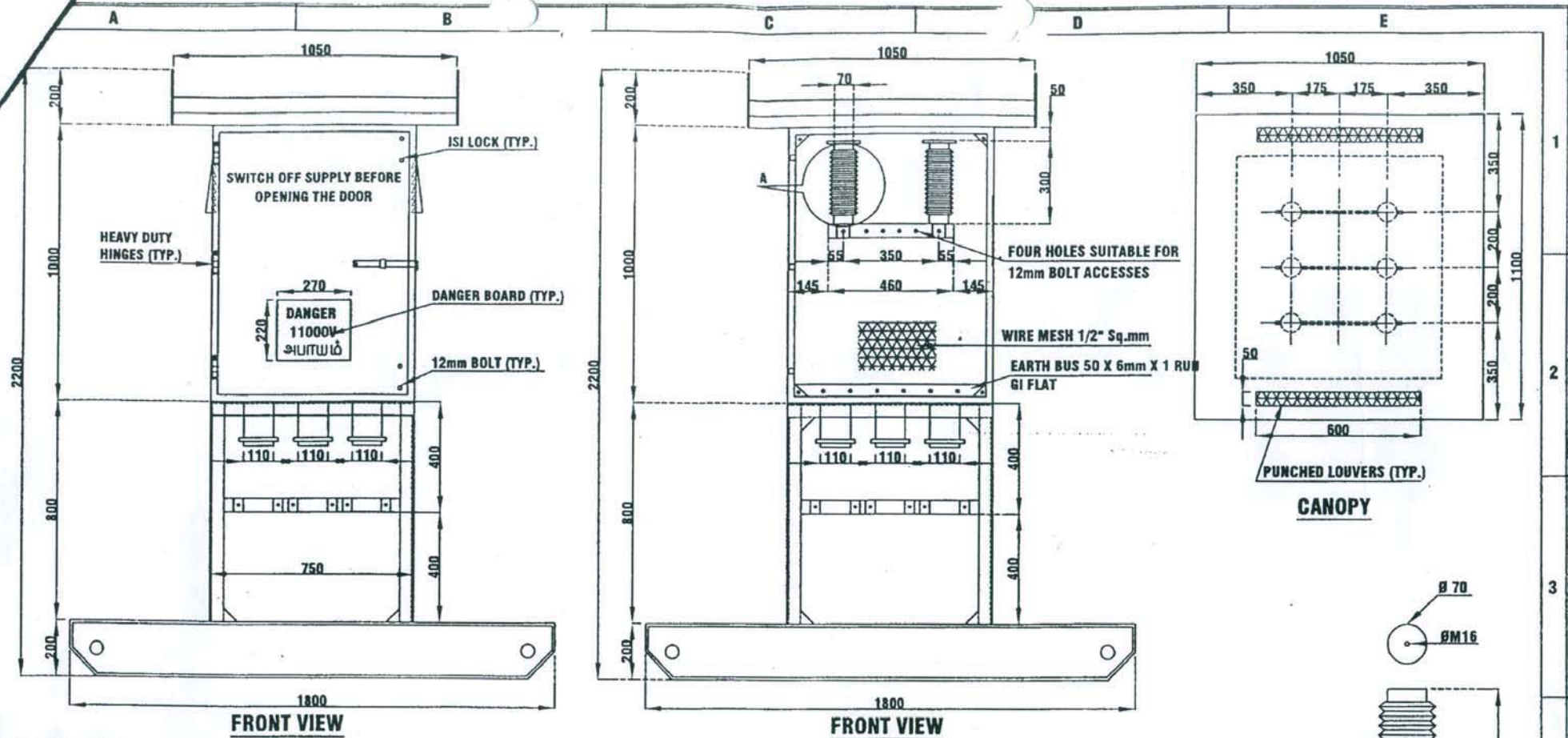
A : INCOMING CABLE ENTRY(300x150mm)
 B : OUTGOING CABLE ENTRY(100x150mm)

INSTALLATION : OUTDOOR				QTY : 12 Nos.		TITLE : FOUNDATION DETAILS-1 11KV, 500KVA BASE MOUNTED USS			
ISSUE	DATE	01.04.2010	REVISION-1	DATE		MEGAWIN SWITCHGEAR-P-LTD SALEM , TAMIL NADU	CUSTOMER ID : 6823		SHEETS 05 OF 25
	DRAWN	R.M	REVISION-1	REMARKS			DWG NO.: MS-GA4-6823-01-RO		
	DRAWN	P.V	REVISION-2	REMARKS					
	CHD.	SRI	REVISION-2	SIGN					

P.O REF. NO. : C 29178	DATE : 25.03.2010	CLIENT : M/s. BHARAT HEAVY ELECTRICALS LIMITED., CHENNAI.
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PILLAR BOX FRONT VIEW

GENERAL ARRANGEMENT DIAGRAM OF FRONT VIEW FOR 11KV 630A PILLAR BOX



SHEET THICKNESS : 2.5mm
 BOTTOM PLATE THICKNESS : 4mm

PAINTING

PILLAR BOX SHOULD BE GIVEN PRIMARY COAT OF ZINC CHROMATE OR ZINC DUST AND TWO COATS OF ENAMEL PAINT OF GOLDEN YELLOW SHADE. INTERIOR SHOULD BE GIVEN ENAMEL PAINT OF GOLDEN YELLOW. PAINTING SHOULD BE GIVEN AFTER PRETREATMENTS AND PHOSPHATING.

NOTE:

1. ALL THE BOLTS NUTS USED IN THE PILLAR BOX AT ANY PLACE SHOULD BE OF SIZE 12mm ONLY
2. FOR CABLE TERMINATION M.S. CADMIUM COATED, BOLTS & NUT PROVIDED ON THE BUS BAR SHOULD BE OF SIZE M12 X 50mm ONLY.
3. CAUTION TO BE PAINTED ON BOTH THE DOORS IS GIVEN AS BELOW:
 "SWITCH OFF SUPPLY BEFORE OPENING THE DOOR"
 THIS SHOULD BE PAINTED IN ENGLISH AND ITS EQUIVALENT IN TAMIL ON BOTH THE DOORS.

BUS BAR:

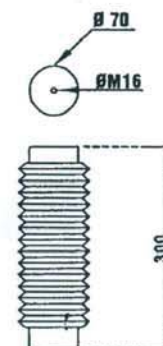
SIZE SHOULD BE 50mm X 10mm X 460mm
 ELECTRICALLY GRADE COPPER.
 EARTH BUS SHOULD HAVE 4 NOS. OF EQUALLY SPACED HOLES SUITABLE FOR 12mm BOLTS.

LABE:

FOR PANEL KEY OPERATION "OPEN-CLOSE" DIRECTIONAL ARROW MARKING SHOULD BE PAINTED ON DOOR

TOLERANCE FOR UNTOLERENCED DIMENSION

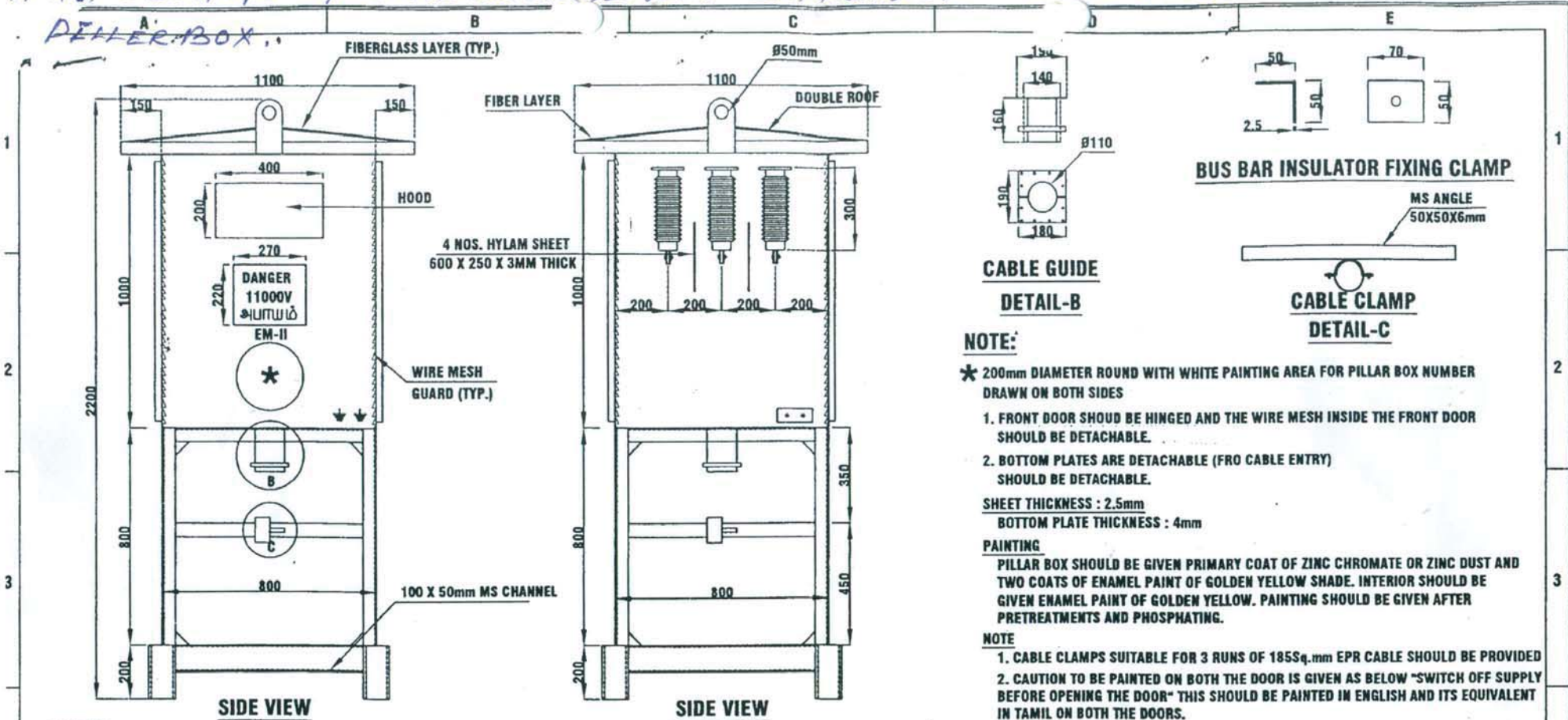
BASIC SIZE	TOLERANCE
0-100mm	±2mm
101-600mm	±5mm
601-1200mm	±10mm
1201-2000mm	±15mm
2001-3000mm	±20mm
3001 AND ABOVE	±25mm



DETAILS-A

PILLAR BOX SIDE VIEW

11 KV, 630 Amps GENERAL ARRANGEMENT DIAGRAM OF SIDE VIEW.



- NOTE:**
- * 200mm DIAMETER ROUND WITH WHITE PAINTING AREA FOR PILLAR BOX NUMBER DRAWN ON BOTH SIDES
 - 1. FRONT DOOR SHOULD BE HINGED AND THE WIRE MESH INSIDE THE FRONT DOOR SHOULD BE DETACHABLE.
 - 2. BOTTOM PLATES ARE DETACHABLE (FOR CABLE ENTRY) SHOULD BE DETACHABLE.
- SHEET THICKNESS : 2.5mm**
BOTTOM PLATE THICKNESS : 4mm
- PAINTING**
 PILLAR BOX SHOULD BE GIVEN PRIMARY COAT OF ZINC CHROMATE OR ZINC DUST AND TWO COATS OF ENAMEL PAINT OF GOLDEN YELLOW SHADE. INTERIOR SHOULD BE GIVEN ENAMEL PAINT OF GOLDEN YELLOW. PAINTING SHOULD BE GIVEN AFTER PRETREATMENTS AND PHOSPHATING.
- NOTE**
- 1. CABLE CLAMPS SUITABLE FOR 3 RUNS OF 185sq.mm EPR CABLE SHOULD BE PROVIDED
 - 2. CAUTION TO BE PAINTED ON BOTH THE DOOR IS GIVEN AS BELOW "SWITCH OFF SUPPLY BEFORE OPENING THE DOOR" THIS SHOULD BE PAINTED IN ENGLISH AND ITS EQUIVALENT IN TAMIL ON BOTH THE DOORS.

- PAINTING:**
1. WHITE PAINTED CIRCLE OF 250mm DIAMETER SHOULD BE PROVIDED ON THE PILLAR BOX DOOR FOR NUMBERING PURPOSE. THE LETTERS EM-II ALONE SHOULD BE MARKED IN RED, ON THE UPPER HALF OF THE CIRCLE LEAVING EMPTY SPACE IN THE LOWER HALF FOR PROVIDING PURCHASER'S NUMBER AT SITE.
 2. NAME PLATE DETAILS SUCH AS MANUFACTURER'S NAME, P.O.No., SI.No., YEAR OF MANUFACTURER ETC. SHOULD BE PROVIDED.
- EARTHING:**
1. EARTH STUDS WITH NUT AND SPRING WASHERS SHOULD BE PROVIDED FOR EARTHING EARTH CORE AND SCREENS OF EPR/XLPE CABLES.
 2. THE DOOR SHOULD BE EARTHED WITH BRIDED COPPER OF ADEQUATE SIZE WITH CLAMPING WHEREVER NECESSARY.
 3. THE SIZE OF GI FLAT SHOULD BE 50 X 6mm WITH 6 Nos. HOLES DRILLED ON IT AND PROVIDED WITH 12mm BOLT & NUT WITH WASHERS. OF SUFFICIENT LENGTH FOR CONNECTING 6 EARTH CORES. FOR EARTHING

TOLERANCE FOR UNTOLERENCED DIMENSION

BASIC SIZE	TOLERANCE
0-100mm	±2mm
101-600mm	±5mm
601-1200mm	±10mm
1201-2000mm	±15mm
2001-3000mm	±20mm
3001 AND ABOVE	±25mm

YARD LIGHTING

Form No.



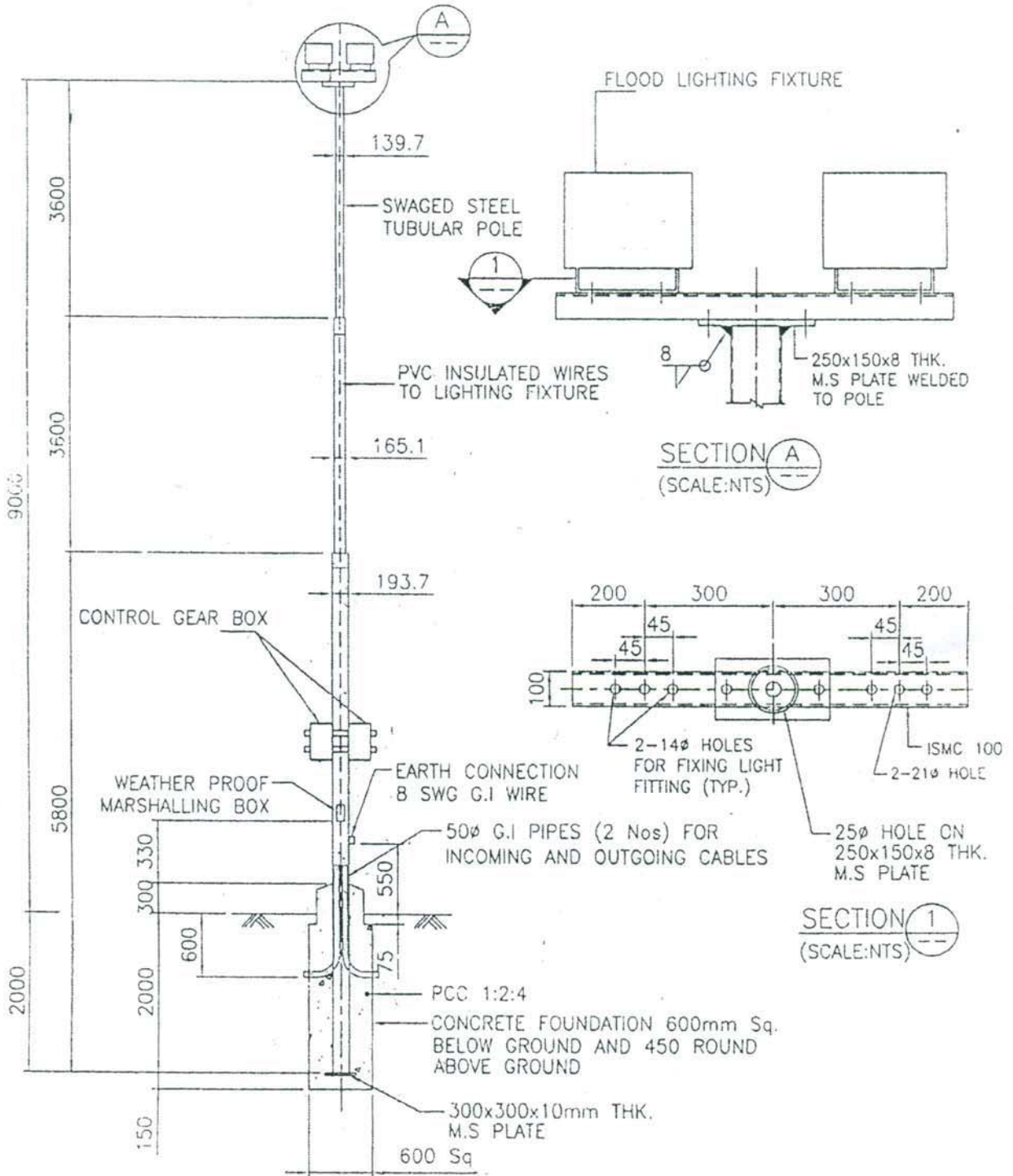
GENERAL NOTES & DETAILS ON LIGHTING SYSTEM PROJECT ENGINEERING

PEEC-2310

REV. No. 00

PAGE OF

It must not be used direct or indirectly in any way detrimental to the interest of the company.



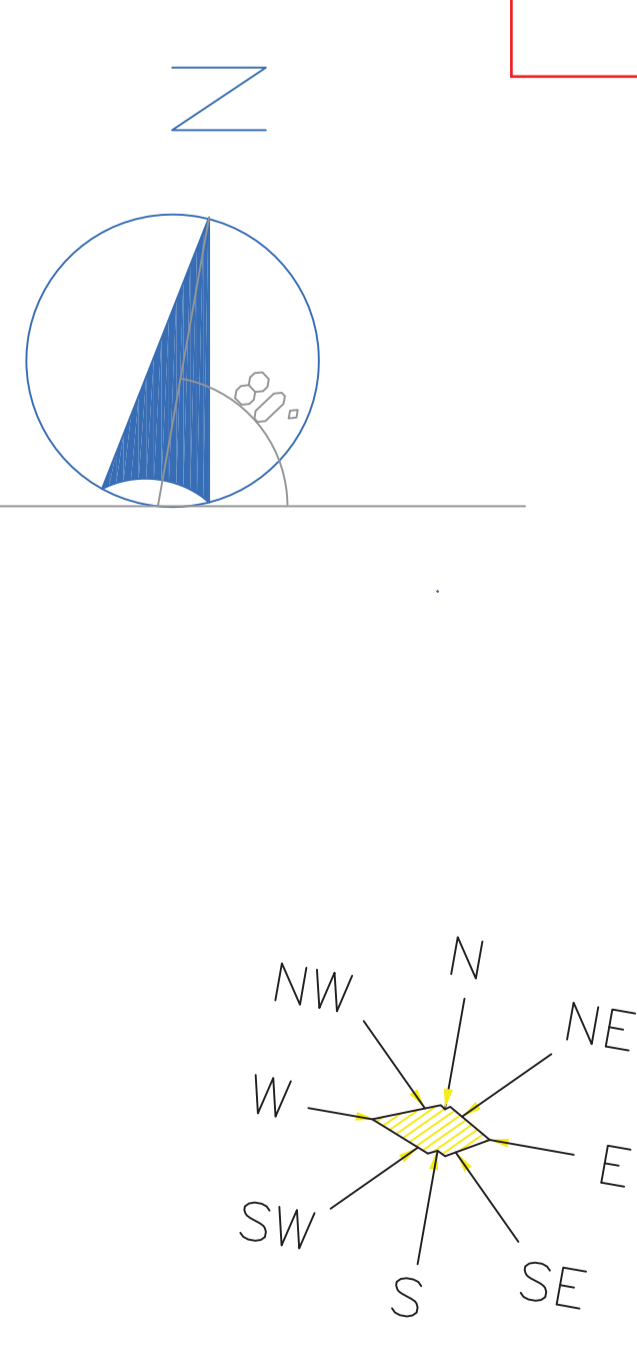
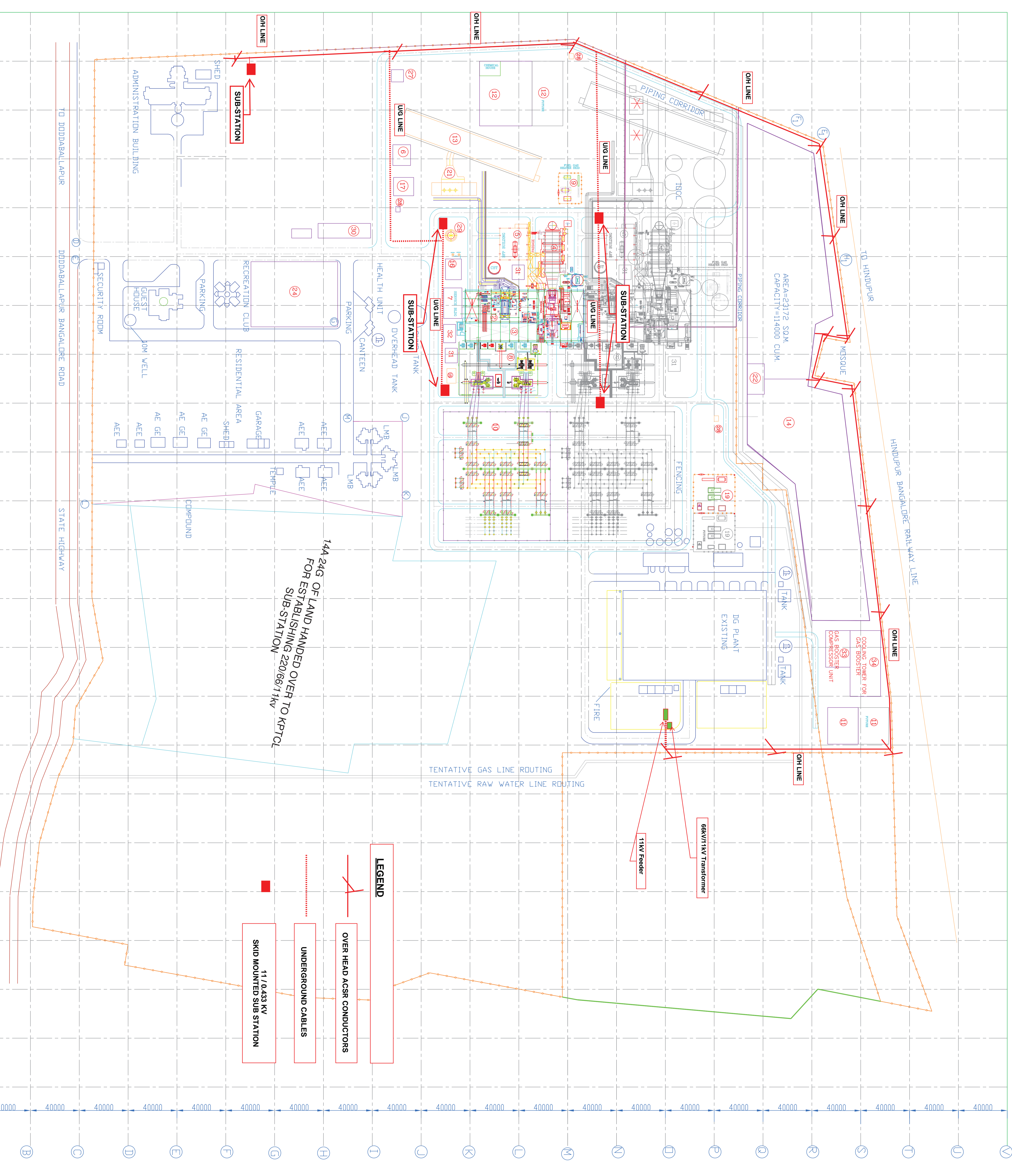
**TYPICAL DETAIL OF FLOOD LIGHTING
FIXTURE ON SWAGED POLES**

IS 2713

NOTE:-

ALL THE DIMENSIONS ARE IN MM ONLY

KPCL - YELAHANKA CAPP
CONSTRUCTION POWER & YARD LIGHTING
TENTATIVE LAYOUT OF POWER DISTRIBUTION SYSTEM & SUB-STATION



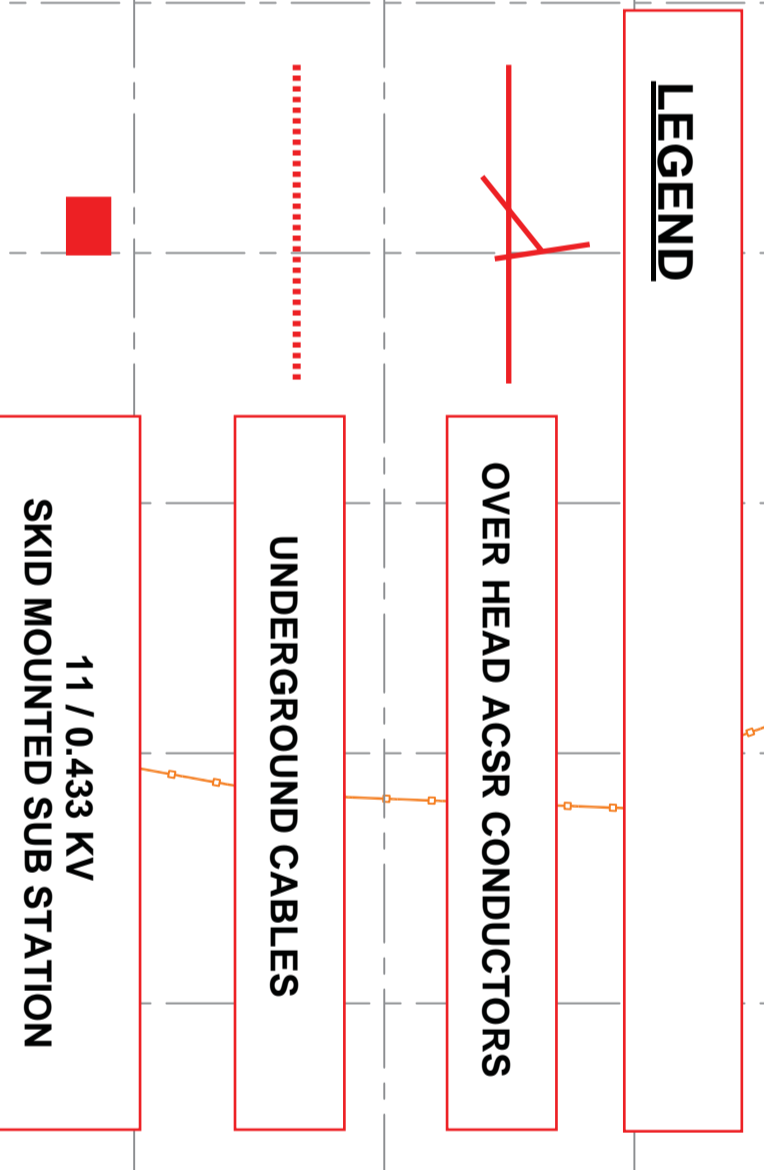
LEGEND (PROPOSED)

1. GAS TURBINE HALL
2. STEAM TURBINE HALL
3. CONTROL & SWITCHGEAR EQUIPMENT BUILDING
4. HEAT RECOVERY STEAM GENERATOR
5. BFP BUILDING
6. CHLORINATION PLANT
7. SERVICE BUILDING
8. TRANSFORMER YARD
9. FUEL GAS HEATER SKID
10. SWITCH YARD
11. GUARD POND/ETP
12. RO/DW PLANT
13. COOLING TOWER
14. RAW WATER RESERVOIR
15. DG SET
16. COMPRESSOR BUILDING
17. CW TREATMENT PLANT
18. DELETED
19. GAS CONDITIONING SKID
20. DELETED
21. CW PUMP HOUSE
22. RAW WATER PUMP HOUSE
23. DELETED
24. DELETED
25. DELETED
26. DELETED
27. CW OZONATION PLANT
28. AMBIENT AIR QUALITY MONITORING STATION (3 NOS)
29. OVERHEAD STORAGE TANK
30. FIRE STATION BUILDING & DRILL TOWER
31. AIR WASHER ROOM
32. AC PLANT
33. GAS BOOSTER COMPRESSOR UNIT
34. COOLING TOWER FOR GAS BOOSTER COMPRESSOR UNIT

* EXISTING BUILDING OF IOCL SHALL BE USED FOR WAREHOUSE AND CHEMICAL LAB

SPACE SHOWN FOR EXTENSION UNIT SHALL BE USED FOR RAW MATERIAL STORAGE/FABRICATION PURPOSE.

FOR TENDER PURPOSE ONLY



REV	DATE	BY	CHK	APP	REV	DATE	BY	CHK	APP
01	23/04	LP	SK	JJ	01	23/04	LP	SK	JJ
FOR TENDER PURPOSE ONLY									
FOR TENDER PURPOSE ONLY									
FOR TENDER PURPOSE ONLY									

JOB No.	K10
STATUS	PROPOSAL
TITLE	350 MW YELAHANKA COMBINED CYCLE POWER PLANT
PROJECT	BHARAT HEAVY ELECTRICALS LTD
PRODUCT	NEW DELHI
SCALE	1:1000
SHEET	1 OF 1
REV	03

TECHNICAL CONDITIONS OF CONTRACT (TCC)

VOLUME-IA PART- II CHAPTER -4

TECHNICAL REQUIREMENTS AND GUIDELINES FOR INSTALLATION, TESTING, COMMISSIONING AND SUPPLY ITEMS OF HT / LT ELECTRICAL PACKAGES

2.4.1 INSTALLATION, TESTING & COMMISSIONING IN GENERAL:

The stages of completion of various works shall be as follows:

Completion

- Equipment shall be considered to be completely erected when the following activities have been completed.
- Moving of all equipment to the respective foundations.
- Fixing of anchor bolts or tack welding as required.
- Leveling and alignment of equipment.
- Assembling of all accessories such as relays, CTs, PTs, meters, instruments etc. as described in the job specification.
- Cable laying, termination with continuity check.
- Applying of finishing coat of paint.

All the equipment shall be tested at site to know their condition and to prove suitability for required performance. The site tests and acceptance tests to be performed by contractor are detailed below.

The contractor shall be responsible for satisfactorily working of complete integrated system and guaranteed performance.

2.4.2 SITE TESTS AND CHECKS

2.4.2.1 General

All the equipment shall be tested at site to know their condition and to prove suitability for required performance.

The test indicated in following pages shall be conducted after installation. All tools, accessories and required instruments shall have to be arranged by contractor. Any other test which is considered necessary by the manufacturer of the equipment, contractor or mentioned in commissioning manual has to be conducted at site.

In addition to tests on individual equipment some tests / checks are to be conducted / observed from overall system point of view. Such checks are highlighted under miscellaneous tests but these shall not be limited to as

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indicated and shall be finalized with consultation of client before charging of the system.

The contractor shall be responsible for satisfactory working of complete integrated system and guaranteed performance.

All checks and tests shall be conducted in the presence of client's representative and test results shall be submitted in six copies to client and one copy to Electrical Inspector. Test results shall be filled in proper proforma.

After clearance from Electrical Inspector system/equipment shall be charged in step by step method.

Based on the test results clear cut observation shall be indicated by testing engineer with regard to suitability for charging of the equipment or reasons for not charging are to be brought by the contractor.

2.4.2.2 Trial Run Test

After the successful test of each equipment as per standard test procedure the entire control system shall be put on trial run test on actual site conditions and operation of the system.

2.4.2.3 Acceptance Test

The acceptance test on the system shall be carried out by the supplier as per mutually agreed test procedures to establish satisfactorily functioning of the system as a whole and each equipment as part of the system.

2.4.3 TRANSFORMER

2.4.3.1 INSTALLATION

To ensure that a Transformer will function satisfactorily, it is important that handling, lifting, storing and assembling are carried out with great care and cleanliness by experienced personnel who know the various working operations very well.

2.4.3.2 INSPECTION

In connection with receiving and unloading at site, and at the final storing place before assembling, the transformers shall be inspected carefully. External visible damages as dents, paint damage etc. may imply that the transformer has been subjected to careless handling during transport and/or re-loading, and a careful investigation is therefore justified.

After the arrival of the material at receiving points, before unloading, the condition of packing and of the visible parts should be checked and possible traces of leaks verified (condenser bushing). If necessary, appropriate statements and claims should be made.

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Drums containing oil which have separately despatched should be examined carefully for leaks or any sign of tampering. All despatched drums are filled upto their capacity and any shortage should be reported.

Check immediately the gas pressure at the arrival. A positive indicates that the tank and the transformer components respectively are tight, and that the active part including the insulation materials is dry.

If there is no positive gas-pressure, transformer should be immediately filled with dry Nitrogen gas at a pressure of 0.17 kg/cm² (2.5 psi) without loss of time.

Otherwise, it should be checked if the core isolation is satisfactory and that accessories packed separately have not been damaged during transportation.

2.4.3.3 UNLOADING

Whenever rollers/trolleys are supplied with transformer, movement of transformer at site is carried out by mounting these rollers / trolleys.

Alternatively for movement of transformer from loading bay to actual site of the equipment, skidding on greased rails etc can also be resorted to.

2.4.3.4 STORING

Dismantled equipment and components are packed to the protected against normal handling and transport stresses. The instructions for lifting given on the packages, must be complied with to avoid damages.

Goods stored outdoors must not be placed directly on the ground, and should be covered carefully with tarpaulin or similar materials.

Oil drum should be stored in horizontal (lying) position with both the bungs also in horizontal position.

2.4.3.5 CHECK POINTS BEFORE STARTING AND DURING ERECTION

a. Check points before starting erection.

- i. Conditions of leads
- ii. Bracing, clamping of leads
- iii. Connections
- iv. Tap changer checks
- v. General conditions of insulation
- vi. Core check that it has not moved in transit.
- vii. Core-ground; this is checked with the megger after removing earth connection

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- viii. CTs, including the secondary leads and their passage through metal parts
- ix. Check that shipping frame for bushings have been removed.
- x. Check that coil position has not moved in transit
- xi. Check for dirt, metal swarf, moisture
- xii. Check that the bushing leads set without being too close to ground or other points of different potential.

b. Check-points during erection:

By means of the part list and the transformer / reactor OGA, the assembling of a fully completed transformer is carried out according to the following instructions. The following precautions are to be taken:

- i. Fire-fighting equipment shall be available at the oil-treatment equipment as well as at work on and adjacent to the transformer.
- ii. Welding work on or adjacent to the transformer shall be avoided, but if this is not possible, the work shall be supervised by fire-protection personnel.
- iii. Smoking on or near the transformer shall not be allowed.
- iv. Transformer tank, control cabinet etc, as well as assembling and oil-treatment equipment shall be connected with the permanent earthing system of the station
- v. Check that there is no overpressure in the transformer when blanking plates or connection lids are to be opened.
- vi. All loose objects, tools, screws, nuts etc. shall be removed from the transformer cover before opening the connection and blanking lids.
- vii. All loose objects (tools, pencils, spectacles etc.) shall be removed from the boiler- suit pockets etc. before starting the work through man-holes.
- viii. Tools to be used inside the transformer e.g. for tightening of screws-joint- shall be fastened to the wrist or another fixed point by means of cotton tape or string.
- ix. Tools with loose sleeves and tools with catches must not be used at work inside the transformer.
- x. Greatest possible cleanliness shall be observed at work inside the transformer, and at handling of part to be mounted inside the transformer.
- xi. Fibrous cleaning materials should not be used as it can deteriorate oil when mixed with it.
- xii. All components despatched separately should be cleaned inside and outside before being fitted.

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- xiii. A Transformer is best protected for damp hazard by circulating warm, dry, de-aerated oil through it until its temperature is 5° C to 10° C above ambient. This should be done before allowing external excess to the interior of the tank. The warm oil should be circulated all the time the transformer is open to atmosphere.
- xiv. Oil pump & all joints in the oil pipe work should be air tight to avoid entrance of air through leakage joints.
- xv. The active part (core and winding) should be exposed to the surrounding air as short time as possible. Open therefore only one blanking plate or connection lid at a time for remounting of bushing, valves etc.
- xvi. Objects which despite all precaution are dropped inside transformer / reactor, must absolutely be brought up from the equipment.
- xvii. Check that the oxygen content inside the transformer tank is minimum 20% if a person is to enter the tank.

2.4.3.6 ASSEMBLY

Assembly of wheels Bushing Valves, cooling device, Oil conservator, Pilot Flanges, Blanking plates and accessories like cooling fans, pumps, OLTC and components for supervision and control oil level indicator, flow indicators, gauges, Buchholz relay, PRV, thermometers etc. are assembled according to leaflet / description valid for the components.

2.4.3.7 OIL FILLING

The following procedure is recommended.

- i. Close and blank the valve to isolate the conservator from main tank. Fill the oil in transformer under vacuum upto Buchholz level as per instructions given else where.
- ii. After filling the oil in transformer and breaking the vacuum, oil can be filled in the conservator either through reactor or by drain valve.
- iii. Remove the inspection cover (ii) provided on the side of the conservator and check the air cell assuring that it is inflated. The air must remain in fully inflated condition during oil filling operation. If the air cell is found deflated fit the inspection cover and inflate the air cell with dry air / nitrogen gas to 0.035 kg/sq.cm max. A gauge may be put by removing plug. After filling close these connections.
- iv. Remove air release plugs provided on top of the conservator.
- v. Slowly pump the oil through main reactor / drain valve. Temporarily stop filling operation when oil starts coming from opening after ensuring that no

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air bubbles come out through these air release holes. Fit the two air release plugs.

- vi. Continue oil filling till oil start coming from air release plug stop oil after ensuring that no air bubbles come out. Fit the plug.
- vii. Now release the air pressure held inside the air cell from point and continue oil filling until magnetic oil gauge indicates 35 deg. C level.
- viii. Remove oil pump and connect air cell to breather from point. Also remove pressure gauge and put plug.
- ix. The system is now properly filled. Air release plugs are fitted in normal operation.

2.4.3.8 Equipment for Oil-Filling Under vacuum

- i. High-vacuum 2 storage oil filtration plant provided with thermostat-controlled oil heaters and vacuum-proof hoses with dependent vacuum pumping system for tank evacuation. Capacity :6 kl/hr
- ii. Oil-storage tanks provided with silica-gel breathers and inlet / outlet valves for oil circulation. Recommended capacity 20kl
- iii. Vacuum gauges provided in filtration plant.
- iv. Equipment for measurement of electric strength (BDV) of oil - 100 kv set.
- v. Equipment for moisture content of oil.
- vi. Equipment for measurement of Resistivity and Tan delta at 90 C.
- vii. Transparent vacuum-proof tubes for checking of oil-level during oil filling.
- viii. Valves, fitting, gaskets etc.
- ix. Dry nitrogen cylinders.

2.4.3.9 COMMISSIONING

Testing after Assembly of the Transformer

After the transformer has been assembled at site, it shall be tested in order to check that it has not been damaged during transport and assembly to such an extent that its future operation will be at risk. Regarding the performance of the test, refer to the testing method as per standards. The results of the test shall be documented.

COMMISSIONING CHECKS

<u>SL NO</u>	<u>DESCRIPTION</u>
1.	Breather Silica gel (Blue when dry)
2.	Oil in the Breather housing cup.

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3. All valves for their correct opening and closing sequence.
4. Oil level in conservator tank.
5. Oil in cooling system.
6. Oil level in bushings.
7. Release air, wherever necessary.
8. Cooling accessories (Pump motors, Fan motors etc.) for direction and O/L setting.
9. Buchholz, oil level indicator, pressure gauges, thermometer, Temp. indicators etc.
10. Neutral earthing.
11. Earth Resistance of Electrodes.
12. Earthing of bushing test tap.
13. Check oil leakage for 24 hrs.
14. Check Auxiliary circuit voltage (415 V)
15. Calibration of OTI / WTI with hot oil.
16. Check Working of WTI / RTD repeaters at control room.
17. IR of core to earth.
18. Die electric strength of oil PPM & Chemical analysis, specific gravity test
19. IR tests on windings to earth and between winding
20. Phase sequence test & vector group check
21. Continuity test
22. No load voltage ratio on all tap position
23. Winding resistance in all taps
24. Tap changing at 415v 3 50 Hz supply in all three phases
25. TAN-DELTA test if quality check list calls for.
26. Dew point check for N₂ Gas at the time of oil filling

INSULATION RESISTANCE TEST

Sl.No	Description	Date	Time in Hrs	Megger (See note (3))	IR Value	Temp	Remarks
1	Control wiring						
2.	Tap Changer						
	a) Motor						
	b) Control						
3.	Cooling system						

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a)	Motor Fan						
b)	Motor pump						
c)	Control Wiring						
4.	Main Winding						
a)	HV/E+LV						
b)	LV/E+HV						
c)	HV/IV						
d)	IV/LV						
e)	HV/LV						

Note :-

- (1) While checking these values no external, lightning arrestors etc should be in circuit.
- (2) Special care should always be taken while meggering the transformer winding to ensure that there is no leakage in the leads.
- (3) Megger voltage to be decided based on the voltage rating of equipment under test.

Oil Characteristics.

Take necessary precaution (regarding rinsing the bottle, cleaning hand, air bubble etc) while withdrawing the samples, Each sample should be free of air bubbles and should not be tested when it is hot. The sample should satisfy IS:1866.

1. Tank Top Sample Bottom Sample
2. Cooling system Top Sample Bottom Sample
3. OLTC Divertor (each phase)

Tests on CT

1. Ratio
2. Polarity
3. Magnetising current
4. IR Value

Potential Transformer Tests

1. IR test of primary winding by HV megger between windings
2. IR test of secondary winding by LV megger between winding and winding to earth
3. Checking of voltage ratio

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4. Verification of terminal markings and polarity
5. Checking of oil level if applicable
6. Checking of continuity and IR values for cables from PT to M
7. Checking tightness of earthing connection.
8. Checking of insulator for cracks
9. Checking output on charging of the system with connected meter

On Load Tap changer

Sl.No	Description	Date	Observation	Remarks
1	Visual Inspection of equipment.			
2	Hand operation on II taps.			
3	Complete wiring of the circuits			
4	Limit Switch			
5	Over running device			
6	Remote Panel Wiring.			
7	Overload Device of Driving Motor.			
8	Local Operation (Electrical)			
9	Remote Operation (Electrical)			
10	Tap Position Indicator.			
11	Step by step contractor			
12	Out of Step Relay.			

Note

- 1) While operating the mechanism on Electrical Control, check once again limit switches, step by step contractor, over running device etc. for their actual operation and prove that they are functioning properly.
- 2) For More details Please refer Respective Manuals.

2.4.4 GUIDELINES FOR ERECTION OF HT SWITCHGEAR PANELS

2.4.4.1 Erection

The base frames will be supplied normally along with the boards. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not available, the same will have to be fabricated and painted at site. Base frames shall be grouted on the openings which shall be made on the floor during the time of casting. All necessary concrete chipping and finishing works are to be completed.

- 2.4.4.2 All the panels/board shall be placed on its foundation or supporting structures and shall be assembled as required. All panels should be installed with parallel, horizontal and vertical alignment by skilled craftsmen.

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2.4.4.3 All the boards will be delivered in sections. Necessary interconnection of busbar, bolting of panels, left out panel / interpanel wiring, etc. will have to be done after assembling the panel.

2.4.4.4 **The Following Points shall be Checked up During Erection**

1. Layout of foundation channels.
2. Floor level covered by the panel with respect to main floor level.
3. Location and serial no. of panels.
4. Positioning of panels.
5. Verticality of switchgear panels within the limit specified.
6. Freeness of Breaker Truck and modules in housing and its manual operation.
7. Earthing of panels and breaker truck to station earth.
8. Lugs for termination of HT and LT cables.
9. Mounting and fixing arrangements of Bus bars.
10. Tightening of Busbar jointing bolts as specified.
11. Clearance between :
 - i. Phase to Phase
 - ii. Phase to earth
12. Minimum clearance for:
 - i. Breaker, Truck and modules withdrawal
 - ii. Distance required for maintenance work
13. Check the operation of:
 - i. Remote control
 - ii. Various required - closing / tripping / alarm / indications / interlocks
14. Installation position of insts and relays
Operation of relays and meters by secondary injection.
15. AC/DC supplies for panel
Final relay settings as per customer requirements.
16. Tightness of terminal connections for HT & LT connections.
17. Opening operation of breaker, manually and electrically.
18. Working of ammeters and voltmeters for their entire range and other panel mounted instruments like recorder, indicator etc.

2.4.4.5 **HT SWITCHGEAR TESTS**

1. IR test

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2. HV one minute P.F. test checking of oil level
3. Measurement of contact resistance for HT breakers
4. Test to prove inter changeability of similar parts (including breaker module)
5. Testing of relays as per supplier's commissioning manual
6. Testing and calibration of all meters.
7. Operation of all relays by secondary injection method
8. Testing of CT polarities and CT ratio by primary injection test.
9. Measurement of knee point voltage and secondary resistance for CTs used for differential protection.'
10. IR and voltage ratio test for PTs
11. Functional test of all circuit components for each panel / feeder.
12. Test to prove closing/tripping operation at minimum and maximum specified voltage in test and service position.
13. Check for drawout test and service position of breakers for all feeders.
14. Check for covering of all openings in the panel - check for continuity and operation of aux. contacts of breaker.
15. HV test on vacuum interrupters (for VCBs)
16. Check for pressure of SF6 gas and air (for SF6).

2.4.5 LT SWITCHGEAR PANELS

2.4.5.1 Erection

- A. The base frames will be supplied normally along with the boards. These will have to be aligned, levelled and grouted in position as per approved drawings. Wherever the base channels are not available, the same will have to be fabricated and painted at site. Base frames shall be grouted on the openings which shall be made on the floor during the time of casting. All necessary concrete chipping and finishing works are to be completed.
- B. All the panels/board shall be placed on its foundation or supporting structures and shall be assembled as required. All panels should be installed with parallel, horizontal and vertical alignment by skilled craftsmen
- C. All the boards will be delivered in sections. Necessary interconnection of busbar, bolting of panels, left out panel / inter panel wiring, etc. will have to be done after assembling the panel.

2.4.5.2 Checks during erection

1. Layout of foundation channels.
2. Floor level covered by the panel with respect to main floor level.

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3. Location and serial no. of panels.
4. Positioning of panels.
5. Verticality of switchgear panels within the limit specified.
6. Freeness of Breaker Truck and modules in housing and its manual operation.
7. Earthing of panels and breaker truck to station earth.
8. Lugs for termination of LT cables.
9. Mounting and fixing arrangements of Bus bars.
10. Tightening of Busbar jointing bolts as specified.
11. Clearance between :
 - i. Phase to Phase
 - ii. Phase to earth
12. Minimum clearance for :
 - i. Breaker, Truck and moduls withdrawal
 - ii. Distance required for maintenance work
13. Check the operation of:
 - i. Remote control
 - ii. Various required - closing / tripping / alarm / indications / interlocks
14. Installation position of instruments and relays
Operation of relays and meters by secondary injection.
15. AC/DC supplies for panel
Final relay settings as per customer requirements.
16. Tightness of terminal connections for HT & LT connections.
17. Opening operation of breaker, manually and electrically.
18. Working of ammeters and voltmeters for their entire range and other panel mounted instruments like recorder, indicator etc.

2.4.5.3 LT Switchgear tests

1. IR test
2. Measurement of contact resistance for LT breakers
3. Test to prove inter changeability of similar parts (including breaker module
4. Testing of relays as per supplier's commissioning manual.
5. Testing and calibration of all meters.

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6. Operation of all relays by secondary injection method.
7. Testing of CT polarities and CT ratio by primary injection test.
8. Measurement of kneepoint voltage and secondary resistance for CTs used for differential protection
9. IR and voltage ratio test for PTs
10. Functional test of all circuit components for each panel / feeder
11. Test to prove closing / tripping operation at minimum and maximum specified voltage in test and service position
12. Check for drawout test and service position of breakers for all feeders
13. Check for covering of all openings in the panel - check for continuity and operation of aux. contacts of breaker.

2.4.6 GUIDELINES FOR CABLE LAYING

- 1) Also refer cable laying clause in chapter – XIII.
- 2) Cables laid exposed in racks/trays and routed through trenches/tunnels/basements etc. to individual drive/control devices etc. shall be taken in embedded surface exposed rigid GI conduits and or flexible conduits unless directly terminated to the equipment in the panels located, above trenches, tunnels or basement.
- 3) All cables routed along walls or in equipment rooms shall be protected by means of laying them through GI pipes or by providing sheet metal covers upto a height of 2000 mm from the working floor levels and platforms, for protection against mechanical damage. All vertical risers shall be of enclosed type.
- 4) Cable trays shall be supported on ISA 50x50x6mm MS/GI brackets. Brackets shall be welded to steel plate inserts in the trenches / tunnels or supporting channel angle / inserts in other areas.
- 5) Wherever cables are to be laid below roads and railway tracks, the same shall be taken through ducts buried at a suitable depth as decided by Engineers.
- 6) Laying and installation of power, control and special cables shall generally conform to IS : 1255
- 7) The cables shall be laid-out in proper direction from the cable drums (opposite to the normal direction of rotation for transportation).
- 8) In case of higher size cables, the laid out cables shall run over rollers placed at close intervals and finally transferred carefully on the racks/trays. Care shall be taken so that kinks and twists or any mechanical damage does not occur to cables. Only approved cable pulling grips or other devices shall be used. Under

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no circumstances cables shall be dragged on ground or along structure while paying out from cable drums, carrying to site and straightening for laying purpose.

- 9) Suitable extra length of cables shall be provided for all feeders for any future contingency, in consultation with Engineer.
- 10) Cable runs shall be uniformly spaced, properly supported and protected in an approved manner. All bends in runs shall be well defined and made with due consideration to avoid sharp bending and kinking of cable. The bending radius of various types of cables shall not be less than those specified by cable manufacturers and that specified in IS 1255.
- 11) All cables shall be provided with identification tags indicating the cable numbers in accordance with the cable circuit schedule. Tags shall be fixed at both ends of cables (both inside & outside of panel) both sides of floor / wall crossings, every 25m spacing for straight runs or as specified by Engineer for easy identification of cable.
- 12) When a cable passes through a wall, cable number tags shall be fixed on both sides of the wall.
- 13) Single core cables for AC Circuits shall form a complete circuit in trefoil formation supported by means of trefoil clamps of non-magnetic material.
- 14) Multi-core cables above 1100 V grade shall be generally laid in ladder type trays in one layer with spacing not less than one cable diameter of bigger diameter cable.
- 15) All 1100 V grade multicore power cables and single core DC cables shall be placed in single layer, touching each other and clamped by means of single or multiple galvanised MS saddles / aluminium strips / nylon cable ties. Cables above 35mm diameter shall be clamped individually.
- 16) Control cables shall be laid touching each other and wherever required may be taken in two layers. All control cables shall be clamped with a common clamp/tie.
- 17) Segregation of the cables on the basis of their types and their functions shall be as under for horizontal formation:
 - 17.1 HT cables shall be laid in the top tier(s)
 - 17.2 LT power cables to be laid in the tray(s) below the HT cable trays.
 - 17.3 LT control cables to be laid in the Tray(s) next below to the LT power cable (trays)
 - 17.4 Special control cables including screened control cables to be laid in the bottom most tray(s).
- 18) For vertical formations, the trays closest to the wall shall be considered as bottom most tray and the order indicated in clause just above shall be followed. However,

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where there is no clear distinction of bottom / top trays, the order convenient for linking the horizontal and vertical formations shall be followed.

- 19) When it may not be possible to accommodate the cables as per the criteria indicated in the two clauses 29 & 30 indicated above, the following rules shall override the criteria. However, prior approval of the Engineer will be required. In hierarchical order:
 - 31.1 Control cables are mixed up with the special control cables with clear minimum gap of 100 mm between them.
 - 31.2 LT power cables are mixed up with control cable with clear minimum gap of 150 mm between them.
 - 31.3 LT power cables are mixed up with HT power cables with clear minimum gap of 200 mm between them.
 - 31.4 LT power cables are mixed up with special control cables with clear minimum gap of 200 mm between them.
- 20) To facilitate pulling of cables in GI conduits, powdered soft stone, plastic scoop or other dry inert lubricant may be used but grease or other material harmful to the cable sheaths shall not be used.
- 21) No single core cable shall pass through a GI conduit or duct except DC single core cables. AC single core cables shall pass through GT conduits/pipes in trefoil formation only.
- 22) In case of a 3 phase, 4 wire system, more than one single phase circuit, unless originating from the same phase shall not be taken in the same GI conduit.
- 23) Entry of cables from underground trenches to the buildings or tunnels shall be by some approved method. Necessary precautions shall be taken to make the entry point fully water tight by properly sealing the pipe sleeves wherever they enter directly into the building at trench level. The sealing shall be by cold setting compound. Any alternative sealing arrangement may be suggested with the offer for consideration by BHEL.
- 24) Wherever specific cable routes are not shown in cable schedules cables shall be laid as directed by Engineer.
- 25) SUPPORT SPACINGS & CLAMPINGS
Support spacing and clamping suitably provided and as required
- 26) LAYING OF CABLES DIRECTLY BURIED IN GROUND
Laying and installation of directly buried cables in ground shall conform to the requirements of IS 1255.
- 27) SUPPORT SPACINGS & CLAMPINGS

Trefoil Clamps:	
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i. Horizontal run spacing	1000 mm (max)
ii. Vertical run spacing	1000 mm (max)
iii Axial spacing between adjacent trefoils	Double the diameter of larger cable or 150 mm Whichever is less

Other Clamps

A. Power Cables:

Above 35mm OD

- i) Horizontal runs : Individually clamped at 3000 mm Interval (max)
- ii) Vertical runs : Individually clamped 3000mm intervals (max).

Upto 35mm OD

- i) Horizontal runs : Collectively clamped at 3000 mm intervals (max)
- ii) Vertical runs : Collectively clamped at 2000 mm interval (max)

B. Control Cables:

- i) Horizontal runs : Collectively clamped at 3000 mm interval (max) ii)
- Vertical runs : Collectively clamped at 3000 mm interval (max)

C. Spacing for cables supported along structure/ceiling

Clamping Spacing:

- i) In horizontal runs : 750mm (max)
- ii) In vertical runs : 750mm (max)

Spacing between cables : 30 mm (min)

Note:

- a. Supports shall also be provided at each bend.
- b. For any change in above spacing, prior approval of Engineer will be taken

43) CABLE TERMINATION AND JOINTING

- a. When the equipment are provided with undrilled gland plates for cable/conduit entry into the equipment, drilling and cutting on the gland plate and any minor modification work required to complete the job shall be carried out at site and drawings shall be prepared and take engineer's approval before drilling holes. Cutting shall not be allowed.
- b. Termination of cables shall be done as per termination drawings & interconnection diagrams furnished to the contractor. Looping of cores / wires at terminals as shown in interconnection diagrams is to be done.
- c. All cable entries in the equipment shall be sealed after glanding the cables.
- d. Adequate length of cables shall be pulled inside the switch boards, control panels, terminal boxes etc. as per near termination of each core/conductor.
- e. Power cable terminations shall be carried out in such a manner as to avoid strain

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on the terminals by providing suitable clamps near the terminals.

- f. End sealing / termination of cables shall be done by means specified on the specification for terminations. The system shall be suitable for types of cable specified and complete with stress relief system.
- g. Termination and jointing of aluminium / copper conductor power cables shall be done by means of compression method using compression type aluminium / tinned copper lugs.
- h. Copper conductor control cables shall be terminated directly into screwed type terminals provided in the equipment. Wherever control cables are to be terminated by means of terminal lugs, the same shall be of tinned copper compression type.
- i. Cable joints shall normally be made at an intermediate point in the straight run of the cable only when the length of the run is more than the standard drum length supplied by the cable manufacturer. In such cases, when jointing is unavoidable, the same shall be made by means of specified cable-jointing kit, subject to BHEL's approval of Engineer shall be taken for deciding location of joint.
- j. Termination and jointing shall generally conform to the requirements of IS: 1255 and shall strictly conform to the recommendations of termination and jointing kit supplier.

44) TESTING OF CABLES:

- i. The contractor shall submit to the Engineer a checklist for testing and commissioning and the activities shall be carried out in accordance with the checklist.
- ii. Testing and electrical measurement of cable installations shall conform to IS : 1255
- iii. Prior to installation, cables shall be tested for :
 - a) Continuity of conductors
 - b) Insulation resistance between conductors & earth
 - c) Insulation resistance between conductors.
- iv. After installation cables shall be tested for:
 - a) Insulation resistance between conductors & iron
 - b) Insulation resistance between conductors & earth
 - c) Conductor resistance
 - e) Capacitance between conductors & earth (for cables above 7C.1.3KV grade)
 - f) DC high voltage test (for LT power cables of higher sizes interconnecting PCCs & MCC)
 - g) Absence of cross phasing

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h) Firmness of terminations.

2.4.7 CODES AND STANDARDS

2.4.7.1 All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) except where modified and / or supplemented by this specification.

2.4.7.2 Equipment and materials conforming to any other standard which ensures equal or better quality may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

IS The electrical installation shall meet the requirement of Indian Electricity Rules as amended upto dates, relevant IS codes of Practice and Indian Electricity Act. In addition, other rules or regulations applicable to the work shall be followed. In case of any discrepancy, the more restrictive rule shall be binding. A list of applicable standards is given below for reference.

IS 3043 Code of practice for earthing

IS 3072 Installation and maintenance of switchgear

IS 5133 Box for enclosure of electrical equipment

IS 5216 Guide for safety procedure and practice in electrical work

IS 13947 Degree of protection provided by enclosures for low voltage switchgear and control gear.

IS 5216 Guide for safety procedures and practices in electrical works.

IS 800 Code of practice for use of structural steel.

In addition to the standards mentioned above, all works shall conform to the requirements of the following rules and regulations.

- a) Indian Electricity Act and Rules framed thereunder
- b) Fire insurance regulations
- c) Regulations laid down by the Chief Electrical Inspector of State and CEA
- d) Regulations laid down by the Factory Inspector of State
- e) Any other regulations laid down by the authorities.

In case any clause of contradictory nature arises between standards and this specification, the latter shall prevail.

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2.4.8 TECHNICAL REQUIREMENT FOR ITEMS SUPPLIED BY THE CONTRACTOR.

2.4.8.1 GENERAL

Equipment and material supplied shall comply with description, rating, type and size as detailed in this specification, drawings and annexures.

Equipment and materials furnished shall be complete and operative in add details.

All the accessories, fittings, supports, anchor bolts etc., which form part of the equipment or which are necessary for safe and satisfactory installation and operation of the equipment shall be furnished.

All parts shall be made accurately to standard gauges so as to facilitate replacement and repair. All corresponding parts of similar equipment shall be interchangeable.

Samples of all items shall be made available for purchaser's approval prior to supply of item to site.

2.4.8.2 FERRULES

- a) Ferrules shall be required for individual core of cable hence they shall be suitable for the insulated conductor diameter.
- b) Ferrules shall be of plastic material.
- c) Numbering on the ferrules shall be engraved type with contrast colour to the base. Engrave colouring shall be of durable quality to match the entire life of the plant. Engraving shall be legible from a distance of 600 mm.
- d) Ferrules shall be interlocking type in such a way that the interlocked ferrules take the shape of tube with complete ferrule number appearing in a straight line.

2.4.8.3 TAGS

- a) Cables shall be provided with cable number tags for identification.
- b) Cable tags shall be of durable fibre, aluminium or stainless steel sheets.
- c) Cable number shall be engraved type in case of aluminium or stainless steel tags, and printed type in case of fibre sheet.
- d) Tags shall be durable quality of size 60mm x 12mm with holes at both ends.
- e) Samples of tags shall be approved by BHEL Engineer before delivery.
- f) Tags shall be provided with non-corrosive wire of sufficient strength for taggings.

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2.4.8.4 FIRE STOP CABLE SEALING SYSTEM (AS APPLICABLE)

Fire stop cable sealing system shall have two (2) hours fire protection rating suitable for sealing both vertical & horizontal cable penetrations. The sealing compound in conjunction with mineral wool shall form effective fire seals. The sealing compound shall have special property to allow for short circuit conditions. **GPG fire stop sealing compo** or equivalent sealing compound shall be used.

2.4.9 GUIDELINES FOR ERECTION OF GI PIPES, SUPPORTS & ACCESSORIES

- 2.4.9.1 For installation of cables in GI conduits the conduits shall be installed first without cables but having suitable pull wires laid in conduits.
- 2.4.9.2 For equipment and devices having GI conduit entry arrangement other than standard GI conduit adopter, adopters shall be provided as required to enable the GI conduit to be properly terminated, between conduit end and motor T.B.
- 2.4.9.3 GI conduits shall run without moisture or water traps and shall be made drawing arrangement towards the end.
- 2.4.9.4 The entire GI conduit system shall be firmly fastened in position. All boxes and fittings shall generally be secured independently from the GI pipes entering them.
- 2.4.9.5 Bends of GI pipes / conduits shall be made without causing damage to the pipes/conduits.
- 2.4.9.6 Occupancy of conduits shall not be greater than 40%.
- 2.4.9.7 The adopter for coupling rigid GI pipe/conduits and flexible conduit shall be of aluminium or galvanised steel.
- 2.4.9.8 Transportation and storage of cable drums shall generally conform to the requirements of IS: 1255.
- 2.4.9.9 All the cables shall be supplied to the contractor free of cost from BHEL / Customer's store / storage area. Transportation of cables from storage area to the work site shall be the responsibility of the contractor.
- 2.4.9.10 The cable drums shall be transported on wheels to the place of work.

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Note :

The test specified above for all the electrical equipment are not exhaustive. Any other pre-commissioning and field tests not included in the above list but necessary as per relevant standards, Electricity rules, code of practice and instructed by the manufacturer of the equipment shall also have to be carried if deemed necessary shall be carried out as per requirement either within the quoted rates / price or at additional cost. Decision of Engineer in charge will be the final regarding additional cost for testing. The contractor shall take the full responsibility of testing, commissioning, trial run and successful operation of the equipment.